Sustainable Human Development in a Medium-sized City: The Example of Freiburg, Germany

Peter W. Heller*

Keywords:

Sustainable urban development; Local Agenda 21; land use and development plan (LDP); local commuter transport system (LCTS); climate protection programme; economic stability.

Contents:

Summary:

When in 1969 Freiburg's city council decided, against the nation-wide trend, to retain and expand its tram network, sustainability issues made their debut in the city's policy. In the following 30 years the city has developed sustainable strategies for the key sectors of urban life - land use, transport policy, energy, water and waste management. This article reports on the experiences made in their implementation.

1. General considerations on the local implementation of sustainable urban development

Those who are concerned with implementing local policy decisions have two reasons to familiarise themselves with the concept of sustainable urban development. On the one hand, the stakeholder is looking for facts, for knowledge on how the urban system functions, how the economic, social and environmental activities are interrelated. On the other hand, his needs are turned towards reflecting on the "**human objective**" of his actions. The direction of normative justifications in local politics has changed over the last ten years as urban growth and related pollution have become recognised more and more as a global problem.[i]

This problematique has moved to the forefront of discussions since UNCED in 1992. UNCED's final document **AGENDA 21** mandates local authorities worldwide

to undertake a consultative process and to prepare local action plans towards sustainability[ii]. Sustainable urban development delivers basic environmental, social and economic services, without threatening the ecological and community systems these services depend on.

Although the concept of sustainability is hard to define exactly in a micro-level (urban) context[iii], local authorities can draw upon a vast reservoir of experience to identify which **tendencies** of the urban living environment counteract with high probability a long-term dynamic global system.

Using this experience a heuristic and pragmatic approach implementing AGENDA 21 on a local level appears feasible. The planner's and politician's task is to identify and quantify these tendencies, if possible, as **trends** and to reverse those, which, apparently in the long term, cannot "be put right".[iv] A sustainable city would differ greatly from most current cities. It would minimize its environmental impact and create a milieu in which humans and nature could coexist in harmony. To implement this objective will likely be easier in medium-sized cities than in megacities. In the case of our example Freiburg/Germany, a medium-sized European city, the following sectors of urban development will be examined more closely:

- land use,
- transport policy,
- water, electricity and waste management.

From a systems theory perspective these sectors are partial models. Their integration into a comprehensive local ecosystem model is highly desirable, but hardly feasible for practical purposes. Again, a more pragmatic and policy-oriented concept derived from the principles of AGENDA 21, **Local Agenda 21**, provides a useful framework to integrate the dynamics of the different sectors of urban development. Local Agenda 21 follows a municipal service system approach which encompasses

- urban infrastructure (such as transport systems, sewerage, and water supply);
- urban management (pollution control, building inspections, and waste removal etc.);
- urban health policy (clinics, disease prevention, public health systems etc.).

In order to achieve the objectives of sustainable human development, the Local Agenda 21 concept is using an advanced approach of capacity-building and participation, including

- interdisciplinary engagement in the planning process through local stakeholders;
- education of, and consultations with, community groups to raise public awareness;
- participatory assessment of local social, economic, and environmental conditions and needs;
- mediation and conflict resolution;
- participatory target-setting for action plans; and
- monitoring and evaluation procedures to track the progress of action plans[v].

By late 1999, more than 3.000 local governments in 73 countries were involved in Local Agenda 21 planning activities[vi].

2. Urban development in Freiburg

2.1 Land use

The current ”master” or **land use and development plan (LDP)** was drawn up during the years 1974 to 1979, the projected implementation was based on the period from 1984 to 1990. Due to a large industrial estate no longer being developed and the unexpected housing crisis, partial planning concepts on housing and real estate were revised in the second half of the eighties, the LDP not being updated, however, due to the incomplete biotope charting procedures. Whereas the city council’s and committees’ discussions on housing of that time lead to the drafting of twelve new development plans with 12,000 housing units, the discussions on industrial estate came to practically nothing.

