

Learning from
Freiburg's
Climate Protection Endeavours

by

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Abstract

There is a growing body of literature on local authorities' efforts to reduce greenhouse gas (GHG) emissions. It is important to identify the factors that lead to success and failure in this endeavour. But this is a complex question because so many interacting variables influence outcomes. These include local political, business and popular support for GHG emission reduction, and the depth of local expertise. Freiburg is a special case because all these variables are overwhelmingly positive. Hence Freiburg can be a test case of what can be achieved, and what can fail, in a near ideal setting. But there are also issues as to how to generalise a German case to other countries, where local authorities have differing constitutional powers. Nevertheless, a framework of four 'governing modes' has been used effectively, to compare German and British municipalities' GHG emission reduction efforts. Using this framework, this study explores Freiburg's GHG emission reduction efforts. It finds several features and approaches that could be applied within municipalities of other constitutional structures or with varying degrees of GHG concern. Chief among these are the City Council's creative methods of enhancing its authority in the building sphere, its uniquely intensive and open style of city-wide consultation, and its successful outsourcing of both risk and engineering in a municipal building renovation project. Municipalities can also learn from Freiburg's shortcomings in GHG emission reduction, in particular the City Council and Administration's preoccupation with high-tech solutions, the city's economic and 'image' dependence on the photovoltaic industry, and an apparent leakage of influence from the City Council to the 'eco-industrial complex' within the city. Meanwhile there is only slow progress in the more down-to-earth project of thermally renovating existing homes, where local politicians believe the biggest volume of CO₂ savings could be made for the least cost.

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Introduction

The purpose of this study is to add to our understanding of what enables local authorities to bring about greenhouse gas (GHG) reductions within their jurisdictions. Many local authorities throughout the world are now committed to this endeavour, to a greater or lesser degree, and it is now widely recognised that they have an important role to play in this field.

However, their success is related to a number of variables. Chief among these are: (a) the degree and consistency of political support for GHG reduction among their elected representatives, (b) the level and distribution of technical competence, in GHG reduction matters, within their governing apparatus, (c) the amount of public, business and administrative support for GHG reductions, (d) the degree of constitutional authority they have over GHG emitters within their jurisdictions, and (e) the availability of finance (Bulkeley and Betsil 2003).

Because of all these overlapping variables, it is not always easy to discover what factors are leading to particular successes or failures in GHG reduction efforts.

The municipality of Freiburg, Germany, is an important test case because the first three of the above variables can be eliminated. In terms of political support for GHG reductions, there has been complete and consistent unity in the City Council on the matter since Freiburg's climate protection programme began in 1996. Even before this, the Council had been vigorously committed to environmental protection for decades. Further, the city administration is fully supportive of the project, and richly endowed with appropriate skills and experience. There are also, within the city, research institutions, professionals, NGOs and business entrepreneurs with a large stake in Freiburg's climate protection program. Voting patterns and the city's unique grass-roots consultation processes show that the citizenry is also solidly behind its GHG reduction goals.

This makes Freiburg an interesting candidate for a case study of local authority GHG reduction achievements. Shortcomings in these achievements cannot be explained by

lack of political commitment, shortage of expertise, or wavering public, business or in-house support for GHG reduction. Any obstacles and failures would have to be seen in other terms, such as sector objections to particular avenues of GHG reduction, poor strategising by the Council, clashes of interest among leading players, and, of course, lack of constitutional authority and of funding.

With regard to constitutional authority, local authorities in different countries work under different constitutional arrangements, and therefore have different instruments at hand in their GHG reduction efforts. However, this need not confine us to comparing only authorities within the same country. Bulkeley and Kern (2006) have shown that framing local authorities' GHG reduction efforts in terms of four *governing modes* enables us to compare the efforts of local authorities in Germany and Britain, even though these have differing structures of constitutional authority. Their study brings to light common features of German and British local authorities' GHG reduction successes and failures, despite these differences.

Hence, if we examine Freiburg's GHG reduction efforts through the framework of these governing modes, it should be possible to generalise issues from Freiburg's GHG reduction experiences, at least to some extent, beyond what is possible in a German context.

For these reasons we have chosen Freiburg as a useful case study. Such a study can address questions such as: What can a municipality achieve, in GHG reduction, in the near-ideal situation where most of the usual restrictive variables (except money) are eliminated? Are there general rules, restraints and dynamics that affect municipalities' ability to reduce CO₂, and are city councillors and their staff aware of these? What social, political and economic factors impinge on a local authority's GHG reduction attempts, reinforcing these or derailing them? What strengthens a local authority's hand, and what weakens it?

Surprisingly, GHG reduction in Freiburg has been modest. A recent study by the *Institut für angewandte Ökologie* (Institute for Applied Ecology¹) revealed that CO₂

¹ Hereafter called by its popular name, 'Öko-Institut'

levels in 2006 were just 5% below 1992 levels, though this equates to nearly 10% per capita, as the city has been growing (Timpe and Seebach 2007). These figures were greeted with disappointment by the City Council, which responded by passing a raft of motions committing to 40% cuts by 2030, backed up by yet more vigorous action (Freiburg 2007).

So it is not the case that a near-ideal municipality necessarily enjoys huge success in reducing GHGs. It is clear, however, that this municipality is radically determined to achieve success in this field. As we will see, this almost ideological drive towards GHG reduction colours Freiburg's efforts in its GHG reduction work, leading to both positive and counter-productive outcomes.

Our first chapter sets the governing modes concept in the context of local authorities' GHG reduction endeavours worldwide, and the reforms and challenges that have faced these authorities in Germany and Britain in recent years.

In Chapter 2 we outline the historical, social and political setting of Freiburg's approach to environmental issues and GHG reduction.

In the next four chapters we examine the municipality's climate protection endeavours in relation to the four governing modes. This will bring issues to the surface that will help us understand Freiburg's achievements, potential and limitations in its climate protection work.

In Chapter 7 we apply the four governing modes to one aspect of Freiburg's GHG reduction program, namely the city's complex of photovoltaic enterprises. This is a very dominant feature of Freiburg's climate protection discourse, its economy and its image as a 'green' city, and is consistently cited by the municipality as a clear sign of its GHG reduction commitment. Oddly, however, it contributes little or nothing to GHG reduction, drains large resources from the national economy, and puts the city's economy and image at risk. Its importance for our study is that it shows how unproductive some aspects of a GHG reduction program can be, even in a municipality where all the variables seem to favour success.

In a final section we draw together our findings and their implications, for Freiburg, for other municipalities, and for the continued study of such bodies in their GHG reduction work. We also make recommendations for further study.

Methodology

The author visited Freiburg for a four day preliminary study in September 2007, and three weeks of major data gathering in May 2008. Documentary evidence was gathered, including key minutes of council meetings, a technical assessment of Freiburg's GHG performance by an independent institution (Timpe and Seebach 2007), and the city's public information and promotional material. This revealed some of the shades and nuances of Freiburg's climate protection work and the politics, economics and social factors associated with it.

Certain aspects, though, were more closely studied by way of formal, recorded interviews with leading players. To better understand the day-to-day politics of the City Council and how this impacted on GHG reduction endeavours, the leaders of each of the Council's two major political groupings were interviewed: the Green Party and the Social Democrat (SPD) caucus chairs (Friebis 2008, Krögner 2008). Council staff were interviewed, to gain insight into the administrative processes of implementing Freiburg's GHG reduction policies, and to gauge motivation and commitment levels within the municipality's bureaucracy (Dresel 2007, Dresel 2008, Veith 2008). To explore how the municipality was coping with energy supply deregulation, the customer services manager of its part-owned energy supplier, 'badenova' was interviewed (Hamburger 2008). Understanding of the role of the PV industry in Freiburg was deepened through interviews with two engineers in different branches of PV research and development (Peharz 2008, Heile 2008). In all cases, interviews also yielded wider insights and understandings of various aspects of Freiburg and its GHG reduction endeavours.

Technical briefings on Freiburg's transport policy and its climate protection strategy were attended, in order to fill gaps in factual knowledge and to see how the municipality framed its work in these areas (Maurer 2008, Zähringer 2008). There were also informal conversations with other administrators, plus follow-up correspondence, to check understandings and pursue outstanding issues. All

interviews and discussions were conducted in German, so as to ensure accurate comparison of key phrases and narratives between various players, and between written documents and the spoken word.

Chapter 1. Municipalities and Climate Protection

There is growing recognition that local bodies and other sub-national governments have an important role to play in GHG reduction (e.g. Kates and Torrie 1998, Collier 1997, Collier and Löfstedt 1997, Bulkey and Betsill 2003, Lindseth 2004, Rabe 2004, Lutsey and Sperling 2008). This is chiefly because most GHGs are emitted at a local level, usually by enterprises that are wholly or partly under the jurisdiction of sub-national authorities, and also because most of these authorities have a traditional role in overseeing local environmental concerns, plus the expertise and local contacts that go with this responsibility.

To some extent this is merely an extension of central government's role, in its delegation of duties to lower levels of the governing hierarchy. National governments began directing local authorities to save fossil fuel 3 decades ago in the wake of the oil crisis. For example, in 1977 the Swedish parliament passed 'The Act of Municipal Energy Planning' (*Det energipolitiska implementeringsspelet*). This required local authorities to develop a municipal energy plan, and resulted in significant CO₂ reductions (Collier and Löfstedt 1997). Concern about climate change is now leading some governments to direct local authorities to bring about reductions in GHG emissions. For example the U.K. government's recent Energy Measures Report gives detailed guidance to local authorities on their 'responsibilities to act on climate change and energy' (BERR 2007 pp25 ff).

Other national government mandates come in less direct forms, such as changes to buildings standards, and regulations regarding proportions of renewable energy. These can be seen, for example, in Germany's Energy Conservation Act and Energy Saving Ordinance, currently being amended (FME 2007).

But it would be a mistake to suppose that the driving force behind local GHG reduction initiatives is the decisions of national governments. Recent studies (e.g. Collier and Löfstedt 1997, Fleming and Weber 2003, Bulkeley and Betsill 2003, Rabe 2004, Demeritt and Langdon 2004, Lutsey and Sperling 2008) show that many sub-national governments (states, regions, municipalities, counties) are their own driving

force for local GHG reductions, and that these commitments and achievements often go far beyond what is required or expected by national governments.

Toronto, for example, was one of the first cities to address the climate change issue at the local level, despite its national government's relative indifference. In 1990 the City Council unanimously resolved to commit to 20% CO₂ reductions by 2005, and established an 'Energy Efficiency Office' to monitor and implement this. By 1995 CO₂ emissions were reduced by 7% (Kates and Torrie 1998).

Even in the US, where Federal government has been unsupportive of GHG reduction, many states have developed their own climate protection policies. States have made:

... formal commitments in virtually every sector that generates (greenhouse) gases. When combined, they constitute an almost stealth-like approach to global climate change, in that they have received remarkably little attention from scholars, journalists, or environmentalists. (Rabe, 2004, p3.)

