

# Greening European Cities

## The example of materials flow management in the Berlin construction industry

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### Ciudades europeas más verdes El ejemplo de la gestión del flujo de materiales en el sector de la construcción de Berlín

El concepto del desarrollo sostenible ha sido adoptado en años recientes como el mínimo común denominador que tanto gobiernos como partidos políticos, organizaciones no gubernamentales y científicos están dispuestos a aceptar en el ámbito nacional e internacional como un objetivo básico del desarrollo internacional.

Una característica posiblemente distintiva de los diferentes postulados relativos al desarrollo sostenible es la de unas "condiciones poco o muy estrictas" de sostenibilidad. Esta distinción da gran importancia a las cuestiones relacionadas con los recursos naturales y a la posibilidad de sustituirlos por recursos generados por la actividad humana. Además de los recursos naturales (suelo, agua, aire, biodiversidad), existen también recursos sociales (instituciones sociales y políticas), recursos humanos (educación, conocimiento) y recursos físicos de fuentes antropogénicas.

El establecimiento de unas condiciones poco estrictas de sostenibilidad significa, en realidad, aceptar el proceso de sustitución de recursos naturales por recursos antropogénicos. Por el contrario, una posición estricta con respecto a la sostenibilidad presupone la inmutabilidad de los recursos no renovables y, por tanto, la existencia de unos recursos constantes. El punto crucial es, por consiguiente, asegurar que la existencia de unos recursos naturales suficientes para sostener la vida. La presentación de las distintas visiones del desarrollo sostenible demuestra claramente que el concepto "apropiado" de sostenibilidad depende mucho del contexto en el que se utilice.

Esta idea se refleja en el debate de los aspectos espaciales y temporales. Para muchas personas, la principal ventaja del concepto radica en el

### 1. Sustainability as goal for housing construction

The concept of sustainable development has been adopted in recent years as a smallest common denominator, acceptable to governments, political parties, non-government organisations and scientists in a national and international context as a relevant framework objective for international development.

One reason for the broad agreement on sustainable development' as an objective is the vagueness of the concept. Various authors have counted more than 100 different definitions of sustainable development.' Sorting through the growing avalanche of literature on this topic, it becomes clear that various schools of interpretation have formed and that different disciplinary and interdisciplinary approaches have been developed.

One possible distinguishing feature between the different postulates concerning sustainable development arises from the discussion of "weak vs. strong (or strict) conditions" for sustainable development. This distinction attaches central importance to the questions of natural capital stock and the potential for substituting resources generated by human activity. In addition to natural capital (soil, water, air, biodiversity) there is also the so-called social capital (social and political institutions), human capital (education, knowledge) and physical, man-made capital.

Setting weak conditions for sustainability means on the whole accepting the substitution process between the natural capital stock and man-made capital. In contrast, a strict position regarding sustainability assumes the immutability of non-renewable resources, and therefore a constant capital stock.' A further viewpoint, frequently encountered in connection with weaker definitions of sustainability involves the assumption of a so-called "critical stock of natural capital" below which life would be unable to continue. The crucial point is thus to ensure that the stock of natural resources is able to maintain life. The presentation of various views of sustainable development clearly demonstrates that the "appropriate" concept of sustainability depends very much on the context in which it is being used.'

This insight is reflected in the discussion of spatial and temporal aspects of the discussion. For many people the particular advantage of the concept lies in the aspect of fairness between generations. Those coming after us should enjoy the same conditions and opportunities as we do today. Thus the time becomes the main

factor for these interpretations of sustainable development. But the spatial framework within which sustainability is evaluated can also lead to different conclusions. For example, measures which seem appropriate for achieving the goal of "local sustainable development" could be evaluated negatively when viewed from a national or indeed international perspective.

Although the efforts of the various "sustainability projects" are important if this goal is to be reached, it is necessary to abandon the idea of sustainability as simply an additive concept in which numerous small "sustainable" actions result in one large "sustainable whole". The question of what constitutes sustainable development for the current generation in a specific locality cannot be considered in isolation either from the global conditions and influences or from the unforeseeable needs of future generations, for which it is impossible to plan in advance. Sustainability is therefore subject to the proviso of future developments.