The political debate experienced new controversies in 1990. The initial planning concept of a new district called ”Rieselfeld” stood in the tradition of the previous (post-war) LDP, which made provisions for the further development of 500 hectares for residential areas towards the west. After a heated debate in the council, finally 70 hectares of the total area of ”Rieselfeld”, extending 320

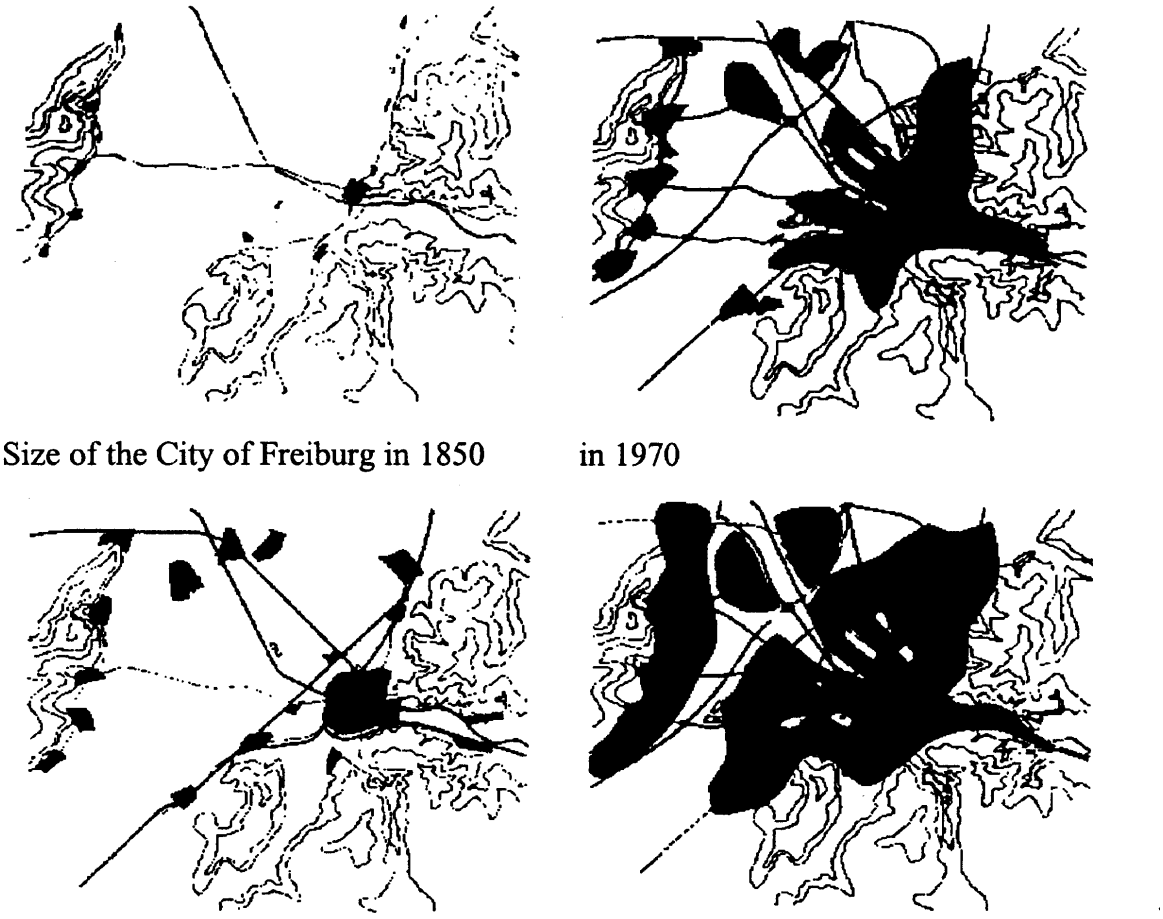
hectares, are to be used for the new district, the remaining areas designated as a nature reserve. This **twin-track decision** divides the area of high biodiversity into two halves, of which one is to be sacrificed for development, the other withdrawn from its grasp for a long period. This apparently ambiguous decision on a rather homogenous area gives evidence of an urban political conflict, which results in partial successes for both development planning and nature conservation. The citizens' sharply raised awareness of environmental issues in land use policy has also left its mark on the city planning concept for the new district. A relatively high density assures achieving an urban character, but the new district should not just become a dormitory suburb. The diversity of architecture, housing styles and small cell plots attempts to avoid establishing monostructures and to ensure a social mixture of the future resident population. The **advanced standard of sustainable planning** appears also in the traffic-reducing spatial link between living and working, the precedence of local public transport and cycle traffic over the car as well as an energy policy which stipulates low-energy construction for all buildings (*see Section 2.3*.) and their connection to a central district heating network. Directly adjacent to the urban section is the new nature reserve which will have its own conservation ”care” programme, designed specially to maintain the unique diver-sity of birdlife in the urban section. The delineation of this nature reserve is one of the most remarkable political successes of nature conservation over the last years and a unique example within the urban districts of Southern Germany during this decade. The ”Rieselfeld” discussion has created a problem-solving model for tackling the conflicting issues of land use and set the pattern for the following debates on the LDP[vii].