Further, Lutsey and Sperling (2008) report that the GHG reduction targets of committed US cities and states would, if reached, stabilise total US GHG emissions by 2020.

In Europe, meanwhile, initiatives such as *Klimabündnis* (Climate Alliance) celebrate GHG reduction achievements among member municipalities: Linz (Austria) is reported to have reduced its private household CO₂ emissions by 36%, Maeder (Austria) has 92 square metres of solar collectors per inhabitant, Hanover reduced its total CO₂ emissions by 5% in seven years. In Zurich 95% of all public buildings erected since 2001 conform to low-energy-standard (Janssen 2007). Though it is difficult to verify these figures, the reporting of them shows how local authorities are developing a self-understanding as reducers of CO₂. Meanwhile in the UK, GHG reduction endeavours in Leicester, Newcastle, Kirklees, Cambridgeshire and Southampton have been investigated (Fleming and Weber 2003, Bulkeley and Betsil 2003, Bulkeley and Kern 2006), while the German cities of Munich, Frankfurt am Main and Heidelberg have been seen as leaders in climate protection policy (Bulkeley and Kern 2006) and many other German cities have made significant gains.

The larger context

Local authorities' role in GHG reduction needs to be seen within the broader context of the functions and roles of local governments. What constitutional powers do they have, and how do these limit or broaden their GHG reduction potential?

British local authorities are directly under the sovereign authority of central government, which may alter their powers, boundaries and functions to suit its own agenda. Further, their powers are *specific*, not general. They may only do what they are statutorily permitted to do by central government (Wilson and Game, 2002).

Until the Second World War, Britain's local authorities were strong, self-funding centres of political and administrative power, with a broad range of local functions, including the provision of welfare services. But in the 1940s their local provision of gas and electricity was transferred to national bodies, while health care was subsumed under the newly formed National Health Service. In the early 1980s, under the Conservative government of Margaret Thatcher, many local government functions were passed to quangos under central government leadership and funding, while local bodies became obliged to expose their remaining provision of services to market testing. In 2000 the Labour government of Tony Blair introduced the concept of 'New Public Management' (NPM), which attempted to bring private enterprise management efficiency principles to local body administration (Woollmann 2004). John (2001) notes the persistent weakening of British local authorities over the last 60 years, and Blair (1998) aptly commented:

There are all sorts of players on the local pitch jostling for position where previously the local council was the main game in town.

By contrast, German local bodies have maintained most of their governing authority, for three main reasons. Firstly, their right to govern has a guarantee dating back to the Prussian Municipal Charter of 1808, and enshrined in the Federal Constitution of 1949:

The local authorities have the right to decide and rule, under their own responsibility, on all matters pertaining to their local community within the boundaries of existing legislation ... (*Grundgesetz*, Article 28, Section 2, author's translation)

This effectively means that, while they have to implement Federal and State government policies, they have wide discretionary powers to do whatever else they think is appropriate.

Secondly, their constitutional powers are derived from the *Land* (state) rather than the national government, in a federal system in which the states, collectively, have veto power over the national parliament's decisions. Hence Federal government cannot order reforms or limitations to their governing structure, as the Thatcher government could with municipalities in Britain.

Thirdly, under the 1949 constitution, the Federal government may not establish local bureaus to implement its own policies (Woollmann 2004). Hence 70-80% of Federal and state legislation is implemented by the local authorities, and quangos like those of the Thatcher government would not be possible in Germany.

Hence German local authorities have been less susceptible to the world-wide reforming trends that have weakened the powers of their British counterparts over the last few decades. However, EU-inspired liberalisation has deprived them of their monopolies on waste and sewage disposal, and energy and water supply. Further, a German version of the NPM has been applied – the 'NSM' (*Neue Steuerungsmodell* - New Steering Model) - in an attempt to transform their 'Max Weberian, rule-bound' (Woollmann 2004) administrative style into a more flexible mode of management, including cost-benefit accounting, performance indicators, and monitoring (Reichard 2003).

A further reform is that all the *Länder* have now introduced direct election of mayors for their municipalities, a move which tends to enhance their constitutional powers. Freiburg already had this advantage, as its *Land*, Baden-Württemberg, together with Bavaria, has had directly elected mayors since 1945. Based on the US presidential

concept, the mayor is both chair of the Council and chief executive of the city administration.

Given these differences, how is it possible to generalise lessons from a German municipality's GHG reduction efforts, to other countries such as Britain?

To begin with, there remain some important similarities. Both countries' municipalities provide services, such as schools and social housing. Both control large estates of energy-using buildings, equipment and vehicles. Both have wide powers over local traffic routing. While British local authorities have lost control of energy provision, their German counterparts now have only a limited and precarious hold upon it.

Further, British local authorities now have the duty of 'well-being', which provides broad scope to address climate change issues, and through the 'Nottingham Declaration' (DEFRA 2006.1) they could argue they have a central government mandate to do so.

Besides, there is now a rich network of agencies promoting and facilitating GHG reduction among sub-national governments worldwide. Chief among these are *Klimabündnis* (see above, p.10), which links local governments in a partnership with indigenous rainforest peoples (KB 2007), ICLEI (International Council for Environmental Initiatives), which provides GHG reduction resources through its Cities for Climate Protection program (ICLEI 2007, CCP 2007), and Local Agenda 21, which arose out of the Rio conference in 1992. These networks promote commonalities between local authorities, both in outlook and means of action in GHG reduction (Lindseth 2004).

More generally, many aspects of local government work stand to some extent outside the strict rules of constitutional arrangements. Leach and Percy-Smith (2001) explore the term 'governance' (as distinct from 'government') to denote the services that are provided and decisions that are made, by a range of organisations and groupings, often in consultation with the Council or facilitated by it. Financial pressures in recent

decades have spurred this process, as they put severe limitations on what British and German local authorities can achieve on their own.

Governance, government and governing

There is ongoing debate about the limits and definition of ‘governance’, not to mention the terminology itself. Bulkeley and Kern (2006) argue that there is sufficient overlap and variation within local authorities’ operational context in both countries to warrant a common framework for assessing their climate protection work. They suggest we examine the ‘**modes of governing**’ which are deployed with respect to climate protection – using the term *governing* to distinguish it from the more constitutionally oriented ‘government’ and the more diffuse ‘governance’. They identify four distinct modes of governing in German and UK municipalities: governing by **authority**, governing by **provision**, **self-governing**, and governing through **enabling**. For reasons similar to those set out above, they argue that municipalities are less and less able to govern by authority and provision, and are increasingly restricted to self-governing and enabling modes.

1. Governing by authority.

This governing mode is now most evident in traffic routing and building standards. German municipalities have long used their authority over traffic to reduce or eliminate cars in city centres. However, municipalities in both countries have little or no say over main traffic routes through their jurisdictions, nor can they set CO₂ emission standards for locally bought vehicles.

Municipalities exercise authority in their enforcement of building standards, though these are set at the national level. Germany has long demanded higher energy standards in new builds than Britain, though Britain is now planning to catch up (BERR 2007). Both countries have enormous capacity for CO₂ reductions in this field. However, councils may not normally demand higher standards than those nationally set down for new builds, and they have little authority to demand the upgrading of old buildings, even though these are huge users of energy (IEA 2007).

2. Provision of services.

A crucial factor is the degree of control a local authority has over the big GHG producers of transport and energy supply. German municipalities control public transport, and have developed it according to integrated transport plans that incorporate cycleways and traffic routing. This has brought considerable success in GHG reduction in many cities, such as Münster (Münster 2007). British cities, which have limited or no control over public transport, have been less successful (Collier and Löfstedt 1997).

Local authority provision of electricity generation can lead to rapid growth of renewable energy generation, as with low carbon replacement power plants in Leipzig (Collier 1997). German municipalities also provide district heating for apartments and businesses. EU-inspired deregulation, however, has led to a weakening of this form of provision, severely limiting attempts by local authorities to impose renewable energy quotas on municipal power supply.

3. Self-governing.

Local authorities are big owners of GHG-producing assets: schools, office blocks, vehicle fleets, recreation centres, council housing and public buildings. In this 'self-governing' area they generally suffer no nationally mandated restrictions, do not need the support of public interest groups, and are limited only by funding and motivation levels.

4. Enabling.

Because of their physical proximity to GHG emitters, local authorities can offer advice and expertise to individuals, organisations and enterprises. For very little cost, they can catalyse changes leading to significant GHG reduction. A successful British example is the 'Personal Travel Plan' (DFT 2007), in which Council officers proactively seek out discussions with commuters on how they can move from private car commuting to cycling or public transport.

Local authorities can also use this 'enabling' mode to influence business and industry toward less GHG intensive practices. Their officials can form alliances or initiate

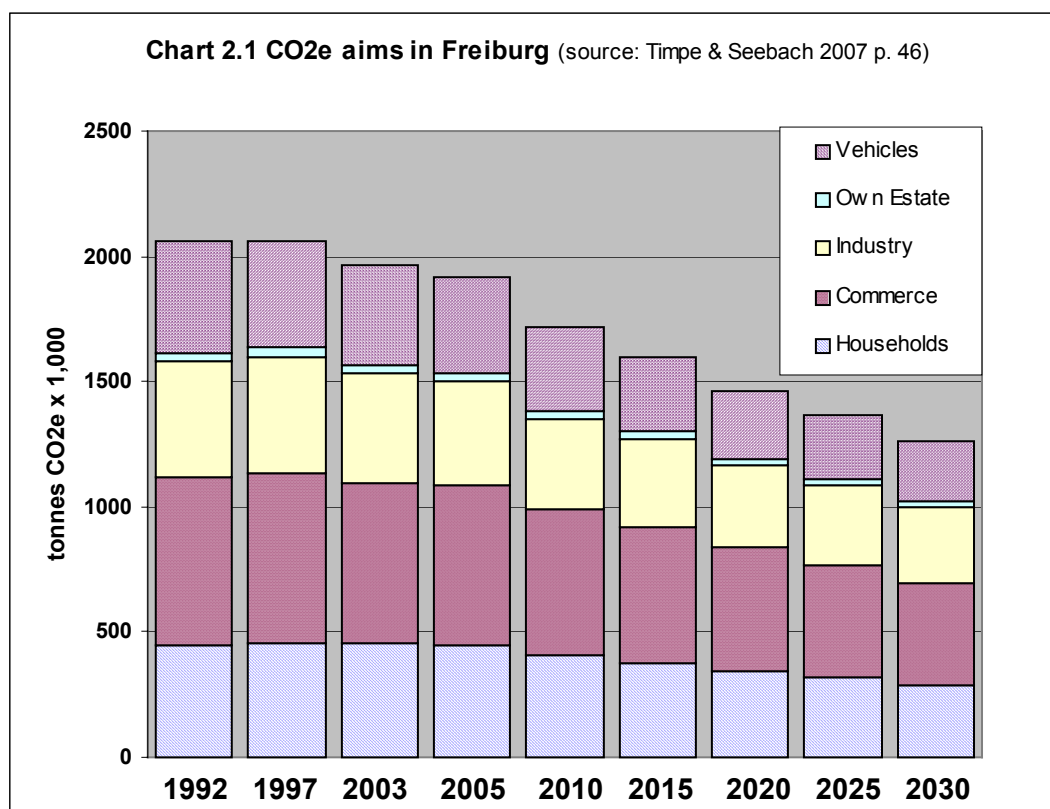
discussions with key players in the community, leading to consensus-based decision-making on abatement programs (Flemming and Webber 2003, Rabe 2004).

