ADAPTATION and MITIGATION – an INTEGRATED CLIMATE POLICY APPROACH

Mitigation Scan Dresden
Report 2006

regarding the 1st climate scan workshop in Dresden on 21/22 June

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Content of the chapters and responsibilities
Leader of the Dresden Climate Scan Team: Norbert Rainer, Upper Austria

1. Status quo of local CO_2-reduction - quantitative indicators (Fritz Pielenz, City of Dresden)
2. Description of activities in Dresden (Fritz Pielenz, City of Dresden)
3. Mitigation Scan (Charlène Anguis/Pierre Crepeaux, Grand Lyon)
4. Identification of 3 additional measures (Ulrike Janssen/Antonella Daniele/ Dr. Andreas Kress, Climate Alliance - European Secretariat)
5. Attachments

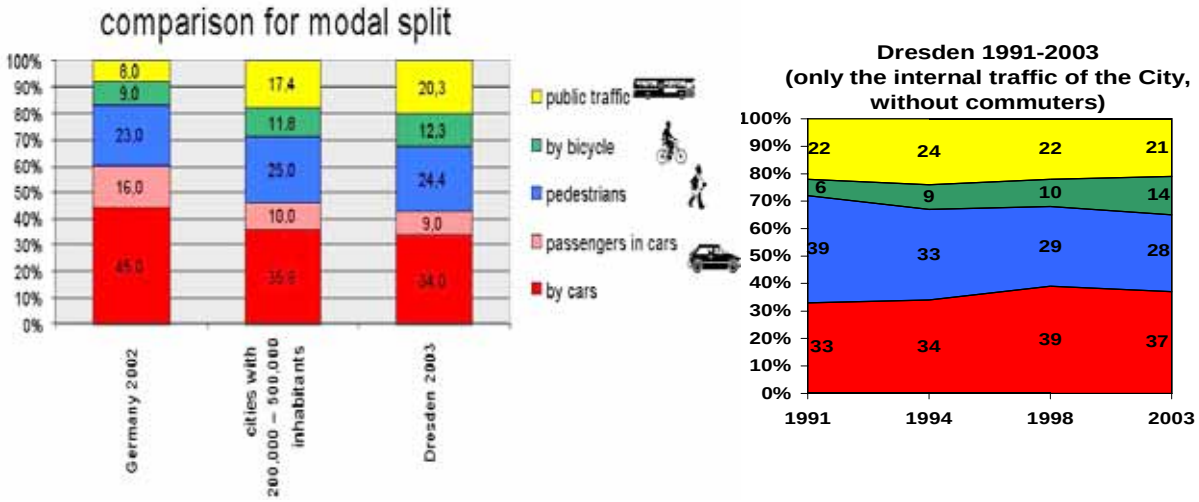
1. Status quo of local CO_2-reduction

It is a common practice to use indicators for energy consumption to describe the current state of the local results in mitigation activities. The following set of quantitative indicators was suggested:

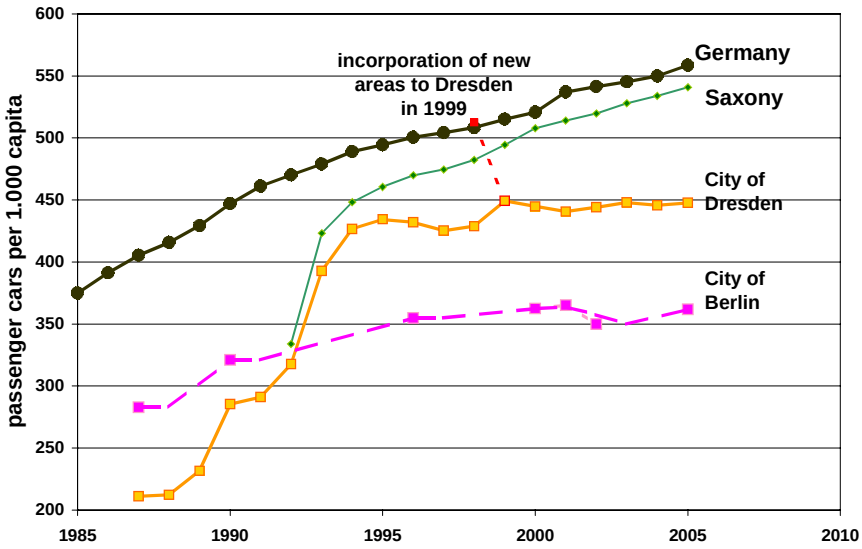
No.	**Field**	**Value in 2005**	**Measuring unit**
1	CO_2-equiv. or CO_2/capita	**4,9** **10,1** (includes nearly 2 t CO_2-equiv./capita of national, international and transcontinental aviation!)	Mio t CO_2-equiv/capita (for the additional warming potential of CO_2 by aviation a factor of 4 is used to get the amount of t CO_2-equiv..
2 a	share of different local renewables: PV *(average in Germany)*	0,028% *(0,16%)*	Percentage of electricity consumption in the city *(of power generation in Germany)*
b	hydroelectric power	0,029%	
c	landfill gas	0,45%	
d	biogas	0,17%	
e	biomass *(average in Germany)*	2,12% *(0,86%)*	*(of power generation in Germany)*
f	windmills	0,00%	
3	area solar collector	0,013	$m^2_{(PV)}$/capita (area of working thermal collectors is not available)
	PV/ capita	1,72	W_{peak}/capita
4	share of energy sources for heating of dwellings		% of households
a	**district heating**	**48 %**	*(average in West Germany lower than 10 %)*
b	gas	41 %	
c	oil	6 %	
d	electricity	2,4 %	