After completing the basic work on the map of local biotopes, the decision for updating the LDP was taken in summer 1994. A few months later ”sustainable development” appeared, for the first time, explicitly as the key word for the discussion on land use: ”The discussions on the new land use and development plan will be a test for the correct management of our environment and nature”[viii]. The fact that the discussion on land use has got a sustainable urban development perspective differs fundamentally from previous discussions and gives evidence that the interrelations between the scarcity of land and population growth, the density of urban districts, nature conservation and mobility are firmly anchored in the public awareness. The local media and press considered Freiburg's approach

to managing its limited areas of land as a crucial test for the future of the city and stimulated controversial debates about **scenarios of local action until 2030**.

Simple extrapolation of the expansion of Freiburg's urban area from 1850, 1910, 1970 into the year 2030 shows that any further continuous urbanisation would render the idea of a local sustainable development meaningless. Frowein and Löffler's "Vision 2030"[ix] shows only remnants of green areas within the urban space, urbanisation has completely absorbed the riverside forest in the Rhine valley:

Figure 1: Freiburg settlement area 1850, 1910, 1970 —> 2030



In light of this scenario the discussion of the LDP must clarify one basic question in advance: Is ”sustainable development” to serve the future of the city as a **local vision** - in which case urbanisation on such a scale up to 2030 needs to prevented at all costs -, or one leaves the municipal perspective and interprets ”sustainable development” as a **regional vision** that does not, a priori, exclude the continuous expansion of its central densely populated area? In practice, the regional concept may often be taken as an issue, yet it is without substance as long as there is no regional political institution which could implement a land use and development plan extending beyond the municipal boundaries. The founding of a municipal association for the area around the Stuttgart region is a first attempt by the State of Baden-Württemberg to achieve a practical manageable regionalisation of settlement policy. The **land use debate** in all the other regions in the State is thrown back onto their own land resources and examines the basis for determining land requirements all the more critically.

The Freiburg Office for Statistics and Resident Population assumes an increase in the city population up to 2010 from 7,000 to 10,000 inhabitants. In addition to the growth of the population considerable changes will occur in the **age structure**. Whereas the number of over-sixties will continue to increase, a significant decrease in the number of under-twenties is to be expected, by 2010 the ”high birth rate” age group of the sixties will be replaced by a lower birth rate group. There are insufficient demographic data for an estimate of the demand for housing land, assumptions must also be made about the changes in floor space per inhabitant. It is remarkable how drastically the floor space required reacts to an increase in **floor space** made available: The increase in the average floor space per inhabitant by only one square metre would require an additional gross 50 hectares building land. An extrapolation for the land required up to 2010 calculated a target area for housing of 126 hectares, for industrial development 180 hectares, for general facilities, energy and water supply and transport 100 hectares, for recreational areas 50 to 100 hectares, thus totalling 450 to 500 hectares.[x]

Running parallel to the landscape plan and the LDP the risks involved in all development options related to land use are to be evaluated and compared. Even though the fully compiled risk analyses for the individual areas are not yet available, it is already apparent that an additional land requirement of 450 to 500 hectares cannot be realised without **encroachment into sensitive natural areas**,

the political conflict between nature conservation and urban development is heading toward a crisis. Whether the trend toward a further expansion of settlement areas will continue is difficult to predict at the current time. Changing majorities both open and block development corridors, so that the important task arising in the current discussion of the LDP is to prevent a political ”stop and go” process.