Conclusion

Many sub-national governments initiate and maintain strong climate protection policies. They do this within the context of limited and shifting degrees of governing authority and a diminishing role as service providers. But they also have non-hierarchical means of effecting GHG emission reductions, particularly by engaging with local organisations in this work, and upgrading their own large estates.

Chapter 2. Freiburg: History and Politics

Freiburg's climate protection policy (*Klimaschutzpolitik* – KSP) began in 1996 with the full support of the council. In July 2007 it was reaffirmed and renewed, with new CO₂ reduction goals (see Chart 2.1 and Table 2.1) for the year 2030 (Freiburg 2007). The only point of dispute was whether to reduce emissions by 30% or 40%. The 'ruling' Green Party and (conservative) Christian Democrats (CDU) wanted the deeper cuts, while the 'opposition' Social Democrats (SPD) supported the city administration's preference for the more 'realistic' goal of 30% (Krögner 2008, Friebis 2008).



	1992	1997	2003	2005	2010	2015	2020	2025	2030
	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr	x1000t/yr
Households	447	458	457	449	406	378	344	317	290
Commerce	672	674	641	640	581	542	492	448	401
Industry	461	468	435	415	362	352	331	319	307
Council estate	37	36	33	32	29	28	26	24	23
Vehicles	442	422	399	381	336	300	270	257	244
Totals	2059	2058	1965	1917	1714	1600	1463	1365	1265
% reductions cf 1992	0.0	0.0	4.6	6.9	16.8	22.3	28.9	33.7	38.6

Table 2.1. Freiburg's CO₂ aims (source: translated from Timpe and Seebach 2007, p.46)

Further, the KSP is just one aspect of Freiburg's longstanding 'Environmental protection policy' (*Umweltschutzpolitik* – USP), and the two are often merged seamlessly in the city's promotional literature. The stated goals of the USP are 'Protection of resources,' 'Reduction of emissions,' 'Worldwide climate protection' and 'Abandoning nuclear technology' (Freiburg 2004b). Freiburg's aspiration to be a 'sustainable city' is promoted under headings that include 'climate protection' (Freiburg 2006a). Freiburg also promotes its goal to be a 'viable city of the future' (*zukunftsfähige Stadt*) in the context of its 'Environmental policy' (*Umweltpolitik*), and this includes references to the economic and technological advantages of its climate policy (Freiburg 2005c).

Environmental protection is deeply entrenched in the city's history, economy and social-political makeup, and climate protection is now a key part of this.

The political landscape

Freiburg's 'Lord Mayor²' is directly elected by the people. The current incumbent is Green Party politician Dr Dieter Salomon, elected in July 2000. The Lord Mayor chairs the *Gemeinderat* (City Council), which consist of 48 members elected by proportional representation. The current makeup is:

Green Party: 13

Young Freiburg 2

CDU: 13

SPD: 8

Unabhängige Liste (Left Party and other leftist groups): 6

FreieWähler (Free voters): 4

Freiheitliche Partei Deutschland (Free Liberals – FDP): 2

'Young Freiburg' is the youth branch of the Greens, giving them 15 seats plus the Lord Mayor's. Together with the CDU, their preferred allies in Freiburg, they have a majority of votes on the council.

² The German word is *Oberbürgermeister*. City administrators prefer this to be translated as 'Lord Mayor'.

On climate and environmental issues there is broad agreement among all 6 political groupings. Important questions follow: How did Freiburg come to be so thoroughly committed to environmental protection? How has the Green Party come to have such a dominant role in Freiburg's politics? Why is the Greens' de facto coalition partner in the city council the CDU and not the SPD?

The natural setting and its influence

Freiburg lies in a naturally beautiful geographical setting at the edge of the Black Forest. The picturesque Dreisam River flows through the inner city suburbs, and the old city centre borders on the vineyards and forests of the Black Forest foothills. Freiburg boasts the most hours of sunshine in Germany. Central and northern suburbs suffered severe bomb damage in World War II, but the ancient city centre has been restored to a good degree of its medieval charm. The great variety of street widths, squares, parks and gardens within the central area make it a city of 'great charm' (Veith 2008).

Several of those interviewed for this study see Freiburg's natural beauty as one of the underlying reasons for its longstanding commitment to environmental protection (Dresel 2007, Krögner 2008, Veith 2008). Further, the city promotes Freiburg's natural beauty in tandem with its environmental policies. As one promotional booklet says:

With 5,138 hectares of forest (43 percent of its land area), Freiburg is one of the biggest forest owners in Germany. The city forest is the lungs and the green heart of the city. (Freiburg 2008a, p14)

The booklet outlines the economic and ecological issues associated with the forest, in the context of Freiburg's 'green' and 'sustainable' policies. There is a clear association of the city's natural beauty with its environmental policies.

However, as Heile (2008) observed, at one crucial point there is a clash between *Naturschutz* (conservation) and *Umweltpolitik* (environmental politics). Many Freiburgers' strong attachment to natural beauty sets them firmly against wind

turbines, which disrupt the local mountain scenery, even though wind power is the cheapest and most readily harnessed form of renewable electricity.

Nuclear protests and the formation of the Green Party

Freiburgers consistently trace their political environmental commitment back to a formative event in the city's recent history. In 1975 a decision was made by the state government of Baden-Württemberg to permit a nuclear power station to be built at Wyhl, a wooded area in the Rhine Valley near Freiburg. Local farmers and vintners – mostly conservative CDU voters – protested vehemently and occupied the land (Gänzle 2004). The CDU state governor Hans Filbinger visited the site to reason with his erstwhile supporters, but:

They shouted through loud hailers, whistled him down, punched the air before him, pushed and shoved him, waved their vintner fists at this important figure. (Bischof 1976)

Filbinger labelled the protesters 'a minority of revolutionaries', further enraging the farmers. Soon they were joined by hundreds of students from Freiburg's university, and within weeks the protests had spread throughout West Germany. Sit-ins, litigation, wars of words and political manoeuvres continued until the regional court stopped the project in late 1978.

The event was a decisive moment in West Germany's political development, as well as in that of Baden-Württemberg and Freiburg. 'The symbolism of Wyhl has radiated throughout the world,' said scientist and writer Georg Löser (Truöl 2005) at a 30th anniversary reunion of the protests.

For West Germany a direct consequence was the formation of the Green Party. There were already 'green' and environmental lists in local and state elections (Gänzle 2004), and a national environmental party might well have formed in any event. But the Wyhl experience pushed it forward. In 1977 the SPD voted at its annual conference for 'a further enlarging of the civilian usage of nuclear power,' a decision seen as a blow to environmentalists within the party. The conference became known as the *Atom-Parteitag* – the 'Nuclear Party Conference.' When the Green Party

formed a year later, a number of SPD MPs from Baden-Württemberg defected to the Greens (Gänzle 2004). They were joined by former CDU MP Herbert Gruhl, also from Baden-Württemberg. Gruhl brought with him *Grüne Aktion Zukunft* (Green Action Future), ‘an eclectic collection of conservative, middle-class oriented people.’ (Gänzle 2004)

In its early years the Green Party worked through an intense internal conflict between conservative and radical factions. Marxist and anarchist groups were gradually disempowered, to the benefit of more orthodox elements. This was especially so in Baden-Württemberg. The effects today are reflected in Freiburg, where the Greens work comfortably with the CDU. In 2006 the city administrators brought a proposal to Council to sell all the city’s council housing, to pay off the city’s debt of 350 million euros. The Greens and CDU were in favour, and narrowly won a vote on the matter against strong protests from SPD and Left Party members. However, the SPD then raised enough signatures to have the question put to a referendum, and won. Green caucus leader Eckart Friebis commented:

And since then there have been problems with working between the SPD and the Greens... There was a lot of conflict and controversy... The SPD and Left Party now act as an opposition. (Friebis 2008)

Ironically, Federal grants to municipalities rose shortly after the affair, so that now the debt is under 300 million euros and the financial crisis is no longer critical.

Economics and the Freiburg Green Party

One reason the Greens prefer debt-free governance is:

... the theme of inter-generational justice³. One doesn’t just think of today, but of the next generation. One doesn’t get into debt, because then our children would have to pay it back. (Friebis 2008)

³ Cf. Rawls (1971), Rawls (1999).

Other aspects of the Freiburg Green Party's economic and social policy contain strong echoes of liberal orthodoxy. In Friebis' view:

Our theme is 'opportunity justice' (*Chancengerechtigkeit*), that everyone has the opportunity to get a good education, the possibility of getting a profession... Many people say, 'The state should care for everything, the state will give you money, social welfare.' That's a big SPD theme. They say, 'Distribution: take from the rich, give to the poor.' And we say, 'Of course we must support those who have nothing,' but when you give too much support you take away the incentive for people to apply themselves and say 'I'll get a job.' ...But we want to offer Kindergarten places, so people can go and get an education, so that everybody will have an equal chance. (Friebis 2008)

Chancengerechtigkeit is a fundamental CDU social theme, whereas its SPD counterpart is *Chancengleichheit* (equality of opportunity) (Stötzel and Wengeler 1995). Its prevalence among the Greens helps explain why the two parties work so well together. But why are the Greens so strong in Freiburg, and what other factors support and underlie Freiburg's deep commitment to climate protection?

The growth Freiburg's eco-infrastructure

The memory of Wyhl is burnt deeply into Freiburgers. Every interviewee cited it without hesitation as the decisive event in bringing a green consciousness to the city.

Freiburg's role in the Wyhl protests led to a high profile for the city throughout West Germany among environmental activists, intellectuals, 'and those impressed with the Club of Rome' (Dresel 2007). This led to an influx of such people to the city, and a tendency for students to remain in Freiburg after their studies rather than seek employment elsewhere. Further, the Öko-Institut was founded as a consequence of the Wyhl experience, as locals wanted an independent energy research institute that would not be dependent on grants from nuclear or other vested-interest sources.

