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## 1. Summary

Impairment of the environment is increasingly considered disruptive and burdensome in connection with generally increased prosperity and with demands within the countries participating in the project. Air pollution, traffic noise, water and soil contamination, as well as damage to the landscape and urban sprawl, impair the quality of life in and around places of residence, and are increasingly considered when choosing a place of residence.

But quality of environment is also a weighty factor in economic development. A low level of environmental impact or high quality of environment are increasingly considered positive (soft) site factors. Quality of the environment is thus a precondition for keeping the residential population from moving away or for enticing them to move in, as well as for keeping young, viable, innovative businesses at a site, or for enticing them to settle there.

In the case studies, different environmental phenomena and problems are addressed. They are not usually the primary reason for the local restructuring process, but are rated as essential tasks that must be considered (amongst others) and solved (amongst others). Thus, for example, in connection with new development measures, a modern and up-to-date infrastructure (motorized individual traffic, public transport, bicycle routes, pedestrian ways, etc.), or an efficient use of energy gain importance (Newcastle: Great Park). This is also based on the expectation that people interested in settling, to whom the building measures are addressed, consider and expect residential quality to include environmental quality.

Negatively mentioned is the urban sprawl from uncontrolled expansion of cities and area-scattering infrastructure. This is especially unfavourable around big cities, since the result is that the city's inhabitants cannot be offered recreational space in free and intact nature within a reasonable distance to their residence (Leidschendam). Additionally addressed are (street) traffic impacts with their manifold burdens for residents and the natural environment (Gouda). Drinking water problems caused by intense agriculture, as well as air pollution from industry, are further phenomena considered in the framework of the individual restructuring measures (Leidschendam, Gouda, Utrecht).

Industrially characterized old sites especially are often connected with environmental impacts. The problem here is the potential or known contamination which (may) endanger soil, water, air, plant and animal life, and therefore, humans. The resulting cost insecurity factor also has an effect on the restructuring project.

Characteristic interference in the landscape, for example, heaps of waste-stone by-product, sinkponds or mining towers visible from afar, also need to be considered. Correcting these interventions into the landscape, however, is neither financially supportable nor desirable, for historic reasons and because these interventions have meanwhile become typical characteristics of the landscape. Not least through a change in consciousness, the supposedly negative appearance must be positively presented and used as a supporting power for the restructuring process.

Old sites often are not totally unused areas which can be planned for in an ideal way, without any restrictions. Old industries with long-term production permits and/or remaining production time make new establishments at the site more difficult, and require a sure instinct and negotiation skills when restructuring.

## 2. Introduction

For thousands of years man has increasingly interfered in ecological cycles. The face of the earth and living and nonliving natural environment is changed, newly formed and often irreversibly damaged. Polluted rivers, lakes and seas; pollution in the air, ground, drinking water and food; extinction of species of plants and animals; surface sealing, erosion, etc., are all known phenomena. Industry and commerce, urban sprawl, increasingly industrialized agriculture, and growing traffic damage and endanger the environment and thus lower quality of life, especially in densely populated regions.

Even after the economic activities of a region or at a site have ceased, the detriment to the environment is not always ended. Negative aftereffects of abandoned, formerly used sites are summarized under the heading “inherited burden”.

Even the removal of these inherited burdens and the recultivation and revaluation of derelict areas is not possible without new burdens to the environment. Building machinery make noise and emit exhaust. Dug-out contaminated ground has to be brought to landfills, treated in chemical-treatment installations or incinerated.

Whether they result from current or past uses, environmental problems are named most as important or very important topics for a region by the partners in a project, in connection with the reasoning behind, and planning of, restructuring measures.

In the centre of the concerns in the case studies are industrially, commercially and agriculturally produced contamination of surface waters and groundwater, mostly coupled with contamination of soil. To correct this, measures ranging from monitoring groundwater and wastewater cleaning to installation of closed-loop wastewater systems are considered. Additionally, project partners list ever-present “classical” environmental burdens of urbanised and industrially characterized areas. These are especially

- noise pollution from traffic
- air pollution from industry and traffic
- spoiling of the landscape by uncontrolled development of cities and building of trafficways to channel growing traffic.

## 2.1 Impact mechanisms

For all burdens that directly impact natural resources of soil, water and air, the following is true: through a chain of impact mechanisms, humans and the health of humans is always at the end of the chain as a recipient. In the following simplified representation the essential impact paths are exemplified from the initiation point of contaminated soil (1):

- Soil -> human
- Soil -> plant/plant products -> human
- Soil -> plant/plant products -> animal/animal products -> human
- Soil -> animal/animal products -> human
- Soil -> soil solution -> plant/plant products -> human
- Soil -> soil solution -> plant/plant products -> animal/animal products -> human
- Soil -> soil solution -> animal/animal products -> human
- Soil -> soil solution -> groundwater -> drinking water -> human
  
- Soil -> atmosphere -> human
- Soil -> atmosphere -> plant/plant products -> human
- Soil -> atmosphere -> plant/plant products -> animal/animal products -> human
- Soil -> atmosphere -> animal/animal products -> human
  
- Soil -> soil atmosphere -> atmosphere -> human
- Soil -> soil atmosphere -> atmosphere -> plant/plant products -> human
- Soil -> soil atmosphere -> atmosphere -> plant/plant products -> animal/animal products -> human

- Soil -> soil atmosphere -> atmosphere -> animal/animal products -> human
- Soil -> soil atmosphere -> atmosphere -> groundwater -> drinking water -> human
  
- Soil -> surface water -> drinking water -> human
- Soil -> surface water -> plant/plant products -> human
- Soil -> surface water -> plant/plant products -> animal/animal products -> human
- Soil -> surface water -> animal/animal products -> human

## 2.2 Inherited burdens

Apart from interdependent impacts on the environmental elements that result from interference in the environment, contamination of the environment may also stem from “resting” areas. Formerly used sites often show contamination of ground or of remaining buildings due to years of intensive economic use. Dangers stemming from ground contamination as well as from old buildings may make it necessary to restore a site. The sources of danger are summarized as inherited burdens.