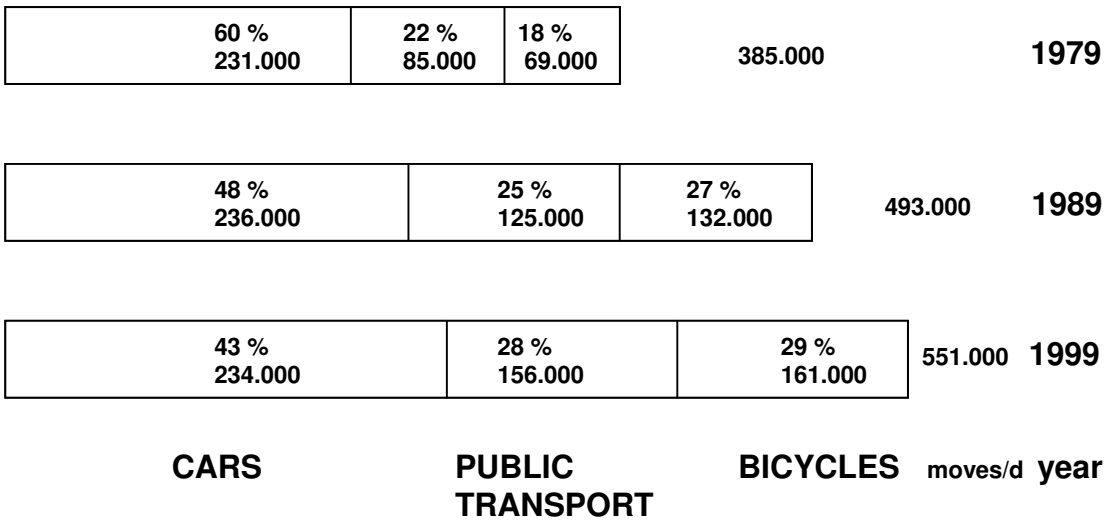
2.2 General transport policy

Not later than 1960 concepts for land use were flanked by early transport plans, which primarily tackled the issue of the motorised commuter traffic. In 1969, the city council made the fundamental decision to retain and expand the tram network, whereas, elsewhere, the tram networks were being dismantled. Between 1970 and 1980 the inner city was converted into a pedestrian zone and multi-storey car parks were erected all around the inner-city ringway. The 1979 general transport plan was already determined by the clear priority of the **local commuter transport system (LCTS)**.

The 1989 update gave even higher priority to the urban ecological aspects of maintaining air quality and sustainable urban development. In principle, the 1989 general transport plan was an action programme to promote environmentally friendly forms of mobility, LCTS, cycle traffic and pedestrian traffic. The consistency of Freiburg’s transport plan over the last 20 years has enabled the inner-city car traffic to be kept constant and the increase in mobility to be diverted onto the LCTS and cycle traffic. *Figure 2* shows the development of the commuter transport system in the form of a modal split for the years 1979, 1989, 1999:

Figure 2[xi]:

"MODAL SPLIT"
DEVELOPMENT OF LOCAL TRAFFIC IN FREIBURG



Although the relative increase in the LCTS share of overall mobility is only 6% (from 22% to 28%), its expansion requires the greatest capital expenditure and is the backbone of the inner-city commuter transport system. A new city tramline running west connects the inner city with the districts of the seventies and nineties (Rieselfeld). Upon its completion, 83% of the Freiburg populace and 89% of the Freiburg places of work will lie within a radius of 600 m of the nearest tram stop. In addition to the new tramline, approx. 50 million DM have been invested in the purchase of new trams to enable faster transport on the existing tramline network. The local bus transport system thus increasingly fulfils the role of a shuttle service to the city tramline system.

This LCTS plan is being supplemented by the construction of **park-and-ride lots**. The stream of commuters from the surrounding areas can only be diverted from cars to the LCTS provided there are an adequate number of park-and-ride spaces. After continuous expansion of the park-and-ride parking sites over the last few years, there are now some 2,500 parking spaces available, the city transport services are investing a great deal in media advertising, encouraging switching to the tramline network at the city limits.