Other consequences followed. The interest within Freiburg in alternative energy sources led to Georg Salvamoser's decision to establish a photovoltaic (PV) factory there in 1996. The Fraunhofer Institute for Renewable Energy Research was soon

established (Peharz 2008). When its research on the FLATCON concentrator PV spawned the Concentrix firm, those involved insisted on locating the firm in Freiburg against pressure to locate in the cheaper eastern states (Heile 2008). The International Solar Energy Society (ISES) and the International Council for Local Environmental Initiatives (ICLEI) established their headquarters in Freiburg, and the Solar Info Center was established. Freiburg's annual hosting of the Solar Trade Fair only ended when the fair became too big for the city's exhibition centre. The university has recently established a renewable energy research chair. A strong theme of 'ecological modernisation' (Spaargaren 2000) is evidenced among participants in this complex of institutions. Though this has many shades, its common theme is that technological advances are the key to a sustainable future.

Meanwhile, architecture in Freiburg was developing interest and experience in solar installations, due to the large pool of eco-oriented new home buyers in the city. The development of the sustainable suburb Vauban (see Chapters 3&6) was both a consequence of and a stimulus to this process. The outstanding 'solar architect' Rolf Disch became a legend in the city, gaining the funding and support to design large, ostentatious, futuristic buildings festooned with solar collectors.

The commercial, academic, political and social aspects of these developments came to reinforce one another. This is partly why the traditionally conservative CDU is so environmentally oriented in Freiburg. Big business in Freiburg tends to be eco-business. This does not always have the best consequences, as we suggest in Chapters 6&7. It might not always be best for low-income families, as SPD councillor Krögner pointed out (Krögner 2008). But it constitutes a kind of local 'eco-industrial complex' (aphrase borrowed from Jörges 2008) that runs with its own momentum.

Further, persistent, committed work by city planners in the decades since the Wyhl affair has delivered a city that is possibly unequalled in Europe for its civic quality of life. Parks and green spaces make up nearly half the urban area (Veith 2008). Public transport is reliable, comfortable and frequent, while cycle-ways are well developed (Maurer 2008). Pedestrian zones dominate in the city centre, and inner city life supports a strong café culture and a great variety of shops, including many locally

owned. These features tend to attract more eco-minded settlers to the city, so that its environmental commitments are reinforced.

Conclusion

In Freiburg we see a strong commitment to environmental protection, and a distaste for nuclear power, at all levels of the citizenry. This is generally reinforced by a strong conservationist ethic, though these clash where wind power is concerned. This 'green' character is deeply embedded in the city's post-war history and is self-reinforcing through migration patterns. It is reflected in voting habits, lifestyle choices, and solid popular support for Council aims to protect the environment, avoid nuclear power, and reduce GHG emissions. It is further reinforced by the build-up of environmentalist concerns and institutions in the city, by a well-established green architecture tradition, and by a lucrative and energetic renewable energy industry – a veritable eco-industrial complex. Freiburg's more conservative political parties have accommodated themselves to this green constituency, while the Green Party has embraced the market-driven economics that fuel the city's eco-industrial complex.

This constellation assures strong, continued support for the Council's GHG reduction aims, while these are set in a context of centre-right economic policy and high-tech industrial-commercial culture.

Chapter 3. Governing by Authority

Municipal authority and its limits

As city councils are local *governments*, they have legal, constitutional, formal authority to act in certain ways within their jurisdictions and to require people to do, or refrain from doing, certain things. As we have argued, German municipalities have more of this kind of authority than their British counterparts. British municipalities may only do what is explicitly permitted by central government. Under the German constitution these bodies are autonomous, in that they can do whatever they like, as long as it does not contradict Federal and State law.

However, in practice the powers of German municipalities in reducing GHG emissions are severely restricted by standards and limitations set by these higher bodies. Building regulations are set at Federal level, and municipalities may not demand tougher standards within their jurisdictions. As Dresel (2008) complained, unlike Barcelona, German municipalities may not require new builds to have solar water heating, as this is not in the Federal Building Code. Further, due to EU-wide deregulation, municipalities lost their monopoly on energy supply within their jurisdictions in 1999, and this has severely restricted their ability to set targets for renewable energy usage. Freiburg's energy company, the *Freiburger Energie- und Wasserversorgung*, was privatised in 2000, depriving the city of a comprehensive and direct means of controlling the energy sources used to power and heat the city.

Regulatory frameworks

Nevertheless, national regulatory frameworks can provide a structure, which municipalities such as Freiburg make good use of in setting CO₂ emission standards. As Dresel (2008) explained, having a 'supportive national framework' prevents energy-saving being merely 'a private initiative, a hobby.' Instead, 'it solves a big problem for us, because here is, quite simply, a set of rules.' It also provides a benchmark that politically active municipalities can push against, seeking continual improvements.

In some areas the national framework is already strong enough for Freiburg to pursue its climate goals. German municipalities are empowered to develop traffic routing plans. Like many German cities, Freiburg has long worked to exclude private cars from the city centre and make this ‘a pleasant environment’ (Maurer 2008). This project is ongoing, and a further main street is currently being turned into a pedestrian zone. The city is also free to charge high car parking prices as a deterrent to private motorised transport. Since the city is also the public transport provider and has the power to expand the cycling network, its traffic planning is well integrated into an overall transport plan (see Chapter 4).

Limits imposed from above

The limits of municipal authority impinge deeply on Freiburg’s climate strategy. One example is the current effective ban on erecting wind turbines on the hills around the city. Planning permission for these comes from the *Regionalplanungsverband* (Regional Planning Board). This board has state powers, but is made up of representatives from the municipalities in the region – in this case the Upper Rhine Region⁴. The board sets the zones where wind turbines may be erected, and current policy forbids these being erected on high ground, due to their aesthetic impact on the Black Forest. As Friebis (2008) explained, ‘no one’s investing in them, as they can only be built on low ground, where there’s too little wind.’ Although the Green Party is the largest caucus in Freiburg’s city council, the CDU dominates in the Region and is, in Friebis’ view, ‘anti-wind power’. The absurdity of this, from Freiburg’s point of view, is that wind turbines produce hundreds of times more energy than photovoltaic panels per unit size and up to 10 times as much per euro invested (Hamburger 2008).

A further weakness in Freiburg’s authority is the relatively lax Federal building standards. New homes must be insulated sufficiently to consume no more than 150kWh/m² of heating fuel per year, but Freiburg prefers the stricter, ‘low energy home’ standard, of 65kWh/m² as a benchmark, and the ‘passive house’ standard of 15kWh/m² where possible. As city building engineer Roland Veith (2008) explained, the city has no power to force private builders to go better than the Federal standard, and almost all new individual builds on privately owned land go only that far.

⁴ Stadt-Freiburg, Landkreis Breisgau-Hochschwarzwald, Landkreis Emmendingen and Landkreis Ottenau. Freiburg has 15 of the 80 representatives on this Board.

Enhancing authority by stealth

However, as Veith and Dresel also explained, Freiburg has found ways around this restriction. Firstly, when the city sells a section of land to a potential home-builder, the city, as the vendor of the land, can negotiate conditions of sale with the purchaser. It is perfectly legal for the vendor to insist on specified energy standards for any building to be erected on the land, and Freiburg does this in every case. This enables the city to require private home-builders to go at least as far as 65kWh/m², and in many cases even further.

A second strategy applies when land is to be subdivided for home building, by a developer, regardless of who owns the land. The authority to sub-divide and build must come from the city, through its district plan. Federal law prevents the city from insisting on low energy standards as a condition of a subdivision. But, as Dresel and Veith explained, there are many trade-offs in such negotiations, and in every case in recent years the development contract has come to include the 'low energy house' or 'passive house' standard.

Freiburg has been using these 'contract instruments' since 1992. Unlike many local authorities, which shy away from using all the authority they have in reducing GHGs (Bulkeley and Kern 2006), Freiburg actively seeks ways to boost its authority.

The Vauban example

A very creative example of this strategy is seen in the low-energy suburb of Vauban, which is promoted as a model development for a low-carbon future (e.g. Freiburg-Projektgruppe 2008, Freiburg 2005b). The site was developed as a military barracks in 1935, expropriated by French occupation forces in 1945, and returned to Federal ownership in August 1992. A group of students proposed a plan for an ecological village, and after lengthy consultations and negotiations with many interested parties (see Chapter 6), the city bought the site for this purpose. The suburb that was envisaged would provide homes for 5,000 residents, in 2,000 houses and apartments.

From the start, very strict ecological project aims were set. These included the 'low energy house' standard of 65kWh/m² per year. They also included local communal

‘Combined Heat and Power’ (CHP) generation, tram links to the city centre, strict traffic calming, retention of existing mature trees, water conservation, ‘child-friendly’ streets, a kindergarten, a primary school and local shops. Only terraced homes and apartments would be allowed, as these save energy most efficiently. But uniformity was to be avoided, with a variety of home concepts and designs to be encouraged. Most of the existing buildings would have to be demolished, but an important feature was the plan to re-use as much demolition material as possible

As the city was both land-owner and developer, it had authority, as outlined above, to apply its own strict standards in all these fields. In consultation with interest groups it drew up a detailed set of criteria, and offered a competition for architects to form this into a design concept (Freiburg 1996). Potential home-buyers and sub-developers were then sought, and there have been no shortage of takers despite the higher prices for homes built to the required standards⁵.

Some parcels of land were sold direct to groups of buyers who organised their own building designs. Others were sold to sub-developers who built and sold on. All homes had at least the 65kWh/m² energy standard, but many customers opted for the ‘passive house’ standard of 15kWh/m². One sub-development, the ‘*Solarsiedlung*’, was built to ‘plus-energy’ standard, using PV panels to make up the deficit of energy consumed by the house. Freiburg’s renowned ‘solar architect,’ Rolf Disch, designed an office and commercial block, the ‘*Solarschiff*,’ which houses environmentally oriented organisations such as the Öko-Institut and an eco-friendly supermarket in the suburb. The former French commandant’s mansion was upgraded to ‘low energy’ standard and now houses the International Solar Energy Society headquarters.

The project is currently in its last phase, with two small remaining land parcels being developed. The city has achieved its goals, in building standards, transport, energy production, variety, water conservation, and preservation of the green environment. By fully exploiting its regular authority, and using the legal manoeuvres it had developed to enhance its authority in building standards, Freiburg achieved everything what it wanted to. The city is now embarking on a similar project in the new

⁵ The average home price in Vauban ranges from 2,500-3,000 euros per square metre, compared to an average price in Freiburg of 2,000-2,500.

subdivision of Rieselfeld, which will house 12,000 people, all in homes with at least the 'low energy' standard (Zähringer 2008).

Where formal authority ends

Nevertheless, city leaders are aware of the limitations of the city's authority. As Friebis (2008) reflected, 'I can't force the world to do my bidding. I can't say, "You can't fly to your holiday, you may not drive a car, you must ride a bicycle."' Although the Green Party and its allies have a majority in the city council, said Friebis, 'we have to try to bring the citizenry along with us, because without the people, and without the economics, it counts for nothing.'