The term “inherited burdens” (Altlasten), which is generally used and comes from waste regulations, is not used in German building regulations. The building code speaks in §§ 5(3) and 9(5) of “ground that is burdened with environment-endangering materials”.

Inherited burdens also play a role when planning a new use of an area. In the framework of a building zoning plan, sites that should be brought into usage again and that show ground contamination should be marked. According to the building code there is an obligation to mark an area when ground contamination is considerable and the materials are suited, due to their chemical characteristics, to cause damage to the environment. The terms “considerable” and “environmental danger” are vague legal terms which so far have not been clearly defined and have to be clarified on a case-by-case basis.

## 2.3 Protected resources

Area use goes hand-in-hand with the use of areas of the environment that are worthy of protection. A hierarchically built list based on a directive from the Minister for Nutrition, Agriculture and Forestry in North-Rhein Westphalia names the following protected resources and documents the outstanding importance of ground and water (2):

- Life and health of people by immediate impact
- Production of drinking water or mineral springs
- Ground utilization in lots with residential housing or in small gardens
- Areas that are designated in the area development plan for the protection of waters
- Agricultural or gardening use
- Other protected resources

## 3. Environment as an element in the restructuring process

The revitalisation of single sites or greater site areas as well as the restructuring of housing developments, cityscapes or regions offers the opportunity to correct mistakes of the past which were rooted in a lower environmental consciousness and/or requirements which were at the time differently motivated. Aspects of sustained use are increasingly important today.

### **3.1 Soil protection as basis of life**

Functioning soil in sufficient areas is an elemental precondition for the nourishment of people – worldwide. Soil is, moreover, a necessity for life of plants and animals. Soil is, however, highly endangered. Every day large open space areas are irretrievably lost due to non-sustainable forms of cultivation as well as uncontrolled construction development and sealing of surfaces, especially in highly developed countries. In addition to this destruction of soil, additional ground area is being burdened, for example by contamination, so that soil in its multiple functions as a space for living as well as a regulatory, utilisation and cultivation area, is being degraded.

Soil destruction, when thought of in human time spans, is irreversible. Soil degradation cannot be compensated for in the short-term by new production of soil. The degradation processes caused by humans happen in short time periods, often within a few years or decades. Soil production, however, takes centuries if not thousands of years, i.e., the resource soil becomes shorter while the requirements placed on soil become greater because of growing population and growing requirements for nourishment (refining of products).

Area consumption is not only in itself detrimental to our environment, it also leads to further environmental burdens. With a stagnating population number the expansion of used area results in an increase of traffic and thus in damaging emissions because ever greater distances have to be travelled. Traffic also requires new trafficways, i.e., sealed areas for parking and driving. Lines cut the landscape into ever-smaller units. Problems result from this, among others, for the protection of nature and species.

Open areas and intact nature are also of great importance as recreation areas for the urban population. Especially for the inhabitants of big cities, geographic proximity to freely experiencable nature can play a part in the decision to live in a city. For big cities it is therefore important to have, apart from the green islands within the city, attractive recreation areas in the immediate vicinity.

### **3.2 Area recycling**

Making old industrial and commercial sites reusable is of economic, political, spatial and social interest. When revitalising old sites, contamination may be encountered. This may be old deposits as well as formerly used areas from which a danger to the environment exists or may arise (3). Restoration measures or measures to deflect the danger can be substantial and possibly costly aspects of revitalisation of an area.

Depending on the position of old sites, area revitalisation objectives may differ. Two essential position types must be differentiated:

- Sites in residentially developed areas that are connected to the existing infrastructure
- Sites in outlying areas

Sites in developed areas are generally suited for redevelopment with economic activities or for city development purposes in general. Areas in the outskirts are more suited for re-naturalization purposes. Such areas can also become valuable as an ecologically balancing measurement for unavoidable new interference with nature.

### **3.3 Agenda 21**

Protection and maintenance of a natural environment require a sustainable use of natural resources. Agenda 21, which addresses all essential policy areas of an environmentally friendly, sustainable development, examines in two chapters

- “The promotion of sustainable housing development” as well as an
- “Integrated approach for planning and use of ground resources” (4)

A controlled use of resources always has care and maintenance as a precondition. A destructive exploitation of resources, as is currently done with the free area potential, will in the long term make use impossible due to lack of quantity and quality.