An important factor for the promotion of the LCTS is the fares policy. Freiburg was the first German city to introduce a transferable "**environmental protection**

pass", based on the example of the Swiss neighbour city Basle, at that time for DM 38 per month, which enabled passholders to use the entire city LCTS network whenever and as often as needed. With the financial support of the State of Baden-Württemberg the local environmental protection pass could be upgraded into a regional pass which, from autumn 1991 on, became valid for the entire regional LCTS network, thus expanding the single-tariff area by about 2,400 km of additional route connections. Also introduced was travelling of the whole family on a single regional pass on Sundays throughout the regional network. The new tariff system was so successful that, on certain tram routes, the passenger capacity limits were reached, requiring an increase in running frequency. The increase in individual journeys from 1979 to 1999 of 71,000 per day could not reduce the use of private cars in the city, but it did at least prevent an increase, and this despite the constantly increasing number of registered motor vehicles, which more than doubled in Freiburg from 1979 to 1999.

One main finding to emerge from twenty years of traffic planning in Freiburg is that the role of cycle traffic in reducing individual traffic in urban areas is being underestimated. On a well laid **cycle path network**, for distances under five kilometres, cycles are a serious competitor to cars. In Freiburg the cycle path network has been continually expanded since the seventies, an investment of 30 million DM has enabled an extension of the cycle path network from about 30 km in 1992 to about 150 km bituminized cycle paths today. In addition, there are 250 km gravelled cycle paths, which are being used increasingly by commuters from small towns to the East and West for the daily journey from home to work. The funds allocated to the maintenance and extension of the cycle path network come to about 5 million DM per year. In order to solve the special parking problems for cyclists, approx. 3,000 new bicycle parking spaces have been made available, and a special cycle port is under construction at the railway station to enable train passengers a direct transfer. Whereas the city LCTS projects require a long preliminary planning period and involve substantial investments costs, particularly in the inner-city area, the new construction and improvement of cycle paths is possible with considerably lower costs which, in terms of **cost-benefit**, can hardly be surpassed.

Complementary to investment in the LCTS and cycle path traffic is the limitation of individual traffic in the inner-city zones and urban centres to give pedestrians

more safety and room for movement. For a long time, the contribution of a pedestrian-friendly city ranked bottom of the priority scale in transport planning. During the last ten years it has become recognised more and more that the weaker traffic participants, particularly children and the elderly, are especially dependent on being able to cover their journeys on foot in safety and in comfort. By creating further **pedestrian zones** all around the city centre and in the urban centres, the designation of zones in which traffic is restricted to a walking pace and pedestrians are given priority, zones designated **30 km/h speed limit zones** in all residential areas and better design of pedestrian crossings could permanently improve the pedestrian's situation in the city.

The increase in private car traffic triggered an increasing demand for parking spaces. The result was that an increasing lack of parking spaces in residential areas arose around the city centre, whose first victims were the residents of the residential areas hit. Since the local council had repeatedly spoken out against providing new parking spaces in the city centre, only with the help of a sustained management of parking spaces could the parking problem in the inner-city sectors be alleviated. This included granting the residents of the respective district a special parking permit, which for 100 DM per year assured a residential parking space in the specially designated streets. A progressive fee was introduced for the remaining parking spaces, making long-term parking relatively more expensive.

The other aspect of Freiburg traffic policy is the continuous extension of the main transport routes and the construction of bypasses, which experience increasing importance in the context of the politically very controversial decision for the widening of the Federal Highway 31 East, which runs through the city from East to West. This "both A and B" in traffic policy appears in the public awareness as a contradiction, continually confusing the debate on the path to be taken to achieve a consistent city transport policy ad initio.[xii]

2.3 Energy, water and waste management

During the years 1983 to 1986 the city council conceived a comprehensive energy policy and passed in 1986 - the year of the Tschernobyl catastrophe - the following energy policy guidelines:

– "saving energy is the best energy policy",

– investment in the implementation of renewable energy sources (solar energy, wind energy, hydroelectric power and biomass),
– implementation of more efficient energy technologies for optimal exploitation of fossil fuels (cogeneration, local and district-heating systems),
– opting out of the use of nuclear energy.[xiii]

These guidelines were supplemented in the nineties by the emerging **climate protection policy** which comprises energy policy, transport policy, waste management, agriculture, forestry and municipal procurement within a comprehensive conceptual framework. Since 1992 the City of Freiburg has been a member in the campaign ”Cities for Climate Protection” of the International Council for Local Environmental Initiatives (ICLEI). The city has thus committed itself to achieving a specific target in CO_2-reduction. At the end of 1994 a local **climate protection programme** was commissioned, based on the following steps:

Monitoring the period from 1987 to 1992, a significant increase in the emission of greenhouse gases is projected until 2010, given that no specific climate protection activities are being taken on the local level (reference scenario). The technological and economic potentials to reduce the emission of greenhouse gases are outlined and climate protection strategies described which, from a cost-benefit point of view, could yield the greatest reduction effect. The local climate protection programme was approved by the city council in 1998.[xiv]

Prior to these efforts **energy saving** was usually being practised in the municipal offices. Ever since 1979 the energy costs for the municipal administration have been monitored, a programme caused by the drastic price increases for energy resources (oil and gas) in the seventies. Based on the number of offices in 1979, investment in energy saving has led to a reduction in consumption, up to 1993, of approx. 40%. One immediate result has been the decrease in the emission of the ”classic” pollutants: 60% less SO_2 and dust, 43% less nitric oxide and carbon dioxide as well as 40% less hydrocarbons and carbon monoxide. Taking into account all the investments made, the total expenditures between 1979 and 1991 came to about 6.3 million DM. The savings over this period are almost **four times as great**: 24.8 million DM. During the last few years the City has invested approx. 1.6 million DM in energy-saving burners and boilers, heat recovery plants, improved insulation, thermostat valves and solar-energy plants. One point of focus during the next few years will be the electricity sector.[xv]

Since the early eighties plans have been drawn up in Freiburg to link the existing district-heating network outside the city centre with the district-heating network of the University in the city centre. To connect these district-heating systems a new gas-powered **cogeneration station** was built which can generate electricity and heat with a very high degree of efficiency. By including the energy demand of the largest industrial production facility on site it was possible to run the system at a "heat output optimum", leading to a high return on investment. Since 1998 the operation of the heat and power station has decreased Freiburg's total demand for fossil fuels by approx. 30%, reducing likewise air pollutants and carbon dioxide. The new cogeneration station has boosted the city's **"autonomous" production of electricity** from below 10 % up to approx. 40%.

Under the impression of "Rieselfeld" debate – as mentioned above – the standard for low-energy construction was laid down for this new city district. In 1992 the city council decided that when selling municipal plots of land for building the purchase contracts should prescribe the **standard for low-energy construction**. This means that only buildings with a characteristic energy profile of 65 kWh/m^2/a, which must be proved within the framework of the planning permission and building regulations clearance procedure, may be built. Taking climate protection aspects into account, this improved heat insulation standard is of high significance, since about 80% of the energy consumed in private households is for room heating; today's construction techniques, however, make it possible to realise this low-energy standard with a value-added investment of 3 to 8% of the total costs. One year later the Federal government of Germany responded to Freiburg's and other cities' local initiatives by introducing new energy standards for room heating and insulation of public and private buildings – an interesting example where **local action has had a visible impact on national policymaking**.

In 1992, together with Saarbrücken, Freiburg introduced a **linear time-variable electricity tariff** for the first time in Germany. This tariff provides a direct incentive to save energy; the fixed price component is dropped that consumers with a low energy consumption pay less on the now linear variable price scale. The electricity meters in the normal tariff sector, covering households and small industries, have been readjusted by the municipal services so that the consumption can be measured in three different time zones. The three time zones are staggered

according to the rates scale so that the price difference between the low demand time at 0,12 DM per kilowatt/hour and peak demand time at 0,45 DM/ kWh is considerable, which makes **shifting the energy consumption** into the low demand times financially attractive to the tariff customer. The experience gained so far has shown that the linear time-variable tariff leads to a significant shift of the consumption into the low demand times. Moreover, it also leads to marked savings on electricity consumption as a whole since the more comprehensible tariff structure, coupled with the financial incentive to save electricity, triggers a more **conscious approach to the individual use of electric power.** In the last eight years, the above-mentioned exemplary innovations in the area of local energy management have already triggered significant shifts in the local energy demand and supply structure.

After an increase in **water consumption** in Freiburg's households from 1965 to 1976, since then there has been a reverse trend which accelerated at the beginning of the nineties.