Freiburg's leaders exploit their constitutional authority in ways that go beyond the norm. But where this ends, they can also accomplish GHG reduction aims through other governing modes, as we shall see.

Chapter 4. Providing Goods and Services

A traditional role for local governments is the provision of key goods and services, such as public transport, energy, water, waste management, recreational facilities, cycleways, footpaths, and education. Transport, energy and waste are major GHG emitters, while schools and recreation centres also contribute to GHG emissions. A municipality with a firm commitment to climate protection can reduce GHG emissions through its control of these services.

Waste management

Waste management is one of Freiburg's most complete success stories, though probably its least publicised. In 1991 the city adopted a waste management strategy built on three pillars: do everything to avoid producing waste; re-use waste as much as possible; and dispose of the rest in an environmentally responsible manner (Freiburg 2005c p.17). Freiburg approaches the first pillar through public education, including extensive school lessons. It also exerts its authority, for example by banning plastic cutlery at public functions. The second pillar works through recycling and the third through burning, to produce energy. The proportion of Freiburg's waste being recycled rose from 25% in 1991 to 57% in 2000, while the tonnage remaining fell from 58,000 to 39,000 – even though the total tonnage of waste rose from 73,000 to 93,000 (Freiburg 2005c, p19).

Until 2005 the leftover waste was dumped, as landfill, in a depot at Eichelbuck, within the city. Its residual methane emissions now fire a CHP generator, which will soon shut down, ironically, through lack of fuel. Since 2005 Freiburg's leftover waste has been burnt in a CHP generator at Business Park Breisgau, some 30km south of the city. The electricity it produces is fed into the grid, and the city is negotiating with potential buyers for the heat produced (Friebis 2008).

The city has been completely successful in eliminating methane, a potent GHG, from waste, and in turning this into useful energy. Due to its success in waste education, however, the 10GWh of 'green energy' it produces each year is predicted to diminish rather than increase.

Public transport

Freiburg, a city of 217,000 inhabitants, provides 130,000 jobs. It lies in an economic region with a population of 615,000, increasing by 1% per year. 80,000 people commute into Freiburg every day (Maurer 2008), in addition to the tens of thousands of journeys within the city. Transport in Freiburg produces 381,000 tonnes of CO₂-equivalent (CO₂e) per year, or 20% of the city's annual total of 1.92 million tonnes. This represents a significant reduction, from 442,000 tonnes in 1992. The city aims to reduce this to 244,000 tonnes by 2030 (Timpe and Seebach 2007, p.46).

A large portion of these emissions comes from through traffic, over which the city has no control. Main road trade routes pass through Freiburg from east to west, and emissions from these are counted in Freiburg's GHG total. Further, east-west road freight in Europe is expected to increase markedly in coming decades (Datamonitor 2008). At the same time, however, much of the expected reduction in emissions is expected to come from improved Federal standards for motor vehicles, with 2030 CO₂ emissions down 50% on today's levels (Timpe and Seebach 2007, p39).

Freiburg's transport strategy is built on five pillars: continually extending the public transport network, promoting cycle transport, managing parking space, restraining traffic, and channelling motorised transport (Maurer 2008). The first three of these are forms of governing by provision.

The public transport network consists of trams, buses, and regional trains. Trams have served the city for over 100 years, and since post-war reconstruction the network has been continually extended. The city now has 30 km of tramlines, with 58 vehicles up to 5 wagons long, serving 70% of all local public transport users. Trams come with a fixed frequency of one every 7.5 minutes, and 4 minutes in rush-hours. Planned extensions will reach the outer suburbs, while other new lines will relieve pressure on inner city routes. By 2015, 80% of the citizenry will have 'good connections' to the tramway (Maurer 2008).

The bus and tram networks are well integrated. There are 62 articulated and 21 regular buses, covering a 270 km network. All trams and buses are technically advanced and have easy wheelchair access. As in most German cities there is an integrated fare

system, with user-friendly ticket machines, and options for single and multiple journeys over a range of time periods.

There is also a regional train system, run by the region's municipalities rather than the German Railway, but integrated with it.

Planning and decision-making for the local transport system is done by the municipality, but 85% of funding comes from the Federal and State government. Maurer (2008) perceives this as a source of frustration, as the taxes that pay for the funds come from the people, while municipalities have to compete with each other to obtain them.

Freiburg's pro-active control of public transport has increased its use, from 11% of journeys in 1982 to 20% today. The proportion of journeys by private car has fallen from 38% to 28%.

Pedal and pedestrian transport

Freiburg boasts a 'cycle path network' of 410km, of which only one-third is on streets shared by cars. Of the rest, 114km lie alongside roads, 46km are dedicated routes within the city, and 120km pass through forests or fields. Cycle routes were started in 1969, with 29 km. Investment in cycleways peaked in 1984, at 3.12 million euros, and now averages 200,000 euros per year.

This has fostered a huge number of bicycles in Freiburg, with cycle journeys now around 28% of total journeys within the city, compared to 15% in 1982. The city centre now has 5,725 cycle parks, an increase from 2,200 in 1987, though any observation shows how inadequate this is for the huge number of bicycles. One very useful feature is the provision of free, lockable, covered cycle parks at commuter railway stations.

The city is also aware of difficulties faced by pedestrians, particularly the frail and those with baby carriages, on its (allegedly) 'historic' cobblestone streets. Attempts are being made to smooth out the stones for easier and safer walking. Engineers are also investigating ways of reducing the waiting time for pedestrians at traffic lights.

This is to encourage more walking in the city, as the percentage of journeys made on foot has reduced, from 35% in 1982 to 24% today (Maurer 2008), despite the relentless and continuing expansion of the inner city pedestrian zone.

Freiburg's long-term focus on public transport has led to impressive statistics. Car ownership in the municipality is 408 per 1000 inhabitants, the lowest in Baden-Württemberg for cities of comparable size. The state average is 638, and the figure for the neighbouring city of Emmendingen is 666.

Energy supply

Despite liberalisation, Freiburg has been able to maintain a fair degree of influence over energy provision within its boundaries. Through its new subdivision contracts, it establishes CHP communal heating and electricity systems (see Chapter 3). Its investments in PV and wind power have increased the renewable portion of local electricity. And by retaining a stake in its privatised and restructured energy supply company, 'badenova', it continues to exert influence in energy provision.

Badenova has to run on business lines, but the municipality's 51% stake gives Freiburg's Lord Mayor a seat on the governing board. The company's roots and culture also contribute to its support for climate protection, and the retention of its market share depend crucially on public goodwill, as much as market efficiency.

Badenova is the result of a merger between four suppliers of gas, electricity, heat and water in the wider region, but most of its electricity goes to customers in Freiburg. It offers a choice of 3 products: bulk power to industry, which includes a full mix of nuclear, fossil fuel, and renewables; normal power to households, which is nuclear-free; and a special eco-product, 'Regiostrom-Aktiv', made up entirely of renewables: wind, PV, hydro, and biomass from waste methane. 11,500 customers choose this option, which carries a surcharge of 1.51 eurocents per kWh above the normal price. The surcharge earns badenova 600,000 euros per year, which it invests in the development of more renewable electricity generation. As badenova's customer services manager, Hans-Jürgen Hamburger (2008), explained, 'This has enabled us to afford 25 small-scale hydroelectric plants, 6 biomass plants, and well over 1300 PV installations.'

Further, badenova has an incentives fund of 3 million euros per year for customers to generate their own renewable energy (badenova 2008a). This includes PV (a grant of up to 900 euros), solar-thermal (a 200 euro grant) and micro-CHP (a grant of up to 5,000 euros).

Badenova has competitors on both sides of the green spectrum. Its main 'green' electricity competitor is *Lichtblick* is a nationwide firm that avoids both nuclear and fossil options, offering prices comparable to badenova's (Lichtblick 2008). There are also '*Billiganbieter*' - cheap power producers who 'are not green, just mainstream,' so that competition is 'a constant threat to badenova's market share' (Hamburger 2008).

A further contribution of badenova is the annual fees it pays the city for use of its water, gas and electricity networks. In July 2007 the city council decided to dedicate 10% of this to climate protection projects (Freiburg 2007, Ziffer 2).

Conclusion

Despite deregulation, Freiburg is able to implement aspects of its climate protection programme by way of governing by provision. The energy generated by waste management is small in comparison to the city's needs, but its complete success illustrates a determination on the part of the city's leaders. Continued provision of public transport seems assured, and keeps the city in a good position to increase its gains in GHG reduction as private motoring costs increase. There are weaknesses with energy provision but the city's financial stake in badenova, and widespread ecological awareness among consumers, give confidence that this form of provision should continue effectively into the foreseeable future.

Chapter 5. Self Governing

Like most German and UK local authorities, the municipality of Freiburg owns a vast estate of administration buildings, council houses, schools, kindergartens, vehicles and recreation centres. Operating these produced 32,000 tonnes of CO₂e in 2005 (Timpe and Seebach 2007 p.46). While this is only 1.7% of the city's total CO₂e emissions, the Council sees reductions as essential, both to set an example and for the value of the reductions themselves (Friebis 2008, Krögner 2008). The current plan is to cut these emissions to 23,000 tonnes of CO₂e by 2030, a 30% reduction (Freiburg 2007).

Because the Council owns the facilities and is fully committed to climate protection, it has much scope to effect GHG reductions. The only limiting factors are money, technical know-how and the laws of physics. In the following samples of its self-governing work we see how it copes with these limitations.

Outsourcing at zero cost

In 2000 the City Council contracted with the renewable energy company Eco-Watt to renovate the energy and water systems of Staudinger Comprehensive School. It did this without investing a single eurocent, and now, eight years later, it is making an annual saving of 80,000 euros, while the school's energy usage has been reduced by 20-30% and water usage by 70%. This is despite the addition of several new computer rooms and an increase in the student roll (ERF 2007).

Eco-Watt began by raising 270,000 Deutschmarks⁶ in loans, at 6% interest, from parents and teachers at the school. This money went into a fund that would pay for the renovations. It then negotiated a detailed plan for the 7-year project, including expected annual savings in kWh and CO₂ (Eco-Watt 2000, see Table 6.1).

Before the project began the annual electricity, gas and water usage was noted. As the project was implemented, and for the rest of the 7-year contract period, all the money

⁶ One Deutschmark was worth about 50 eurocents when the euro was introduced

gained through energy and water savings went to Eco-Watt. But from September 2007, the savings accrue to the City of Freiburg.