This line of argument is not intended to demonstrate the futility of any theoretical attempt to define the concept of sustainable development, but rather to emphasise its integration in spatial, temporal and institutional structures, and the scope for interpretation which results from this. It would be wrong to view sustainable development as a final concept and to think that there was some static state which we should be striving to reach. Such an interpretation owes more to the human desire for a paradise on earth. The objective must rather be to concentrate on the dynamics of the concept and the processes it implies and to act and make decisions in front of our door with consideration of their implications globally and for future generations. "Think globally, act locally". The constraints on such implementations are obvious, if people from all parts of the globe have to be taken into consideration and the needs of all regions while also protecting the interests of generations who have not yet been born.

Current contributions to the discussion therefore operate between the poles of better theoretical analysis of what actually constitutes sustainable development and the obvious need for pragmatism in political actions.

In the international process, various conferences and documents led to the growth in significance of the concept of "sustainable development", notably the UN Conference on the Human Environment, Stockholm, 1972, the report of the Brundtland Commission (WCED), "Our Common Future" published in 1987, and the UN Conference on Environment and Development (UNCED) in Rio de Janeiro 1992, as well as for questions of human settlements and urban development HABITAT I and II, the latter of which was held in Istanbul in 1996. These conferences are an expression of the efforts to strengthen the global and inter-generational dimensions of the discussion. There is necessarily a risk that the international conferences

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aspecto de la justicia entre generaciones. Los que lleguen después que nosotros tienen derecho a disfrutar de las mismas condiciones y oportunidades que nosotros disfrutamos hoy en día. Así pues, el tiempo se convierte en el principal factor para estas interpretaciones del desarrollo sostenible.

Si bien las actividades de los distintos "proyectos de sostenibilidad" son importantes para alcanzar ese objetivo, tenemos que abandonar la idea de la sostenibilidad como un simple concepto aditivo según el cual un gran número de pequeñas acciones "sostenibles" dan origen a un gran "conjunto sostenible".

Los firmantes de la Agenda 21 en Río pidieron a las administraciones locales que elaboraran una "Agencia Local 21" a través de un proceso general de consulta. En Alemania, más de 600 administraciones locales han iniciado ya ese proceso. En paralelo a las actividades de la Agenda, una importante iniciativa emprendida en el campo de la construcción y las viviendas ha sido la revisión del código alemán de la construcción y las disposiciones sobre los planes de ordenación del espacio en la ley de la construcción y la ordenación del espacio de 1998 (BaurROG). El texto incluye ahora explícitamente el término equivalente para el desarrollo sostenible como un objetivo. En la Sección 1.5.1 del código de la construcción se establece el principio de la sostenibilidad en la planificación del desarrollo urbanístico. En el futuro, los planes de zonificación deberían garantizar un desarrollo sostenible.

Berlín está atravesando una fase de intensa actividad en el sector de la construcción como no se había visto desde el auge de la construcción cuando se convirtió en la capital de Alemania hace ya más de un siglo. La reunificación de la ciudad dividida la ha convertido en el foco de la transformación social en Alemania. Los retos que plantea son especialmente grandes en el campo de la planificación y la construcción.

Las dimensiones poco habituales del reto al que se enfrentan los planificadores y constructores es motivo suficiente para aplicar los nuevos criterios

del desarrollo sostenible. En los años siguientes a la unificación de Alemania, la presión de los inversores y la preparación política de la nueva capital obligaron a tomar decisiones en muchos casos precipitadas con relación a la planificación urbanística, la construcción y el transporte. Ahora que han pasado los primeros años de desarrollo dinámico, ha llegado el momento de analizar con más detenimiento el proceso de planificación y construcción, y también con respecto al desarrollo sostenible.

La aplicación del concepto del desarrollo sostenible requiere un enfoque más holístico que consiga un equilibrio entre los distintos factores. En particular, los problemas del medio ambiente pueden enfocarse con más transparencia cuando se dispone de una normativa que establece objetivos ambientales cuantitativos, ya que estos garantizan un enfoque más racional de la política de medio ambiente.

Si se pretende que el sector berlinés de la construcción mejore la manipulación de los flujos de materiales, los acuerdos y las iniciativas de carácter voluntario con relación a los materiales de desecho de la construcción ya mencionados antes sólo pueden considerarse como uno más de los muchos pasos que tienen que darse. Este tipo de acuerdos tienen que considerarse también en el contexto de la creciente importancia de las obligaciones personales en las políticas alemanas de medio ambiente, que es objeto de un controvertido debate.