### 3.4 Nature protection laws

Federal nature protection law – BNatSchG – and the nature protection laws of the states, are the basis for the protection of nature in Germany. Objectives and principles of the protection of nature and care of landscapes are, according to § 1 Section 1 BNatSchG: Protection, care and development of landscapes in developed and undeveloped areas for the sustained securing of

- Productivity of the ecosystem
- Usability of natural resources
- Plant and animal world
- Diversity, individuality and beauty of nature and landscape

as the foundation for human life and as a precondition for recreation in nature and the landscape. In § 1 Section 5 the German building code takes up the expression “Naturhaushalt” (ecosystem). It denotes the complex interdependent interweave that comprises all natural factors:

- Ground
- Water
- Air
- Climate
- Plant and animal world

In Germany, interference in natural areas must be accounted for and compensated by compensation or replacement measures, according to the rules of the federal nature protection law. Since there are no acknowledged scientific methods to measure the impairment of the capacity of the ecosystem due to interference, however, it can hardly be judged whether the impairments can be made up for by the compensation and replacement measures, which are being determined on case-by-case (5).

Area revitalisation is also an interference in the (already interfered-with and reshaped) environment. The application of the rules of interference contained in the nature protection law would, however, run against that which is desirable in urban development (closing of building gaps), that which is economically needed (utilization of existing infrastructure), and that which makes ecological sense (preservation of soil).

### 3.5 Building code

The interests of protecting nature and landscape care still play a subordinate role in the German building code (BauGB). An adequate accounting of these interests is difficult due to nonexistent valuation standards, debated terms and vague statements. For example, it is debated whether the interference of reactivating an idle site requires compensation or replacement measures (6).

For an appropriate consideration of the interests of natural protection and landscape care, the German landscape development plan offers useful information. This strictly ecologically oriented technical plan, on the planning level of the zoning plan, takes stock of nature and landscape on a municipal level and judges the value based on ecological value. Statements are gathered over what condition of nature and landscape is strived for and with what protective, maintenance and development measures this goal should be reached. Green-zone plans as well as care and development plans concretize the landscape plan on the development-plan planning level.

Within the framework of restructuring measures and the associated area revitalisation projects, the following environmental aspects become relevant:

### **3.5.1 Soil**

- Sealing and condensation as quality characteristics of the ground structure
- Topography and relief energy
- Soil quality

### **3.5.2 Water**

- Suitability of the area as a groundwater renewal area
- Groundwater quality
- Potential of the area as a source of flooding

### **3.5.3 Climate and air (7)**

- Suitability of the area as a zone where cold and fresh air develop
- Potential of the area to increase humidity
- Suitability of the area as a corridor for air exchange
- Suitability of the area for regeneration of air masses through removal of foreign matter (dust, gases) (8)

### **3.5.4 Plant and animal world**

- Suitability of the area as habitat for plants and animals

## **4. The position of environment**

Soil is a scarce resource, whereas the different ways to use soil overlap and influence each other. The uses compete not only in condensed areas, but also in rural areas. Expansion of one type of use usually restricts other types of use (9).

Protection of the environment costs money; that is, protection of the environment initially causes costs and is therefore a factor in the operating costs, and in the end burdens production. In practice it has been found, however, that omitting environmental protection can become substantially more expensive. An example of this are inherited burdens and associated water and soil contamination. A reproduction of the original natural conditions generally cannot be financed.

In order to prevent environmental protection and the associated use of capital contributing to a competitive distortion, a stringent “polluter-must-pay” principle is necessary and this must be applied uniformly Europe-wide. Environmental damage and impacts do not contain themselves within administrative borders. It is not in the interest of environmental protection that European laws are handled and applied more or less stringently depending on economic orientation.

### **4.1 Sustainability**

Area recycling is an important building block of a sustainability strategy, as demanded by the principles of Agenda 21 as an order to the states of the world. The Council of Experts for Environmental Questions names in its Environmental Appraisal (short version) (10), however, general deficits among industrialized countries in the development of sustainability strategies.

- Environmental goals are often too vaguely formulated,
- The fact that the goals are nonbinding leads to insufficient ability to check achievement of the goals,

- Mostly traditional or already accomplished environment protection goals are newly being set instead of approaching problems that have been unsolved up to now.
- Due to a lack of society consensus, environmental planning is prone to changes in political priorities
- Planning processes are for the most part barely institutionalized
- Environmental goals are hardly considered in the decisions of other departments

These general deficits are also true for soil protection or the caring use of the soil resource.

## **4.2 Land consumption**

Due to increasing utilization of land and expanding of economic activity, limited land resources are under increasing pressure, which leads to competitive situations and utilization conflicts and in the end to a less than optimal utilization of the area and land resources (11).

The availability of land is named in the thesis of the Agenda 21 as “an essential part of a sustainable, environmentally protective way of life.” Land resources form the foundation for human life, serve as cultivatable lands, supply energy and water, and are the basis of all human activity (12). In all European industrialized countries, however, there is still a steady increase of land consumption (13).

Land consumption is almost unslowed in Germany as well (14). Every day approximately 120 hectares of land are sealed. In a draft for a focus program of the Federal Environment Agency, a land consumption of 30 hectares a day (15) is strived for. But even this ambitious goal contradicts the central objective of sustained land, climate, nature and species protection. For a truly environmentally protective land usage, zero growth of land consumption by housing development must be strived for (16).