This turn in the trend was, on the one hand, the result of increased public awareness concerning the non-replaceable resource water; on the other a result of the price increase triggered by the **water-management investments** made since the mid-seventies. Securing high-quality and sufficient quantity of the water supply was accompanied by a drastic expansion of the water conservation areas in 1992 from 2,000 to 8,000 hectares, which for the first time in Freiburg made evident the conflicting targets of land use and ground and drinking water conservation. The debates on the increasing amounts of nitrates and pesticides in ground and drinking water have shown that all political parties and local stakeholder groups advocated unanimously for urgent local action to protect the water resources. Since the majority of pollutants stems from **agriculture**, local policy operated at the limits of its range of power and moved in a conflict of interests with the State policy.

The **waste-management** sector became an important factor in urban planning much later than traffic, energy, and water management. Not until 1991 did the city council decide on a waste-management plan, comprising the local policy options for waste reduction (”precycling”), recycling and management of residual waste in

a comprehensive programme. Similar to the energy sector a list of target priorities was formulated which put **precycling, recycling and environmentally friendly treatment of residual waste** at a high priority. The key target to reduce the local residual waste of over 300,000 tons/a in 1988 to under 90,000 tons/a in ten years has been almost achieved with approx. 100.000 tons/a in 1998.

Since the municipal legal options for waste reduction are small, considerable efforts were put into public relations. Public interest was especially great for events on the ”package recycling (Green Dot) dual system” promoted and introduced by Minister of Environment Klaus Toepfer in 1991. The city has been campaigning for promoting returnable packaging as well as for **purchasing waste-free goods**. In the manufacturing industries special attention has been given to branch-specific advice. The increased activities were reflected in the budget for public relations activities for waste management which increased from 445,000 DM in 1990 to 1,2 million DM in 1994.

In 1985 good results were achieved with the ”green bin” for paper and combined valuable substances, but, since 1993, a much more differentiated **collecting system** has been introduced for both households and industry. The standard guidelines for the dual system have been dispensed with and a more differentiated **sorting system**: containers for different types of glass, a separate bin for paper, a bin for light packaging, collecting stations for aluminium, cork and hazardous waste from households and small industries. This collecting system has been further supplemented by separate collection and recycling of garden and organic waste from households and industry. The city has built small composting plants and a central fermentation plant for biological waste to ensure, in collaboration with the county, a regional recycling system of materials for organic waste from its collection to its commercial sale as compost.[xvi]

Price increases for the disposal of waste by a factor of up to six as well as strict monitoring of deliveries to the municipal landfill by private security services have led to a drastic **decrease in the volume of waste disposals.** This decrease is not caused by a lower output of household waste, in fact a slight increase has been registered over the years 1990 to 1995. The considerable reductions in volume are a result of the lower amount of industrial waste being delivered to the landfill. The rising cost pressure on industry and trade in the disposal of residual waste has led not only to considerable efforts in precycling and recycling, but also to **evasive**

strategies involving an increase in mostly illegal exports of waste across the borders to neighbour countries.

3. *Ars politica* - the scope for local action

In the manageable dimensions of a medium-sized city, as illustrated above, it is possible to implement **programmes fostering sustainable urban development** and to reverse or at least stop countertrends.

At the onset of the nineties, the financial situation of the German cities and counties had deteriorated considerably. The most important factors contributing to this development were the **economic and structural recession** of the German economy and the local authorities' share in financing German unification. Without exception, all cities were hit by this unique burden in their local budget. Since 1999 the financial situation of local authorities in Germany has largely improved.

Concerning the State of Baden-Württemberg, it is remarkable that compared to the middle Neckar region, which went through a serious structural crisis at that time, Freiburg has been able to achieve **economic stability**. The result was a distinctly slower rise in unemployment compared to the State average and in a positive development in tax revenues, showing a record figure for the post-war period in 1993.[xvii] Economic stabilisation of the city was possible since Freiburg as a city of the tertiary sector (including tourism) and public institutions was only marginally hit by the structural crisis in the production sector.