e	coal-burning stoves	1,9 %	
5	**electricity consumption** in *households/capita*	**1090** *(1500 … 1600)*	**kWh**/capita p. a. *(average in Germany)*
6	energy consumption in the transport sector/ capita		
7	energy consumption in households/ capita		
8	modal split - passengers	in 2003	
a	by cars	43,0 %	% of ways
b	public transport	20,3 %	at a working day
c	by bicycle	12,3 %	
d	pedestrians	24,4 %	
9	modal split - freight		
10	passenger cars/ capita	450	cars/1000 capita

However, not the whole data set is available for the City of Dresden. For an estimation of such indicator values it is necessary to get a national standard (see 2a, 2e, 4a or 5 in the table) or comparative values from other cities. For the modal split it is shown in the left figure. In other cases it would be better to look at the development in series of time.

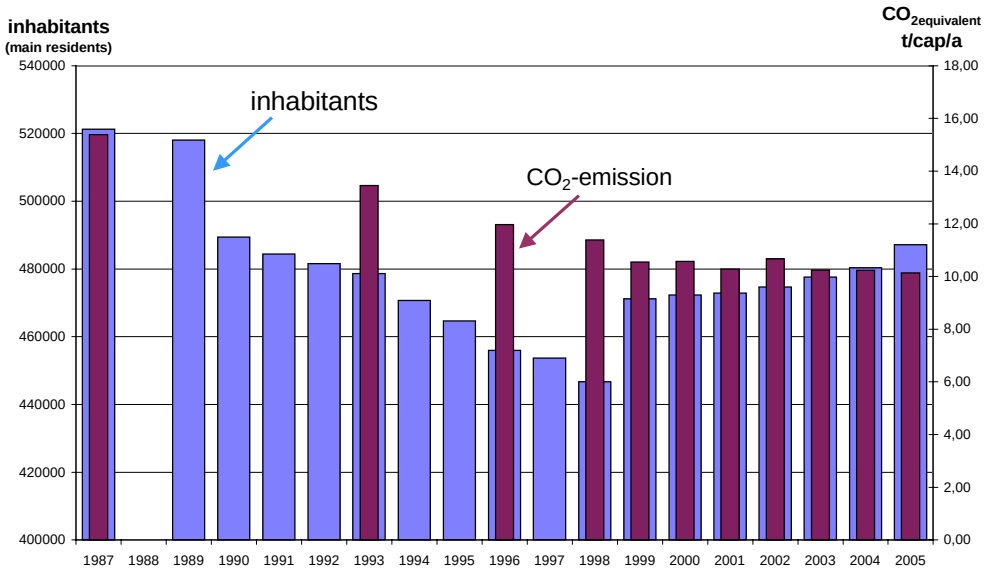


In the City of Dresden the increase of passenger cars per capita could have been stopped. This is shown in the following graph in comparison to the development in full of Germany and in Saxony. Therefore a combination of time series and the development of comparable values in other cities and regions should deliver the best picture of the current state in local climate policy. This, however, can not be done for all indicator values.