Cuando se analizan los objetivos de sostenibilidad con referencia a los flujos directos e indirectos de materiales, los esfuerzos por promover la innovación en Berlín pueden considerarse beneficiosos para todos, ya que por una parte genera innovación y, por otra, mejora la situación competitiva de las empresas regionales.

can become increasingly remote from lives of normal people and the specific problems they face. With this problem in mind, the participants in Rio produced the "Agenda 21" as one of five final documents. In forty chapters it presented a practical catalogue, with Chapter 7 being devoted to sustainable settlement development, and Chapter 10 to the management of land resources and questions of planning. Chapter 28 considers the role of local communities and formulates the task of initiating an agenda process at local level. The goals and recommendations for implementation included in the final document, however, are expressed in general terms, and represent more of a stimulus to use the opportunities provided by the "sustainable development" approach at all levels of society to further the sustainability of the global community.

The signatories to the Agenda 21 in Rio called on all local administrations to develop a "Local Agenda 21" in a broad process of consultation. In Germany, more than 600 local authorities have already begun such a process. In parallel to the Agenda activities, an important development in the field of building and housing has been the revision of the German building code and the spatial planning legislation. In the building and spatial planning law 1998 (BauROG). The text now explicitly includes the equivalent term for sustainable development as a goal. In Section 1.5.1 of the building code the principle of sustainability is established for urban development planning. Zoning plans in future should ensure sustainable development.'

The commission of inquiry of the 13th German Bundestag "For the protection of people and their environment - Goals and framework conditions for a (sustainable) future-compatible development" attached particular importance to the field of building and housing. Three reasons were given to explain this:

Firstly, this demonstrated "...with particular clarity the interactions between environmental influences and lifestyle, social structures and needs, work styles and habits of consumption."

Secondly, "the reformation of such a central area of life in accordance with the goals of a sustainable, future-compatible development (represented) a key challenge".

And a further reason, in the eyes of the commission of inquiry, was "the low level of international networking of housing construction, material and planning policies oriented towards a sustainable, future-compatible development."

The study "Zukunftsfähiges Deutschland" drew up an audit of the environmental consumption for Germany and came to the conclusion that the field of "building and housing" was of enormous importance, accounting for 30% of resources used, with in comparison the largest flows of materials used, the highest energy consumption, and the greatest emissions of nitrogen oxides, sulphur dioxide and carbon dioxide.' The commission of inquiry also commissioned various studies in order to provide a sound basis for discussing environmental quality, and operationalising goals for action.

The study entitled "Material flows and costs in the field of building and housing" was presented to the commission of inquiry by the Institute of Technology Assessment and System Analysis (ITAS) of the Research Centre Karlsruhe and the Institute of Industrial Building Production (ifib) of the University of Karlsruhe. The results were reflected in the final report of the commission." Two contrasting approaches are presented. A top-down approach to material flows (ITAS) attempts to calculate direct and accumulative material and energy flows from available macro-economic data. In a bottom-up approach using life-cycle analysis (ifib), the attempt is made to establish the accumulated materials flow, energy flow and costs for individual buildings.

The second study deals with "Building materials and sickness caused by buildings". On the basis of available data it shows harmful emissions from building materials and chemicals used, and their effects on workers in the construction industry and people using the buildings after completion. Estimates are made on the basis of these figures of the economic damage, possible legal consequences are outlined and recommendations are made for the avoidance of certain substances or their substitution."

Concerning the use of land and influencing behaviour by economic instruments, a report was commissioned on "Possible measures, instruments and effects of steering traffic and settlement area use", and this has now been presented by the Financial Science Research Institute of Cologne University and the Institute of Ecological Spatial Development Dresden."

A common feature of virtually all approaches to the interpretation of sustainable development is that, to a greater or lesser extent, they see ecological, economic and social objectives are united. In the field of "building and housing" these triple goals both complement and compete with each other, which will be illustrated briefly taking as an example the utilisation of settlement land.

A reduction in the use of land and a low level of additional sealing of surfaces can be achieved with a 'floor area figure' (GFZ) for the building project of approximately 0.8." With the optimisation of technical and social infrastructure which is possible. the costs per dwelling are comparatively low for a given floor space, so that the economic aspect can be brought into harmony with the environmental interest in reducing land use. However, where additionally criteria are introduced such as "low density building" or "variety of building types", with the aim of encouraging mixed use or of preventing monotony, then the relative land use factor will increase."