The continuous development of land for housing and traffic, even on a reduced level, is also in competition with other area uses such as the exploitation of raw materials close to the surface, wind energy, leisure and recreational uses, water supply and conservation, as well as agriculture and forestry. These use claims on the land have to be considered appropriately.

In German planning codes, the interests of nature and the landscape as well as the ecologically oriented planning objectives are being represented by spatial planning as opposed to the building zoning plan. The contribution of spatial planning is limited, though, to an expert assessor’s contribution.

In the end, the extent to which the interests of nature and landscape are considered in planning is only a question of political will. Especially with the compulsory building zoning plan, municipalities have multiple possibilities to decide on compulsory land usage regulations. An obligation to use these possibilities as much as possible does not exist, however (17).

## **5. Future development**

Environmental consciousness in private households as well as in enterprises is on the increase. In the latter case, change in attitude is partially motivated by the possibilities to use environmentally positive production methods or environmentally friendly products to a competitive advantage. A Europe-wide uniform environmental protection law and a uniform application of these laws in the future especially open additional possibilities to improve the protection of the natural foundations of life.

Land protection has long been neglected. Soil had no protective status in the law. The interest of the media and therefore public awareness was mostly occupied by aspects of air and water and topics such as greenhouse gases, smog, dying fish, etc. Political actions therefore concentrated first on measures to keep air clean or on wastewater disposal and cleaning.

Soil protection got its due attention only in connection with the discussion of the financing of cleanup of contaminated sites in recent years. In 1985 a soil protection concept was laid down by the federal government. It demanded for the first time a reversal of the trend in land consumption. In 1995 a fact-finding committee was established to study the subject of “building and living”. The goal was to come up with recommendations to implement the guiding model of sustained and viable development.

Since the end of the 80s a federal land protection law has been discussed, which finally came into effect 1 March 1999. It was then specified and administratively implemented by the federal land protection and contaminated site regulation.

The building code is not determined by the land protection law. As a special law it stands above the land protection law. No essential new mechanisms for preventative land protection can be derived from the land protection law. Suitable municipal instruments for area recycling and removal of surface sealing are mainly to be found in the laws for urban and regional policy and in the building code.

### **5.1 Federal land protection law**

With the law for protecting land from detrimental changes and for contaminated site cleanup, federally uniform requirements were for the first time instituted for effective land protection and sustained cleanup of contaminated sites. The law has the purpose of securing or reinstating the functions of the land. The main motive for a legal regulation in this area was, however, mainly the legal uncertainty and legal nonuniformity for home- and landowners, commercial investors, and municipalities in the area of contaminated sites. The focus of the law is therefore the topic of contaminated sites and insofar it is rather a remedial land protection.

A concretization of legal requirements is contained in the federal land protection and contaminated sites regulation (BBodSchV). The content of this regulation is firstly the determination of threshold values, and secondly coordination and answering procedural questions that arise when cleaning up contaminated sites.

§ 5 contains a first approach for the regulation of unsealing land with the objective of bringing it back into the ecosystem. It lacks, however, a legal regulation requiring the property owner to unseal an area if the area is unused for an extended time and if the development or sealing of the area contradicts decisions in the planning rights.

### **5.2 Building code**

The building code contains a requirement to unseal (§ 179) when a surface is no longer used for an extended time and the productivity of the area which has been negatively impacted by development or sealing should be preserved or reproduced. The reasonableness of the measure for the owner is a prerequisite for its enforcement. Thus, this instrument is also on shaky ground.

For historic reasons, cities are often found in areas with above-average ground fertility. This soil has over long periods of time contributed to the supply of food for the urban population. The increasing use of mostly agricultural land for new housing and commercial areas and for infrastructure feeds on the natural bases for life of the city region. Here especially high-quality land is being lost (18).

Because of the sealing of open areas, water drainage via closed systems and the associated reduction of the rate at which groundwater is newly produced, many city regions may only be supplied with sufficient amounts of drinking water via long-distance water supply systems. Since this evasive method succeeds relatively easily, a preferable change of consciousness cannot be expected in this situation.

## **6. A comparison of current policies**

### **6.1 The Netherlands**

In the national environmental policy plan, environmental objectives are formulated at the regional level. The principal objective of the 3rd Environmental Policy Plan of 1998 is sustainable development (19). Main actors are the municipalities. The goal is to realise sustainable development by changing behaviours.

Citizen participation is prescribed for Dutch municipalities in the local legislation. In practice, however, only a consultation process exists based on planning drafts. There are also first attempts to include target groups, especially (environmental) associations, actively and at an early stage in local planning.

### **6.2 Federal Republic of Germany**

Local autonomy in Germany allows the municipalities to organize and administer their own affairs within the framework of the legislation. This right to self-government is guaranteed in article 28 Abs. 2 of the constitution and of the respective state constitutions. Municipalities, however, can only enforce it “within the framework of the laws”, meaning that the municipalities are bound to federal or state laws.

In Germany an extensive regulatory responsibility of federal institutions exists. The states must enact the framework regulations based on federal law, for example local water supply and conservation laws must be based on the federal law. The states are also responsible for filling regulatory gaps left by the federation. The federation determines principles of waste disposal and the state laws regulate areas of responsibility and the public support system. On a local level, statutes regulate in detail, in particular local waste and waste water disposal systems.

Municipalities are obliged to inform their citizens about plans and the participation of the public is legally regulated in the framework of the planning procedure.