Aspect of project	Investment (D-Marks)	Energy Saving (MWh/yr)	Saving per year (D-Marks)	Years to pay back costs
Rebuilding of heating and ventilation system on clubroom, workroom and youth room	7,100	10	720	10
Solar heating, including rebuilding of water heater	36,500	20	1,440	25
Regulator control in hall, rebuilding of ventilation, addition of gas sensor, humidity switch and CO2 sensor	87,000	395	28,440	3
Zoning of school areas, improved night, weekend and holiday cut-out switching, timing device for ventilators	24,900	422	30,380	>1
Stripping and reassembling of heaters, and insulation of heat supply	10,300	10	720	14
Increasing flexibility of power supply regulators	3,000	-	-	-
Insulation of radiator niches	2,000	1	72	28
Other minor installations and improvements to energy regulators	29,200	-	-	-
Totals	200,000	858	61,772	

Table 6.1: Expected costs and savings in aspects of the Staudinger school project. (Source: Eco-Watt 2000)

As Table 6.1 shows, considerable savings could be made in some areas for relatively little cost. Simply programming ventilators to switch off when nobody was in the rooms paid for itself in less than a year. Adding smart sensing to the gas, humidity and ventilation controls in the hall paid for itself in 3 years. Rebuilding heating and ventilation systems in the clubroom, workroom and youth room should pay for itself after 10 years, while major renovations to the heating system, and adding proper insulation, should pay off in 14 years. Adding solar thermal heating, which also involved rebuilding water heaters, will take 25 years to pay for itself, but this improvement has the additional benefit of permanently eliminating a portion of fossil fuel usage. The longest payback time was for insulation of radiator niches, while the two items without payback times were upstream of the other items, and contributed to their energy savings.

Over the 7-year period, 2,650 tonnes of CO₂ were saved. Savings included 5.4 GWh of heat energy, a reduction of 20-30% annually; 1.4 GWh of electrical energy, an annual reduction of 20-25%; and 77 million litres of water, a 70% saving.

By engaging an outside contractor, the municipality incurred minimal overheads in personnel involvement, and by using community investments to seed the project there were no up-front costs. But most impressive, for nil investment the Council has made itself a handsome annual profit while self-governing effectively in its climate protection strategy. (See also Eco-Watt 2008, Eco-Watt 2008a.)

Council buildings and installations: the grand strategy

The Council's own estate is large and complex, so reducing GHGs will require considerable strategic and technical skill. Self-governing involves the optimising of resources to produce the most favourable result. Freiburg is richly endowed with technical-ecological expertise, and the recent report of the Öko-Institut (Timpe and Seebach 2007) sets a basis from which the Council can work (see Table 6.2).

In Table 6.2 the heading, 'Priority', reveals the strategic thinking behind the plan. Items with high or medium CO₂ savings that are 'more economical' or require 'minimum investment' are most likely to be given high priority. High priority is also given to items which impact widely across the Council estate, such as checking the 'climate impacts of City Council decisions,' introducing 'guidelines for energy standards for public buildings,' and 'preparing an annual energy report.'

Another high priority is 'monitoring of energy use so as to optimise running.' In Freiburg's environmentally aware culture, savings can be made simply by giving people information updates as to how their behaviour is affecting energy usage. 'Training of caretaker staff' is also a very effective way to avoid energy wastage.

While some Council staff speak privately of their frustration at working in buildings of poor ecological design, there is clearly a sophisticated long-term strategy being developed, that should relentlessly upgrade the energy efficiency of the Council estate over the coming decades.

	Evaluation criteria from the point of view of:	Cost to the city administration					Economics of investment			CO2 Saving			Priority		
		Requires financial investment?	Requires council personnel?	Requires outside help?	Requires agreement with partners?	Requires high level implementation?	Requires Council decision?	More economical	Less economical	Minimal investment	High	Medium	Low	High	Medium
1	Monitor energy use to optimise running	s	y	y			y			y			y		
2	Prepare an annual energy report	s	y	s				y			y		y		
3	Develop and decide on investment plans for energy-optimising building renovations	s	y	y			y			y			y		
4	Regular training of caretaker staff		s	y			y				y			y	
5	Take account of indirect environmental costs of investment decisions		s			y		y				y			y
6	Set up demonstration projects with renewable energy systems	y	s	s	s			y				y		y	
7	Introduce guidelines for energy standards for public buildings		y	s		y	y					y	y		
8	Introduce energy-optimising criteria for supply and procurement		s	s			y					y		y	
9	Simplify and incentivise public participation projects		s	y					y		y			y	
10	Check climate impacts of City Council decisions		y			y			y		y		y		

y - yes s = small

Table 6.2 Valuing of measures for saving GHG emissions in Council buildings and installations
(source: Translated from Timpe and Seebach 2007 p.55)

Insulating council houses

Freiburg owns some 8,000 council houses and apartments. The vast majority have inadequate wall and roof insulation, substandard windows and inefficient heating systems. The city has a commitment to renovate these, though funds dictate this will be a long slow process. This estate is only a fraction of the tens of thousands of such homes in the city. As Friebis (2008) admits, despite his own and the city leaders' enthusiasm for high-tech PV, the 'biggest volume' of CO2 savings is to be made in thermal renovation of these homes (compare IEA 2007). But, as Social Democrat

Councillor Krögner (2008) adds, most people cannot afford to renovate, and suffer cold winters with attendant health risks.

As a landlord, the Council now has a responsibility to bring its homes up to the Federal standard of 150kWh/m² heat energy per year. As we have seen, however, Freiburg prefers the stricter ‘low energy house’ standard of 65kWh/m² and even more, the ‘passive house’ standard of 15kWh/m². The Council has decided on a pilot project, to renovate an ageing multi-storey apartment house to passive house standard (Veith 2008). Residents will be temporarily re-housed while the renovations proceed, and the completed project will be put forward as a demonstration model.

There are ethical questions around this issue. While the tenants will benefit from the lower fuel bills and extra comfort of a passive house, the expense means that fewer apartments can be renovated to the minimum, Federal standard, or even to low energy standard. Freiburg’s self-governing is naturally influenced by its ethical and political priorities, and these tend to be very green and economically centre-right. The Council also shows a preoccupation with technological sophistication, perhaps in part because of the high-tech interests in the city’s economy and the ‘ecological modernisation’ motif among its leading players. The passive house standard meshes well with this constituency, whereas, as Friebis notes: ‘Wall or cellar insulation? That has no ring to it. It’s not sexy.’ The Council does not appear to have done a formal cost-benefit analysis comparing various types of renovation⁷.

Conclusion

In the self-governing mode Freiburg shows considerable financial acumen, in achieving its climate goals, plus profit, at zero cost in school renovation. It also shows a careful, technically sophisticated approach to the long-term renovation of its buildings and plant. Its commitment to renovating its council housing stock is laudable, but its desire to produce another ‘demonstration object,’ and its love of the technological cutting edge, raise questions as to its priorities in this endeavour.

⁷ All the author’s requests for one drew a blank response.

Chapter 6. Enabling

When municipalities use the ‘enabling’ mode of governance to reduce GHG emissions, they are in effect extending their influence beyond its legal and constitutional limitations. Bulkeley and Kern (2006) identify ‘enabling’ as ‘promotional activities, public-private partnerships and the provision of financial incentives or subsidies to encourage action by others,’ plus ‘shaping policy goals and the delivery of infrastructures and services in partnership with other actors.’

Freiburg makes extensive use of the enabling mode, though some aspects of its partnerships with other actors seem to go beyond, or at least broaden, the usual understanding of this mode of governance. We explore its endeavours under the headings of advice and education, incentives, and consultation.

Advice and education

Freiburg has its own carbon footprint calculator, the *Freiburger CO2 Diät* (Freiburger CO2 diet). This appears in the centre of the municipality’s homepage, with the commentary:

Use our CO2 calculator to work out your individual CO2 emissions and see where you cause a lot or a little CO2 to be released. You’ll also find immediate, practical tips and advice as to how you can arrange your life in a more climate-friendly manner. (Freiburg 2008c)

The web link invites citizens to consider reducing emissions from 10 to 5 tonnes of CO2 annually, explaining:

Climate protection is a question of proper technology and infrastructure, but the individual can also do something. (Freiburg 2008d)

The user is then led through 3 steps. First, she can work out her CO2 diet with the city’s online calculator. Second, under the heading ‘Act in awareness’, four links are offered for everyday tips and advice: heating and electricity, travel, food, and

consumerism. The third step offers the user the opportunity to invest in a climate protection fund that is currently being set up, to ‘save emissions continually.’

The city distributes a leaflet promoting the ‘CO₂-Diät’ and pointing readers to the website (Freiburg 2008e). It also distributes the Öko-Institut’s Federal-backed ‘Eco Top Ten’ series of advice leaflets, which cover topics such as washing machines, dishwashers, and energy use in general (e.g. Öko-Institut 2008).

There are also advice stations for more specific and costly undertakings in climate protection. For example, the city has a one-third stake in the home insulation and heating advice office, ‘Energieagentur Regio Freiburg GmbH’, housed in the Solar Info Center. Many of the other 43 firms represented in the Centre give free advice on renewable energy sources and energy saving.

Freiburg has introduced environmental education at every level in its education system, from kindergarten to the end of secondary school. Its intention is to produce an environmentally aware populace that furthers its goals.

Incentives

The city offers a raft of incentives for home insulation, new heating systems, and renewable energy installations. These complement badenova’s incentive schemes (see Chapter 4) and supplement those from the state and Federal governments. The city’s incentives are not large, and no money is offered in support of PV, which is already generously subsidised at national level, plus one-off grants from badenova of up to 900 euros.

Social Democrat caucus leader Walter Krögner (2008) believes there should be more incentives for renovating existing homes, as this brings big CO₂ savings and healthier home environments. Green Party caucus leader Friebis (2008), too, would like to see ‘energetic renovation of old houses, as we have tens of thousands of these buildings that are badly insulated.’ Friebis bemoaned the fact that ‘there isn’t a strong financial incentive for home insulation.’ The shared frustration of these two, who represent both sides of Freiburg’s political spectrum, suggests that this is an area where the City Council’s influence is at its weakest. We will return to this issue.

Krögner would also like to see better rationalisation of Freiburg's advice centres, with more comprehensive information on the plethora of incentive instruments available from various levels of government, from the EU down, as well as from non-government sources.

Consultation

A theme that emerges repeatedly in Freiburg's life and politics is consultation. As Friebis (2008) pointed out, 'we have to carry the people with us.' He also described the consultation process that led to the Vauban development (see Chapter 3). A paraphrase of his description follows:

When the French handed the site back to the Federal government, a group of students approached the Council with the suggestion that it be re-developed into an ecological village. There was scepticism among Council members, but discussions were initiated, and the pool of interest groups was widened. The original group formed itself into a *Verein* (the German equivalent of a charitable trust) with the epithet 'SUSI', for *Selbstorganisierte Unabhängige Siedlungs Initiative* (Self-organised independent residential development initiative). Discussions continued, and representatives of SUSI were included in a City Council-led 'Workgroup Vauban,' which also included other municipal and citizen interest groups. Eventually the basic project concept crystallised and was put to the vote in the Council. It narrowly passed. The project has been a huge success, and has set the path for the further and larger development of Rieselfeld, as well as establishing strict standards for new builds within the municipality. Yet, as Friebis reflected, 'without the student initiative it would never have happened.'