Competing goals could arise, for example, between the environmental consideration of concentration, i.e. the reduction of land use, and the economic consideration of job creation in the construction industry. More detailed investigations would be required of the precise effect of reduction of land use on the level of building activity. The political goal of increasing the number of owner-occupiers. involving the construction of more homes rather than apartments, is also in conflict with goal of reducing the amount of land used.

The type of construction adopted, while meeting the goals for land use and low levels of sealing, must also be suitable for and attractive to large sectors of the population. This in turn implies that the price level for such a type of construction is an important, and probably crucial, factor. From an economic point of view, the level of rent of the apartments must be weighed against the level of subsidies, which again influences the economic targets."

The conflicting goals of the various dimensions have a particular importance. If the concept of sustainable development serves only to obscure such competing goals then it would fall short of the claim that it provides scope for reinterpretation of the relationships between goals at the three levels. The arbitrary nature of the sustainability maxim already documented can give rise to suspicions, and is cited by many critics as proof of its conceptual vacuity. The broad unification of a strange alliance under the banner of "sustainable development" makes bedfellows of the chemical industry and the environmental pressure groups, of left-wing and conservative political groups - only serving to strengthen this suspicion.

## **2. Materials flow management in the Berlin construction industry - Strengthening innovation**

Berlin is going through a phase of major construction unequalled since the building boom when it first became capital of Germany over a century ago. The reunification of the divided city has made it the focal point of social transformation in Germany. The challenges faced are particularly striking in the field of planning and building."

The new planning problems faced in meeting the needs of the new national capital, the enormous efforts required to refurbish the many neglected old tenement buildings, or the challenges posed by the vast estates of industrially built housing in particular in east Berlin are all only parts of the overall task. In addition, since 1991, new commercial and residential construction projects have also been implemented on a scale almost without parallel. The new centre of the city is evolving in the Mitte district. At Potsdamer Platz we have seen the largest building site in Europe. The construction work there has required some 17 million tonnes of building materials, including some 2 million tonnes of general cargo, and 1.8 million tonnes of concrete. On the output side, the work has involved the removal

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of 6 million tonnes of excavated soil and 200 000 tonnes of building waste. Large inner-city areas which had been unused for the duration of the Berlin Wall are now being integrated in a unique way in urban development. A further significant area of activity is the provision of new technical infrastructure and the renovation of existing networks. Since the fall of the Berlin Wall, the city has invested some DM 25 billion in renewing its supply networks. Enormous investments are also necessary to upgrade the public transport network if it is to be able to cope with growing demand. It is estimated that it will cost DM 40 billion merely to re-open urban rail lines and stations that have long lain unused, and to replace outdated rolling stock and vehicles. The German Railways (DB) alone will be investing DM 20 billion in the coming years for the "Reconstruction of Rail City Berlin". Inter-city connections are just as important as links to the surrounding region. The proposed 'Transrapid' magnetic levitation railway route between Berlin and Hamburg would be the first regular service of this kind in Germany. Of the 17 measures for "Transportation Project German Unity" decided on in 1991, seven affect Berlin directly (4 rail connections, 2 autobahn, 1 waterway).

All these developments were decided on under extreme pressure arising from the necessity to bring together two halves of a divided city into a functional unit, and influenced by extremely optimistic predictions regarding future population and levels of investment. The city's general development plan for 1994 was based on an assumed growth in population of 300 000 per annum until the year 2010. Current predictions are that the population will not grow at all during this period."

The unusual dimensions of the challenge faced by planners and builders is reason enough for drawing on the new criteria of sustainable development. In the years directly following German unification, the pressure of investment and the political preparation of the new capital city meant that decisions regarding urban planning, building and transportation were often taken in a peremptory fashion. Planning approval was granted for major investment projects after the briefest of consideration. Closer scrutiny of requirements, costs, benefits and environmental criteria only took place to a limited extent. However, the special situation in Berlin following the reunification of the city can hardly be measured by "normal" political standards. With the early years of dynamic development now past, it is time to inspect the process of planning and construction more carefully, also with respect to "sustainable development".