### **6.3 Great Britain**

A general right to local autonomy does not exist in Great Britain (20). The responsibilities of the municipalities are fixed by national legislation. Guidelines for local environmental policies are fixed by the Minister for the Environment. The development of these guidelines, however, takes place in coordination with local municipal planning associations. In British municipalities, planning is principally based on area utilization.

The authority of local administrators covers different environmentally relevant areas, such as strategic planning, land development, mineral resources, waste management, roads and other traffic infrastructure, as well as actual protection of the environment. Excluded are environmentally relevant planning circumstances such as energy supply, water supply and disposal, as well as air quality.

Citizen opinion must be requested in all public planning matters.

## **7. The instruments**

It can often be noticed that instruments, concepts and strategies are available, however, they are not, or not sufficiently, being used. There are, however, new considerations that may ripen to become effective tools in the future.

An example of this may be the concept of the ecological footprint (21). This concept is based on the assumption that any kind of consumption and any kind of waste production depends on the productive and assimilative capabilities of ecological systems, and thus stresses land.

## 7.1 Public environmental law

An essential instrument in Germany is public environmental law, especially federal and state law. It covers relevant environmental laws (nature protection law, emission protection law, water conservation law, etc.), ordinances (land protection and contaminated site ordinances, incident ordinances, etc.), and also administrative regulations (technical guidance for protecting air quality, technical guidance for protection from noise, etc.), even if the latter do not have legal status, but rather give explanations or specifications for the execution of environmental laws.

Of increasing importance is also EU legislation (waste placement ordinances, water framework guidelines, UVP guidelines, etc). EU ordinances outrank national legislation of single member states and do not need to be transferred into national laws.

The federal laws generally have a framework character and are being specified and realised by state laws. In Germany, laws are carried out by the states. Thus the recycling and waste disposal laws or federal land protection law are being carried out by corresponding waste and land protection laws of the states.

At the municipal level, waste water and waste disposal aspects are regulated predominantly by statutes.

## 7.2 The principles and instruments of environmental law

Environmental law is based on 3 essential principles:

- Precautionary principle:

The goal is sustained securing of the natural foundations for life. The avoidance of contamination has priority over the decrease of or subsequent recovery of environmental damage.

- Polluter-must-pay principle:

He who damages the environmental must pay for the removal of the damage.

- Cooperation principle:

Effective protection of the environment can especially be reached by cooperation between state, economy and society.

Substantial instruments of environmental laws are:

- Permits/prohibitions

Direct steering of behaviour by regulations

- Environmental protection charges

Indirect steering of behaviour by creation of financial incentives (wastewater charges)

- Subsidy

Focused promotion, for example, of environmentally careful techniques or environmentally friendly behaviour

- Public relations

Objective: creation of consciousness, reducing distrust

- Planning

Building zoning plan, landscape and area planning

- Sanctioning of criminal offences/violation

Punishment of environmental criminality by the state. Prosecution by public prosecutor's office and criminal proceedings before the criminal courts.

### **7.3 Environmental criminal law**

The German penal code–StGB places the polluting or destruction of the natural foundations of life (water, soil and air) under penalty.

### **7.4 Civil law**

Important topics with relevance to the environment of civil law, which is regulated in the German civil code book, are the environmental liability law and the insurance of environmental risks.

### **7.5 Legal basis for the recycling of land**

The legal framework for area recycling is primarily given by the building code and environmental legislation. Of relevance are, additionally, the German civil code book (BGB) as contract law in the real estate market and in the contracting of building projects; the legal situation regarding promotion, financing and facilitation of investments; as well as the police and ordinance law in the context of contaminated site problem areas. In individual cases, special legal areas such as chemical law or work safety laws are touched on. In the new German states, additionally, legal questions of ownership as treated in the unification treaty, as well as the environmental framework law and the obstacle removal law, are to be taken into account (22).

## **8. Environment as an element of the planning process**

### **8.1 Building zoning plan**

In the Agenda 21 an “environmentally compatible development policy and area utilization” (23) is demanded, as well as the realisation of a policy “that aims at environmentally friendly urban development, area utilization, housing and settling policy, and an improved management of the growth of the cities” (24). An integrated area and land utilization plan is thought to offer almost ideal possibilities to contribute to the realisation of the goals of sustainable development (25).

In the Federal Republic of Germany, communities have planning authority. The constitution guarantees to the communities the right to regulate their own affairs under their own authority. In spite of the constitutionally guaranteed authority to establish building zoning plans, the communities must follow the federal building code’s procedural and content limits when establishing the zoning plan. Accordingly, the community land development plan as a central urban development plan, stands between the supra-local plans of area and regional planning, as well as the special plans of all kinds, and the plans of neighbouring municipalities, and a municipality’s own plans that affect areas (26).

The function of the zoning plan is to guarantee orderly urban development and to ensure a socially fair land use that contributes to the wellbeing of the public, contributes to securing an environment fit for human beings, and to protect and develop the natural foundations of life. Various interests are to be coordinated; that is, the housing, social and cultural needs of the population have to be considered just as the interests of monument protection, of the economy, of defence and civil defence, and of the environment and protection or nature.

The federal building code demands a sparing and careful handling of land and soil. This means for the planning of communities that

- the necessity
- the extent and
- the intensity

of all measures leading to a use of open space or to the sealing of land have to be critically examined.