Freiburg is an old European city. A local philosopher, Rainer Marten, must surely have been thinking of his home city and its surroundings when he observed: "*Entire cities and landscapes have already become museums. One already imagines one can see how queues form in front of ticket offices at their boundaries. Appreciation of life, gained from the encounter of old traditional culture and remaining natural areas, is booming. However, it speaks the language of curiosities*."[xviii]

The medieval culture heritage, the University and the "remaining" natural areas do, indeed, give this city its character and form the basis of its attraction. The **challenge** is to ensure Freiburg a future with a non-museum-like identity within the scope of its strengths. One solution is: In the wake of urban progress, Freiburg can offer **"provincial" solutions** for the pressing issues which generate more confusion in bigger cities: the unrestrained private motor vehicle traffic in the inner

city, destruction of natural landscapes and their wildlife diversity in urban areas, the inconsistent energy, water and waste management. Following the **vision of sustainable urban development** local action-oriented policy can, indeed must, under the Freiburg premises, work toward a time when, bearing the oblivion of natural areas in mind, today's urban ”progress” is felt by future generations itself as a ”language of curiosities”.

Endnotes / Bibliography:

---

* Dr. Peter W. Heller, former “Bürgermeister” (Deputy Mayor) of Freiburg and past Chairman of ICLEI, is Executive Director of the Swiss-German CANOPUS FOUNDATION (homepage: www.canopusfund.org)

[i] cf. Diekmann, J.: Stadtpolitik im Umbruch. Wohin steuern unsere Städte? Lecture given at the symposium ”Stadtperspektiven” (Urban Development Perspectives) on the occasion of the 20th anniversary of the Deutsche Institut für Urbanistik (German Institute of Urban Development) on 03.11.1994 in Berlin, p. 6.

[ii] United Nations: Earth Summit – AGENDA 21, New York, December 1994 (DPI/1344), p. 233f.

[iii] cf. essays by P. Ekins, H. Achterhuis, C. von Weizsäcker and D. Worster on ”Confusion Over Sustainability”. In: Sachs, W. (ed.): Global Ecology. Halifax 1993. Part II.

[iv] cf. this heuristic approach: London School of Economics (LSE) / International Council for Local Environmental Initiatives (ICLEI) / Local Government Management Board (LGMB): Third International Expert Seminar on Environmental Management Instruments, Report + Abstracts, London/UK, 1-3 April 1998

[v] ICLEI / International Development Research Centre (IDRC): The Local Agenda 21 Planning Guide, Toronto 1996, p. 13-19

[vi] ICLEI Biennial Report 1998-1999, Toronto, June 2000, p. 16

[vii] see City of Freiburg: Council Paper G 185 of 04.02.1991 and G 94192 of 02.11.1994.

[viii] cf. City of Freiburg: Presentation of the Biennial Budget 1995/96 on 22.11.1994, p. 39.

[ix] Frowein/Löffler/Roos/Kienle + Partner: Beitrag zum städtebaulichen und landschafts-planerischen Ideenwettbewerb Rieselfeld (Proposal submitted to the invitation of tenders concerning the “Rieselfeld” development), 07.02.1992 (unpublished)

[x] cf. City of Freiburg i. Br.: Council Paper G 94088 of 06.05.1994

[xi] Source: City of Freiburg, Traffic Planning Authority, Hufbauer/Rombach 1999

[xii] for the General Transport Plan cf. City of Freiburg i. Br.: Council Paper G 536 of 22.03.1989 and the revised ”Information File on Traffic Planning” by the Civil Engineering Office. cf. also Liebich, E.: Verkehrsberuhigung und Mobilitäts-Chancen im städtischen Raum. In: Raumforschung und Raumordnung. Vol. 53 (1995), H. 1.

[xiii] cf. the ”Energieversorgungskonzept für die Stadt Freiburg i. Br.” (Energy Management Concept for the City of Freiburg), Study by Energieconsulting Heidelberg, Heidelberg, April 1995, Ch. I.

[xiv] City of Freiburg i. Br.: Council paper G 95212 of 25.11.1994, Council paper G98306 of 23.11.1998

[xv] City of Freiburg i. Br.: Municipal Energy Report 1998, III

[xvi] City Council of Freiburg i. Br.: Council Paper G 236 of 18.04.1991

[xvii] cf. City of Freiburg i. Br.: Presentation of the Biennial Budget 1995/6, p. 28

[xviii] Marten, R.: Der menschliche Mensch. Paderborn 1988, p. 201.