It is noticeable that some projects in Berlin make promising references to the topic of sustainable development. These include the contribution of the large settlement in the Hellersdorf district to the "Good Practices" exhibition at HABITAT II in Istanbul, or the numerous Local Agenda initiatives." Nevertheless, particularly when viewed from a national perspective, the developments in Berlin seem still to be in their infancy. The implementation of the concept of sustainable development requires a more holistic approach which balances factors against each other. In particular, environmental problems can be approached with greater transparency by transferring to policies which include quantitative environmental goals, since these offer the guarantee of a more rational approach to environmental politics." Political parties and the administration in Berlin have found it difficult to initiate such holistic investigations in the field of building and planning. It is necessary, in this

context, to conduct an intensive discussion of quantitative and qualitative environmental goals and to establish indicators for progress.

In the field of materials flow" in the Berlin construction industry, the dimensions of the building and refurbishment projects make these immensely important. In the Berlin conglomeration, building work amounting to DM 40 billion is being completed annually. Predictions suggest building activity at similar levels in the medium term."

The flow of materials generated in building and housing are comparatively large. The problem with moving such large amounts of material is reflected in the fact that almost half of all waste is attributed to the building sector (currently about 40%). The two reports prepared by ITAS and ifib on material flow in building construction show that current levels of inputs are many times larger than outputs (waste), which means that material reserves in the standing buildings are growing continually. From the year 2000 until 2020 there will be a downward trend in levels of material inputs and a rising trend for outputs, i.e. the levels of building waste will increase. The commission of inquiry set the goals of:

- Avoiding the use and input of harmful substances in the construction, conversion and operation of buildings;
- Observance of these principles while closing the materials cycle for building materials."

In view of the complexity of the flow of material inputs and outputs in the construction industry, if these demands are to be met then it will be necessary to take into account institutional regulations and questions of market regulation. They thus form an important frame of reference for the establishment of goals under the overall heading of sustainable development.

Responding to the Federal Ministry of the Environment, the confederations of the building industry have voluntarily undertaken to increase recycling quotas for building waste to 50%. " In Summer 1998 an agreement was reached between the Berlin Senat Department and numerous employers' associations in Berlin-Brandenburg on the handling of mixed building waste.' If Berlin's construction industry is to improve the handling of material flows, then the voluntary agreements and undertakings relating to building waste already mentioned can only be regarded as one of many necessary steps. Such agreements must also be viewed in the context of the growing importance of self-obligations in German environmental policies, which is the subject of controversial discussion.<sup>10</sup>

It is necessary to examine critically whether the establishment of a functional material flow management system can ensure optimum material flows and thus improve the efficiency of material handling. In addition to direct material flows, indirect flows must also be taken into account. These material 'rucksacks' can have one of two possible origins. On the one hand, there are the residues and waste originating from the production and pre-production which must be taken into account. On the other hand, services for the construction industry also consume materials which are also indirectly attributable to this sector.

The institutional and market interrelationships relating to the material inputs and outputs in the construction industry must be examined as a whole, and innovative solutions tested in pilot projects. However, in this context research and development generally plays an insignificant role for the building industry in Berlin. The expenditure for research and development by building companies accounts for less than 1% of turnover."

The "generally low level of interest in innovation in the construction industry of the region is increasing the dependence of local companies on construction companies from elsewhere"." The lack of competitive edge explains the poor market position of Berlin companies in an inter-regional comparison. According to surveys by the DIW, for example, above-average proportions of high-quality building services will continue to be imported into Berlin. Estimates speak of planning services and constructional activities amounting to approximately DM 13 billion per annum being imported into Berlin and the direct surroundings.

When discussing goals of sustainability with reference to direct and indirect flows of material, then the stimulation of innovation potential in Berlin can be regarded as a win-win situation, which on the one hand generates innovation, and on the other hand improves the competitive situation of the regional companies.

Despite some positive initiatives in the search for innovative potential in Berlin, it is still unfortunately the case that it has not been possible to establish an overarching network in the region. The attempt to establish such an "Innovation Centre - Building Berlin" (Innovationszentrum Bau Berlin) should not be abandoned. The efforts to gain acceptance for these measures from those directly affected and the coordination with statutory duties of the associations and chambers should receive massive support from political bodies. Furthermore the cooperation between the building companies and the Berlin's universities also offers considerable scope for development.

#### Notes

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