This land protection clause leads to a promotion of internal development of the residential areas, for example, for revitalisation of areas that have become derelict.

Community development plans are the basis for the development of new residential areas as well as commercial or industry development. Often such plans cause negative impacts on the environment. In order to take sufficiently into account environmental impacts of big projects that typically impact the environment considerably, the German parliament currently alters federal building codes, amongst others. In doing so, the federal government simultaneously fulfils European Union requirements and brings municipal development planning to a standard required by European law.

Environmental impact was previously gathered by municipal administrations; due to the introduction of an environmental report as a fixed part of the development plan, however, in the future the impacts will be open for all to recognize and understand.

## **8.2 Sustainable development**

The revitalising of inner cities and reutilizations of derelict cityscapes, such as sites with a former military use, are important building blocks for a sustained area and residential area development. They contribute to the avoidance and reduction of environmental impact, to the development, securing and utilization of environmental quality, to the reduction of emission of matter into the environment, and to the removal of environmental damage.

The importance of an area for the ecosystem is determined by (27):

- Soil structure
- Topography and relief
- Soil quality
- Groundwater renewal rate
- Groundwater quality
- Valuableness for air exchange
- Valuableness as an area where cold and fresh air are exchanged
- Biotope quality

These aspects can be considered in the planning process and define in the end the importance of the used area for the environment.

## **8.3 Environmental aspects when planning area recycling projects**

In planning of a measure to revitalise an area, different environmental aspects are looked upon. Clarified must be in the pre-planning process prior to the execution planning:

- Legal situation regarding natural protection and planning related to the site and its environment.
- Existing and planned supply and disposal concepts
- Existing and planned nature protection restrictions
- Natural conditions at the site and its environs
- Existence of contaminants that may possibly restrict the uses

Sources for this research are, amongst others, diverse special plans referring to environment

- Landscape plans according to BNatSchG,

- Water supply and conservation plans according to WHG
- Clean air plans according to BImSchG
- Noise reduction plans according to BImSchG
- Waste disposal plans according to KrW-/AbfG
- Wastewater removal plans according to WHG

In the actual planning phase one tries to coordinate the situation analysis with the objectives of the planning. In doing so, economic aspects must also be taken into consideration. It is, for example, hardly economically justifiable to establish a plan with a residential area as an objective on a contaminated site. In such cases, rather, a commercial or industrial reutilization offer themselves, which have lower demands on the “cleanliness” of the building site.

Also when planning a commercial or industrial reutilization, such isolated areas of an old site that show higher contamination can be integrated into a commercial or industrial utilization of the whole area by an adjusted plan. Isolated ground contamination for which an excavation or treatment is financially out of question can, for example, be sealed as paved parking areas and thus be rendered harmless. Details like the building of control wells, soil-atmosphere exhaust systems or others can be prepared with the authorizing agencies on the basis of existing laws and under utilization of all room for movement.

An industrial and/or commercial area can also be planned to be environmentally compatible. Keywords are:

- Rainwater percolation
- Rainwater as industrial-use water supply
- Harmonizing of commercial buildings with the conditions and characterizations of the landscape
- Minimized surface sealing
- Interlaced biotopes for plants and animals, etc.

#### **8.4 Ecological evaluation of area revitalisation measures**

The revitalising of old sites positively affects the various environmental media in different aspects, for example, because

- Natural areas are being preserved and their productivity for the environment is retained,
- Derelict areas are freed from contamination in the course of a revitalisation, and
- Newly used derelict areas can be used in a more environmentally friendly form compared to their former utilization.

The importance and value of a site for the environment can hardly be measured since no generally acknowledged, reliable method exists to evaluate it, for example in a monetary way. The assigning of a monetary value to environmental damage or to the performance of intact nature seems to make sense, however, as a decision-making aid for increased reprocessing of areas that have become derelict. In the final report of the research and development project No. 103401119 “Revitalising of old sites versus reutilization of old sites” (28), a monetary evaluation of the ecological criteria of land area is being attempted.

### **9. Environment as an element in connection with implementation**

#### **9.1 Soil contamination as a cost factor**

Development of previously used sites contains risks which may have considerable influence on development costs. Financial risks can come, for example, from possible legal obstacles to obtaining a permit that lead to

costly delays of development projects, or from low-quality building ground that requires a considerable effort to improve or requires large-scale foundation work.

Soil contamination contains an especially considerable cost risk, due to the often insufficient knowledge level regarding its volume (contaminated mass) as well as the specific character of the hazardous material. Disposal costs can contribute a large part to the entire cost of area preparation. The following contamination scenarios are possible and lead to disposal costs (29):

- Use-caused sources of contamination normally lead to locally limited soil contamination.
- Contaminants coming from a locally limited source or contamination focused in one spot will, if sufficiently mobile, be spread laterally and perhaps vertically when they contact ground water.
- The deposition of production residues or waste leads to a spreading of contaminants that concerns more or less large areas of a previously used site.
- In the course of building ground preparation/improvement for the first use, contaminated replenishments were applied in the past that have, independently from the subsequent use, led to a spreading of the contamination over an area.
- Due to war effects, a local release of contaminants took place whereby concentrated release can cause substantial extent of damage, especially for groundwater.
- In the demolition of old buildings and preparation for construction for the following generation of use, contaminated parts of buildings and soils were spread on the site in a locally isolated way, as well as over large areas, in the course of smoothing the area.