An observer might add, without the Council's openness to citizen-led initiatives it would also not have happened.

Consultation was also a feature of the beginning of pedestrian zones in the city centre. Veith (2008) recalled the proposal for the first ever such zone. When the idea was first mooted the shopkeepers were resistant, believing they would lose customers if cars were banned from their streets. So initially, the Council persuaded them to tolerate a

trial period, where only temporary barriers were used to block vehicle access. The shopkeepers were surprised to find that their custom increased, and after further public consultations the barriers were made permanent. The steady increase in pedestrian zone development has proceeded with very full consultation with those most affected. Veith commented, 'Freiburg has a style of discussion, that goes: "Let's try it out, without any pressure."'"

Freiburg's extensive consultation culture has now formalised into two main groupings. One is the *Burgervereine* (citizens' organisations). Each district of the city and suburbs has developed its own grass-roots club, or organisation, which explores and represents the interests of its members. These groups are a spontaneous phenomenon peculiar to Freiburg, they are not part of the official governing structure of a German municipality. The Council now consults the groups regularly to seek feedback on Council proposals and to listen for new ideas. The people 'can articulate their view,' said Veith, 'they don't have to just sit down and listen. The discussion is active.' There is, said Veith, 'A great deal of dialogue between the citizens and the City, whether or not the citizens are directly affected by a proposal.'

The second grouping is the 'Round Tables.' These are semi-formal groupings of leading figures in the main interest groups in the city: transport, energy, building, and commerce. As Dresel (2008) explained, they meet regularly with Council representatives:

They don't just talk, but think through the issues. What use is it, if we in the city administration wield the power, but don't have the concrete answers? Their ideas are then made into reports, and gathered together, and brought before the Council for approval.

In Dresel's view:

The city of Freiburg has only so much influence. So its task is to win over the business community, so that they come on board. It's not just enforcement, but that we make sure, from the beginning, that all the actors are right there with us, with their input.

Freiburg's attempts to involve other actors in its climate protection endeavours are not unique. As Rabe (2004) shows, this can even be used as a tactic by administrators to push reluctant state governments into action. But Freiburg seems to have developed it to an extraordinary degree. It fits well with the green philosophy of participatory democracy (Gänzle 2004), so in a city with so many green thinking citizens it is not surprising to find it so well developed. It represents an interesting extension of the 'enabling' mode of governance, as it does not just enable the citizens to take the kind of ecological steps the Council would like them to. It also enables the city as a whole to discover and create new initiatives as one integrated community together. In the case of Vauban, it led to the creation of a suburban development style that is being held up as an example to the world. In pedestrian zoning it has led to a smooth and non-controversial expansion over decades. Clearly it has also contributed to the sense of shared responsibility, and therefore widespread support, for Freiburg's very radical and determined climate protection strategy.

Its one apparent weakness is the possible erosion of Council's governing authority brought about by having to heed too closely the desires and interests of business groups. At least one interviewee felt the Roundtables had more power than the City Council (Heile 2008). This issue will arise and be more fully explored in our next chapter.

Chapter 7. Solar Façades

Photovoltaics (PV) are by far the most visual aspect of Freiburg's climate protection program. The entire south corner of the main railway station's multi-storey administration building is a continuous array of PV panels. Across the street, the 'zero-emissions' (Freiburg 2005a) Hotel Victoria displays a massive PV tower. A nine-story apartment block in Wilmersdorfer Strasse has PV panels covering the breadth and height of its south wall. The roofs of Churches, schools, supermarkets, factories and the football stadium are covered with PV units. Special buses offer tours of the futuristic creations of renowned architect Rolf Disch, including the 'Heliotrop', a building that rotates throughout the day to keep its solar panels facing the sun. 'Solar Fabrik,' the local PV factory, is itself decked out with thousands of PV panels. PV panels are ubiquitous throughout the city.

Further, the city council promotes PV as a central feature of its character, in much the same way that Florence promotes its ancient works of art. Visitors to the Tourist Information Centre are offered free, high quality tour guide literature on the Freiburg solar phenomenon, ranging in size from 12 to 54 pages (Freiburg 2005a, Freiburg 2005b, Freiburg 2004a). There is also a DVD, *Solar City Freiburg*, available for 15 euros (Freiburg 2006b).

PV and governing modes

At least three of the four governing modes are represented in Freiburg's involvement with PV. In *self-governing*, the municipality has covered the roofs of schools and other Council buildings with PV panels. In *governing by provision* it works through its part-owned energy supplier, badenova, to ensure a growing portion of PV-generated electricity is available to the city, and to support private PV generation with extra subsidies.

But it is in *governing by enabling* that the bulk of its PV infrastructure is supported and promoted. To begin with, the municipality actively promotes PV as a viable solution to our CO₂ dependence. One of its key promotional publications on climate protection policy is the booklet *Freiburg Green City: Weg zur Nachhaltigkeit* (the road to sustainability) (Freiburg 2008a). Solar power is 'the new leading energy' (p3).

PV installations ‘on the badenova depot, the city hall, the roofs of schools, churches and private homes, on building facades and towers’ point to Freiburg’s ‘success in economy and ecology’ (p.5). The title ‘SolarRegion Freiburg’ denotes a city where research and production of solar technology are reinforced through a confluence of cutting edge institutions (p.6). Claims such as these lead up to a detailed account of Freiburg’s climate protection policy (p.7), setting out the city’s CO₂ reduction goal of 40% by the year 2030. The association of PV with the municipality’s CO₂ reduction aims is very strong.

Freiburg also hosts a significant number of PV institutions. The Fraunhofer Institute is developing cutting edge PV technology, including the FLATCON-Concentrix (Peharz and Dimroth 2005). The Solar Info Centre is a permanent exhibition and hosting centre for 44 firms and agencies that deal in solar and renewable energy (Solar Info Centre 2008). The International Solar Energy Society (ISES) has its headquarters in Vauban. The *Solar Fabrik* manufactures PV systems for export. (The buildings housing these institutions are festooned with PV panels). While none of these bodies are institutionally related to the City Council, the municipality promotes and celebrates their GHG-emission-reducing character in PR brochures, tourist guides, and audio-visual resources.

Costs and benefits

What does Freiburg gain from this? PV produces very little power and is extremely expensive. The most economical modern units cost 5 euros per Wp⁸, and produce around 0.9kWh per year, in German sunshine, for each Wp installed. Hence a PV unit that lasts 20 years will produce 18 kWh for each Wp installed, at the cost of 28 eurocents per kWh. Electricity sells on the German spot-market for less than 7 eurocents per kWh. So the very best PV panels are still four times as expensive as conventional power, and far more expensive than the newest wind turbines, at around 8 eurocents per kWh.

The cutting edge of Freiburg’s PV technology is the FLATCON-Concentrix, in which lenses amplify sunlight up to 450 times onto germanium-based crystals. The

⁸ Wp (watts peak) is the maximum power a unit can produce under ideal conditions.

manufacturers claim the cost per Wp is 2.38 euros and should fall to 1.5 euros by 2010 in the optimum conditions of southern Spain (Lerchenmüller et al. 2005). This is still twice the current price of wind power, which should also gain in efficiency.

Since PV is so uneconomic, the Federal *Erneuerbare Energien Gesetz* (EEG - Renewable Energy Law) provide it with a generous subsidy of around 50 eurocents per kWh (EEG 2004). Spain now has a similar law, and is the main market of Freiburg's PV manufacturers.

The German subsidies are paid to individual PV owners but are added to the power bills of all users, evenly distributed throughout the country. So all Germans pay more for their power for each PV unit connected to the grid.

Frondel *et al.* (2008) argue that German PV electricity brings no net reduction in CO₂ emissions, as the grid owners who are forced to buy it trade it away under the Emissions Trading Scheme. Every kilogram of CO₂ saved by a PV unit leads to one less kg of CO₂ being saved by a big energy producer.

The EEG has recently come under scrutiny for the enormity of the subsidies for PV. This payment, or 'Feed-in tariff' (FIT), was set at 57.4 eurocents per kWh in 2004, to be paid at that guaranteed rate for 20 years to those who installed a grid-connected PV system in that year. The rate for systems installed in 2005 was to be 5% less, and another 5% less for new systems installed in each subsequent year. The reductions were intended to spur the PV industry to make gains in efficiency and economy, so that by 2030 PV could pay its own way.

But PV has not come down in price in the last two years, while the uptake of this generously subsidised technology has been far higher than expected. With a guaranteed annual return of around 6-7%, subsidised PV has proved a safe and lucrative investment, leading to a 55% increase in installed capacity per year for the last 5 years. In 2006 the FIT for PV throughout Germany reached 1.18 billion euros (VDN 2007), and will reach almost 3 billion euros in 2008⁹.

⁹ Author's calculation based on known and expected increases in installed PV.

Frondel *et al.* (2008) developed a model based on modestly increasing sales of PV units in Germany and a steadily increasing spot-price of wholesale power. They calculated that the total subsidy for PV would amount to over 30 billion euros *if the FIT were to be phased out from 2010*. If not, estimates made by the Rhein-Westfalen Economic Institute run to at least 120 billion euros in real terms (cited in Waldermann 2008).

Freiburg boasts around 3 times the German average of installed PV capacity per capita (Zähringer 2008). So much PV is installed, that the physical roof space on municipal buildings, supermarkets and other flat roofed surfaces is now almost exhausted. The cost of installing these units has amounted to around 50 million euros¹⁰. Yet just 0.85% of Freiburg's electricity is produced by PV (Dresel 2008, Zähringer 2008). The four modest sized, outmoded wind turbines on the hills northeast of Freiburg produce 30% *more* energy each year than all the city's PV (Friebis 2008).

Further, due to the saturation of roof space, future predictions of PV increase in Freiburg are modest. The Öko-Institut's scenarios see at best a rise from 8 to 18 GWh by 2030 (Timpe and Seebach 2007), which would bring PV's share of Freiburg's electricity generation to just under 2%. And, since electricity makes up just 20% of Freiburg's energy requirements, the most optimistic prospect is that PV could produce 0.4% of Freiburg's energy by 2030 and reduce its CO2 emissions by about 1%¹¹.

Freiburg's defence of PV

1% is better than nothing, but it comes at an enormous cost. Why is the city so enamoured of it? Dresel commented:

PV makes much better publicity than home insulation. PV is cool and sexy. And our success with PV has contributed more to home insulation than the reverse.
(Dresel 2008b)

¹⁰ Author's calculation based on an installed capacity of 8MWp at an average price of 6,000 euros per kWp.