## **9.2 Environmental aspects**

The preparation for use of previously used sites is always connected with environmental strains. With noncontaminated sites, the environmental impacts correspond to those that normally come from a construction site: noise, dust, smells. From contaminated sites the site has environmental impacts even before the preparation phase. Site utilization also brings with it impacts to the environment.

### **9.2.1 Environmental impact of a contaminated previously used site**

- Soil pollution (soil contamination due to negligent handling of hazardous material or intentional emission)
- Water pollution (hazardous material emissions into groundwater due to washout from existing ground contamination or leaks),
- Air pollution (gassing out of contaminated soil)

### **9.2.2 Environmental impact of a noncontaminated previously used site**

As a rule the acute environmental impacts are small, but nevertheless exist:

- Surface sealing reduces groundwater formation
- Surface misuse by the deposition of waste

### **9.2.3 Environmental impact of a contaminated previously used site during revitalisation**

- Area analysis to find out about soil contamination and stability (drillings)
- Dismantling and demolition (-> building debris, hazardous materials (for example, asbestos, tar) noise emission, air pollution such as dust, smell)
- Soil excavation (dispersion by wind, washout, direct contact)
- Soil preparation (transport to treatment site, energy use for treatment)
- Recycling of demolition material (breaking process)

- Prevention of danger
- Restoration (for example, soil-atmosphere vacuuming: -> air pollution, waste production, chemical, physical and/or thermal treatment -> use of energy, air pollution, residual substances, landfill capacity, etc.)

#### **9.2.3.1 Restoration methods**

- Pneumatic methods to restore soil that is contaminated with volatile organic matter.
- Thermal methods are suited for treatment of organic contaminants in the ground. They are not suited for the decontamination of grounds contaminated with heavy metals.
- As a chemical-physical method for treatment of contaminated soil, techniques to extract contaminants by washing the soil have proven acceptable.
- Biological methods to restore soil intend to accelerate reduction of present organic compounds by activating and optimizing organic compounds already present in the soil, by activated and optimizing bacteria that are already present as well as by the addition of suitable microorganisms.

#### **9.2.3.2 Restoration measures**

- “In-situ” methods, i.e., the contamination is near the surface and is treated at the contaminated site by adding microorganisms and additives
- “On-site” methods; with those the soil is excavated and treated at the site in special treatment facilities or installations.
- “Off-site” methods; regional waste disposal centres where bio-patches are coupled in extensive or large scale facilities with a biological wastewater and air-cleansing system.

#### **9.2.4 Environmental impacts of a nonpolluted previously used site during revitalisation**

- Area analysis regarding stability (drilling, noise)
- Dismantling and demolition (building debris, hazardous materials, noise emission, air pollution such as dust and smell)

#### **9.2.5 Environmental impact of a revitalised previously used site**

- Noise and dust emissions (traffic, running of the installation)
- Wastewater
- Surface sealing

### **10. Factors affecting the outcomes of the different case studies**

#### **10.1 Camphausen coal mine, Reden coal mine, and the Fürstenhausen coking plant**

From the former mines in Camphausen and Reden result not so much the typical environmental pollution, but rather clearly visible changes of the landscape. Coal mining has characterized the landscape of Saarland visibly from afar by the creation of heaps and sink ponds for waste stone by-product of the coal mining process. These landscape changes have partly a (time-limited) character of landscape destruction. The sink ponds have thus been regarded as disposal facilities during the operating phase. After the shutting down of production, the remaining ponds are biotopes that have potential for development. Coking plants like Fürstenhausen generally caused massive air pollution during operation. This was also the case for the Fürstenhausen coking plant. Especially in the area of the production installations, contamination (“substantial impacts”) must be expected. Detailed investigations remain to be done.

## 10.2 Newcastle

In the project “Going for Growth” environmental aspects are of secondary importance. In the course of building renewal of the residential areas there are of course also measures foreseen to increase the attractiveness of the living surroundings, since an improved environment might attract new residents to the area.

It can be assumed that with new development measures also a new disposal infrastructure will be established and traffic control measures, traffic noise and exhaust fumes can be reduced.

Also in the “Great Park” project, environmental aspects are considered very important, but in the project layout as whole they are rated rather secondary. Importance is given to the sustainability of the measures. Sustainability is one of the fundamental features of the development and has been included at all stages of design and planning. With such a sensitive development, sustainability played an important role in its design. From the early planning stages through each of the drafts, it had objectives to reduce commuting, provide an efficient public transport system and have a high quality environment. The Council and Developers came up with several sustainable schemes to benefit the site. These include, aiming for energy efficient, high density housing, environmental conservation, and the unique Green Transport Plan with its emphasis on public transport and reducing use of the private car.

## 10.3 Gouda

The city describes in the questionnaire the environmental conditions as follows:

The natural and scenic value is disturbed considerably. Furthermore, to a great extent the water quality no longer complies with the standard of being biologically healthy. This decrease is partly the consequence of the high pressure to urbanise as from the outskirts of the Green Heart and, locally, within the Green Heart.

The transition of urban areas into rural areas is still abrupt. Among other things this is a consequence of the typical Zuid-Holland landscape and the structure of responsibilities within the spatial planning in the Netherlands. Partly responsible for this is the way in which the autonomy within the administration of the Netherlands (administrative split-up) is arranged.

The problematic nature of water and its storage in the area is going to be a problem in the future. The solution could be an integration framework for the whole problem.

The present rural main road structure (roads, railways and water) burdens the environment. Unfortunately, the pressure to urbanise causes an improper use of the rural areas.

Furthermore there is pollution of the River Hollandsche IJssel, a tidal river with subsiding waste from the harbour area Rotterdam.

Of central importance for the restructuring project are the traffic problems and the connected environmental impacts, as well as the urban and regional development planning with its negative effects to the nature and water system, as well as agriculture.

## 10.4 Leidschendam

Preservation and development of nature and rural environment are some of the main motives for the desired restructuring measures. This holds true for the rural area as a recreation area for the urban population in general, for the Driemanspolder and the lack of water there, as well as for the pollution of soil and water by agriculture. The information deficit regarding the condition of water and soil are also criticized.

The land purchased with the aim to develop nature and landscape is considered important as well as financial agreements with agricultural landowners or nature conservation boards for keeping and developing nature on their land.

At a different spot in the questionnaire, environmental impacts are named that result from street traffic: noise and pollution.

### **10.5 Zuid-Holland Province**

Environmental problems are not explicitly seen as reasons for the required restructuring measures. In the questionnaire environmental aspects are therefore rated as secondary. The environmental situation there is evaluated as follows: For an Urban Area in Northwest Europe there are little real environmental problems but as in every urban area there is pollution by traffic, industry, etc.

### **10.6 Utrecht**

Environmental problems here are also not decisive for the establishment of the restructuring project. Only the usual air and soil impacts are being addressed, which are being looked at in the project rather on the side.

## **11. Recommendations**

The processing of derelict sites and old sites for new use, or the restructuring of urban residential areas, offer many possibilities to achieve positive effects on the environment. Newly established industrial and commercial businesses usually operate more environmentally friendly than former users of the site. An additional positive contribution to the environment is offered in the course of area processing by newly installed or modernized infrastructure (separation systems for water drainage, efficient energy supply systems, etc.).

These positive effects for the environment are not an end in themselves, but an essential contribution to the increase of the quality of the site, and are therefore necessary in order to keep up in competition with other sites, cities or regions, for the favour of the people, industry and commercial businesses.

A useful revitalization also avoids new impairments at other sites. Area revitalization enables qualitative growth and therefore corresponds to the principle of sustainability. The more one succeeds at presenting the environmentally positive effects of area recycling as opposed to new consumption of areas, the easier it will be to integrate valuable old sites into the economic and social life of a city or region. Old sites present a unique chance to correct planning and development mistakes of the past.

Area recycling is protection of the environment. Environmental protection creates jobs and is a precondition for sustainable economic development. Area recycling can be supported by an improvement of regulations relevant to planning, so that the dictates of sparing area utilization must receive greater consideration.

As a general rule, environmental aspects should in the future receive more attention in the new development of buildings, facilities or entire city districts. Emphasis should be placed on condensed, space-saving, but still attractive building, amongst others. Public support should direct this in a suitable way, and should be tied to corresponding approaches.

Motorized individual traffic is responsible for a multitude of impacts on the environment. In the framework of restructuring, therefore, aspects that avoid traffic should be considered, such as the creation and expansion of an attractive public transport network, a traffic-route reducing mix of functionalities in the cities, generally space-saving building to reduce distances, etc. On the other hand, unavoidable traffic may not be ignored, but has to be directed in a rather environmentally compatible way, and if needed, even by a demand-oriented expansion of (street) traffic infrastructure.

For environmental protection to receive its due weight already in the planning stage, legal planning regulations should be accompanied by employment of economic instruments; for example, area consumption rights that can be traded, as has been discussed for a while now (30). With that, the utilization of areas could be determined to a maximum tolerable extent in periodic intervals. A fine-tuned steering of reutilization rights on a municipal level could be accomplished by a sealing charge (31).

An especially important factor for environmental protection is long-neglected soil protection. Soil protection is, amongst others, the base for preservation of nature and free spaces, for the (micro) climate, for area utilization by agriculture and forestry, for water ecology and production of drinking water, for the protection of species, and for leisure time/recreation, etc. Soil protection must therefore be conducted more effectively. This can be done, for example, by giving more attention to planning of soil protection on all levels of spatial planning or by designating soil protection areas or soil priority areas on the regional planning level, which would disallow settling activities in these areas. Also, consideration of the idea of a sparing and considerate area utilization in the local Agenda 21 would be conducive to protection of soil.

## 12. Conclusions

Protection of the environment is not an end in itself, but develops increasingly into an absolutely essential precondition for the attractiveness and future viability of a site or region. But environmental protection is also unavoidable with regard to a sustainable use of our environment. Only the preservation of the ability of our natural resources to regenerate by protecting individual environmental resources allows future generations a life at a high material level.

Environmental protection, however, is still often an undesired cost factor which is preferably kept as low as possible, especially in a short-sighted view of investment. Politics in general, and planning specifically, must therefore ensure that planning, building and restructuring measures of today are realised not only with a mind to success that can be realised short-term and which then must be extensively maintained or expensively corrected by future generations, but that these measures are successful in the mid- and long-term and without harming future generations.

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