¹¹ Author's calculation based on 2030 projections of Freiburg energy use in Timpe and Seebach (2007).

Dresel also maintained that solar power is the only long-term solution to our energy needs, while ‘wind, biomass and hydro are only temporary fixes’. Further, he claimed, it is only by mass production that ways will be found to produce PV at an economical cost. This view was shared by others in Freiburg’s solar industrial complex (e.g. Peharz 2008, Heile 2008), though none was able to point to a sound empirical basis for it. It is also expressed in the city’s printed literature, such as ‘Solar Guide Region Freiburg’ (Freiburg 2004a, p.20). The belief that PV will become 4 to 5 times as economical as it is today through continual mass production is widespread in Germany and is frequently adduced in defence of the EEG.

The theme of PV as ‘sexy’ was also expressed by Green Party city councillor Eckart Friebis (2008), who readily admitted PV contributes very little to CO₂ abatement.

Dresel and Friebis noted, however, that the city puts no money and very little time or energy into promoting PV. The only subsidy for PV given by or in the name of the city, noted Dresel, is the 900 euro grant from its energy supply company, badenova.

The general view was summed up by Rolf Zähringer (2008), of the Environmental Protection Office: “Photovoltaic is not very efficient, but it’s a symbol.”

Cheaper energy savings

One needs to ask what exactly it symbolises. For those unaware of the enormous cost it is laying on the German public, and the tiny or null reduction in CO₂ emissions it is bringing, PV can symbolise ‘ecological modernisation’ (Langhelle 2000) - a green high-tech future, free of GHG emissions and nuclear power. For those who know the costs and output levels, and the painfully slow progress towards cheaper modules, it can symbolise a wrong turn.

All those interviewed accepted that far more CO₂ reduction was to be gained through insulating buildings than through PV, and at a far cheaper cost to the country. By trumpeting PV rather than this issue, which it knows to be most crucial to CO₂ abatement, Freiburg could be missing an important opportunity. If Freiburg wishes to

remain a trend-setter in climate protection, it is in building insulation, not PV, that it has a golden opportunity to move forward.

One is driven to the conclusion that what Freiburg really gains from PV is money. The FIT for its 8 GWh per year of PV power brings 4 million euros of subsidies into the city annually. The Fraunhofer Institut, the Solar Fabrik, the newly formed Concentrix PV firm, ISES, the Solar Info Centre, the creations of architects such as Rolf Disch and others, and the solar tourist circuit, bring hard cash into the city.

Jörges (2008) speculates that there is an 'eco-industrial complex' throughout Germany, in which a confluence of green ideological, political and financial interests support and reinforce one another in what has grown to be a 'colossal power' (*gewaltige Macht*), in which 'there is no shortage of money for a good cause.' It is clear that Freiburg's interdependent and mutually reinforcing solar institutions and professionals benefit financially from the city's unwavering support for PV. The city's leaders need to raise some critical questions as to whether this support is in the best interest of Council's agreed aims. The weakness of governing by enabling is that the influence of non-elected bodies can swamp that of the elected Council.

Discussion, Conclusions and Avenues for Further Study

Freiburg's climate protection policy enjoys overwhelming support among party politicians, local business interests and the public, and is enhanced by the wealth of technical expertise and experience among City Council staff and throughout the city. Hence it is not surprising that each of the governing modes is well exploited in reducing GHG emissions.

In **governing by authority** the municipality makes vigorous use of national and state regulatory frameworks to enforce building standards and route traffic flows. Nevertheless it lacks the constitutional power to permit wind turbines on its high ground, and has to bow to higher authorities in this.

Freiburg's advanced and continuously expanding public transport system is an impressive instance of **governing by provision**. This is fully integrated with its vigorous provision of ever-expanding cycleways and pedestrian zones. While its provision of energy supplies has been severely hampered through deregulation, Freiburg still exercises influence in this field by way of its partly-owned energy company, badenova. Meanwhile, the municipality provides a waste disposal system that turns 93,000 tonnes of rubbish into 10GWh of clean energy annually.

In **self-governing**, Freiburg has a comprehensive and finely worked out program to establish permanent energy-saving regimes in its own estate. This includes engineering works, effective monitoring, and in-house training. It has learned how to thermally upgrade a school for no cost, while drawing a handsome profit, and it has an ongoing program to thermally renovate its social housing.

In **governing by enabling** the municipality furthers its GHG reduction aims through its strong links with the public, grass-roots groups, business, commerce and academia.

These achievements are not especially surprising in a German municipality with such ideal political and technical advantages. But there are special lessons we can learn from the case of Freiburg, in both positive and cautionary areas.

Positive lessons

By exploiting aspects of planning and contract law, Freiburg has got beyond the limitations of Federal building standards. This simple legal manoeuvre has enhanced the municipality's governing authority, enabling it to bring home-building to where the rest of Europe hopes to be in 10 years time. New homes built merely to Federal standards are now the exception in Freiburg.

The thermal upgrading of Staudinger School is an impressive act of self-governing, in which smart outsourcing with no capital outlay led to a free building upgrade, bringing substantial annual savings in energy, CO₂ and money. This style of working could be an important model for councils more widely. The need for thermal upgrading of existing buildings is now a pressing topic worldwide. A recent IEA report (IEA 2007) argues that such upgrades make very good economic sense, but are beset by a cluster of market failures. Hence there is little progress in this vast potential for GHG savings. Freiburg has given us an example of at least one method of overcoming this market failure. We would recommend it for closer study (see, e.g. Eco-Watt 2008, Eco-Watt 2008a, IEA 2007 pp38ff).

A further lesson can be learned from Freiburg's extensive and sophisticated consultation procedures. The City Council's openness to Freiburgers' views and ideas led to the inception of the low-energy suburb Vauban, which has led to the even larger development of Rieselfeld and a new city-wide standard in home building. Active consultation has also enabled the expansion of pedestrian zones to proceed smoothly.

To a greater or lesser extent these three examples could have wide applications beyond Germany and for many sub-national authorities that do not have Freiburg's depth of political and civic support for GHG reduction.

Cautions

A special feature of Freiburg's political, social and economic landscape is its highly developed 'eco-industrial complex.' This meshes well with Freiburg's image and aspirations in environmental and climate protection, but it also brings problems.

1. Who's rules rule?

The de facto power of the eco-industrial complex can compromise the influence of the City Council – the legitimately elected decision-making body. We have to ask why a Council that is so deeply committed to GHG reduction promotes so much discourse in favour of PV, which saves next to no GHG emissions and drains large resources from fellow Germans, while the Council is relatively so much quieter about thermal renovation of old houses and apartments – a huge source of economical GHG savings. And why does the city's energy provider continue to subsidise PV, when it is fully aware of the minimal or zero contribution this technology makes to climate protection? Friebis' and Dresel's explanation is that PV is 'sexy', i.e. it draws peoples' attention vividly to the GHG problem and offers hope of a solution. But it also seems that commercial interests gain handsomely from this supportive discourse – interests that have more to do with commercial gain than with effective, well-costed GHG reduction. A general lesson, for other councils, might be: how can the elected body retain its influence in the face of huge (and often seductive) pressure from commercial interests? We would recommend further study of the influence of Freiburg' eco-industrial complex on the Council and its administration.

2. Reliance on PV

The PV industry exists on subsidies. These are coming under increasing scrutiny, as the rationale behind them is shown to be flawed (e.g. Frondel *et al.* 2008, Economist 2008). During the writing of this study the EEG was amended, reducing PV subsidies by larger annual percentages as from 2009. It is not beyond the realms of possibility that the financial support for PV could be reduced even more, or removed altogether, in both Germany and Spain. This would impact negatively on Freiburg's economy. Further, the discourse around PV could quite easily turn sour, if climate activists realise how wasteful it is compared to other renewable energy sources. This could also impact negatively on Freiburg, as its thousands of PV panels would be seen, quite justly, as a poor investment in a sub-standard technology. This could discredit the most visible aspect of the public face of Freiburg's climate protection programme.

Hence another area recommended for further study is: what would be the consequences for Freiburg's economy if PV subsidies in Germany and Spain were to be withdrawn?

3. Renovating old homes

It is widely agreed in Freiburg that the greatest volume of potential GHG savings, at the cheapest cost per tonne, is thermal renovation of old homes. The city is indeed concerned about this, and provides economic incentives, in addition to those offered by state and Federal governments. But two things need further clarification. One is whether the city's choice of the strictest insulation standard, of 15kWh/m² per year, gives the best value for money. Renovating a multi-story block of council housing to this standard will provide a 'demonstration object,' but could more homes have been renovated, more CO₂ saved, and more people made comfortable, with a lower, cheaper standard? This represents a further area for study: is the choice of passive-house standard an appropriate one for municipalities' social housing upgrades, or would a lower standard save more CO₂ at less cost?

A related issue is, what would be needed to kick-start, or build up to, an accelerated, comprehensive programme to thermally renovate Freiburg's tens of thousands of substandard private homes? Politicians from both sides of the spectrum want to see this work move forward, but both expressed frustration. The municipality has successfully renovated a school, at no cost to itself, so there is at least an example of what can be done with buildings. A generic working package could be useful to municipalities everywhere.

If Freiburg wishes to retain its place as a leading exemplar of climate protection achievement, the currently 'uninteresting,' 'unsexy' field of thermally renovating old homes could be an important way forward. This would also benefit low income people, who have not been among the major beneficiaries of Freiburg's climate protection programme.

Abbreviations

CDU *Christlich-Demokratische Partei Deutschlands* – German Christian Democrat Party

CHP combined heat and power

CO₂ carbon dioxide

EEG *Erneuerbare Energien Gesetz* – Renewable Energy Law

EP Energy Policy (of the European Commission)

EU European Union

FDP *Freiheitliche Partei Deutschlands* – German Free Liberal Party

FIT feed-in tariff

GHG(s) greenhouse gas(es)

GWh Gigawatt hours – a measure of energy (1 billion watts of power for one hour)

ICLEI International Council for Environmental Initiatives

IEA International Energy Agency

ISES International Solar Energy Society

kWh kilowatt-hours – a measure of energy (1000 watts of power for one hour)

kWp kilowatt peak- a measure of power

kWhr/m² kilowatt hours per square metre

KSP *Klimaschutzpolitik* – climate protection policy

MWh Megawatt hours – a measure of energy (1 million watts of power for one hour)

NGO non-governmental organisation

NPM New Public Management

NSM *Neue Steuerungsmodell* – New Steering Model

PV photovoltaic, photovoltaics

SPD *SozialDemokratische Partei Deutschlands* – German Social Democrat Party

SUSI *Selbstorganisierte Unabhängige Siedlungs Initiative* (Self-organised independent residential development initiative).

USP *Umweltschutzpolitik* – environmental protection policy

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