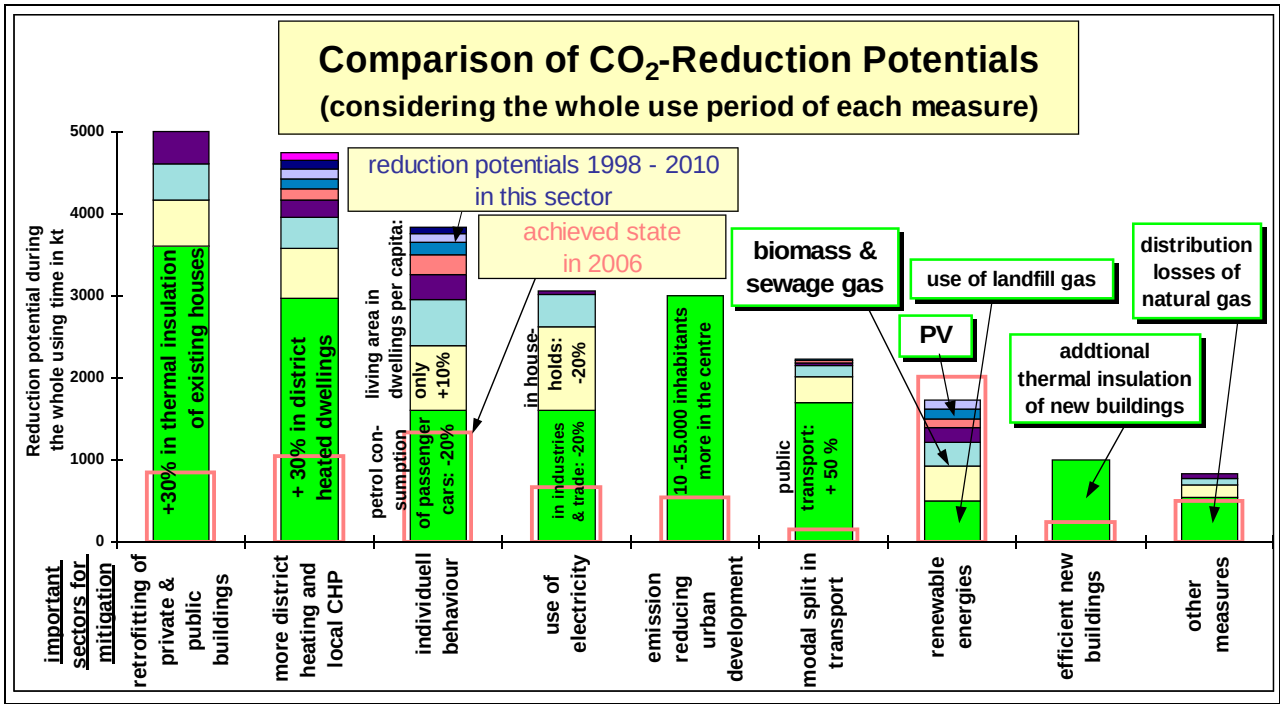
Since 2000 the use of cars and the consumption of motor fuels in Dresden have decreased. This advantage for the emission balance in traffic, however, has been overcompensated by the rapid increase in the emission of aviation, where the global warming potential of emitted CO_2 is more than 3 times higher.

The best indicator for local climate protection activities seems to be the value of CO_2-emission of the city. Basic value is the whole energy consumption per capita in several kind of fuels. The total volume of CO_2-emission has been on a constant level since 2001. Because the number of inhabitants is currently increasing, the emission of CO_2 equivalent decreases continuously. The exception was in 2002 when the big flooding interrupted the high efficient electricity supply from the combined heat&power-plant.



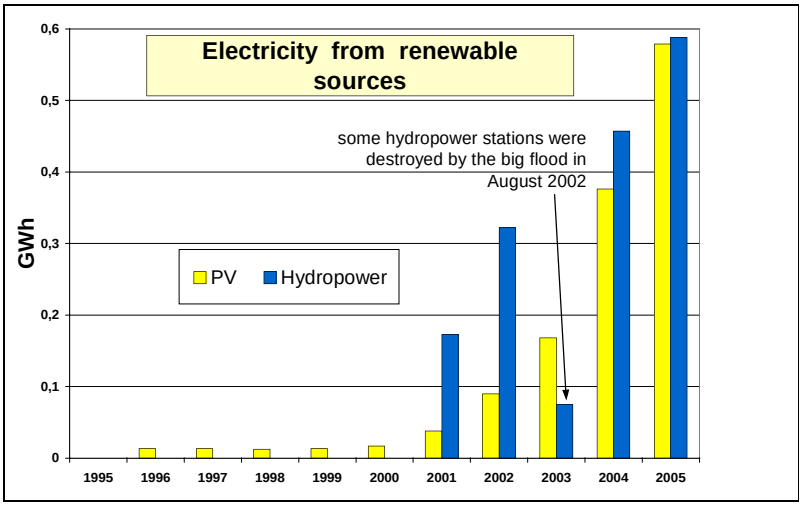
The specific emission per capita has been reduced by about 35 % between 1987 and 2005.
The comparison of development in CO_2-emission balance should be complemented by an analysis of local potentials in CO_2-reduction measures. This potential analysis could become the most suitable basis for the CO_2-reduction program and an adequate report.

The bars show the total potentials of reduction in the most important sectors. Only the first one or two measures with the largest mitigation power in each sector are named. The volume of results should be sufficient to fulfil the “minus 50 percent CO_2-target” of the Climate Alliance by 2010. The graphs, however, show for a better comparison the total reduction volume over the full duration of time of the decisions that have been taken in each sector. By this way you are able to see the high importance of measures in infrastructure and urban development for a sustainable climate protection. We can find here the effecting periods of longer than 50 years!



Most potentials have been underachieved since 1998. Only about 30 % of the decided activities in the CO_2 frame program have been implemented so far. If you look only at the indicators (compare with the table at the beginning of this chapter) for a benchmarking you have to estimate that you will find the same potentials in all cities. Only with these assumptions it is justified to compare such indicators of different cities with each other.

2. Description of some activities in Dresden

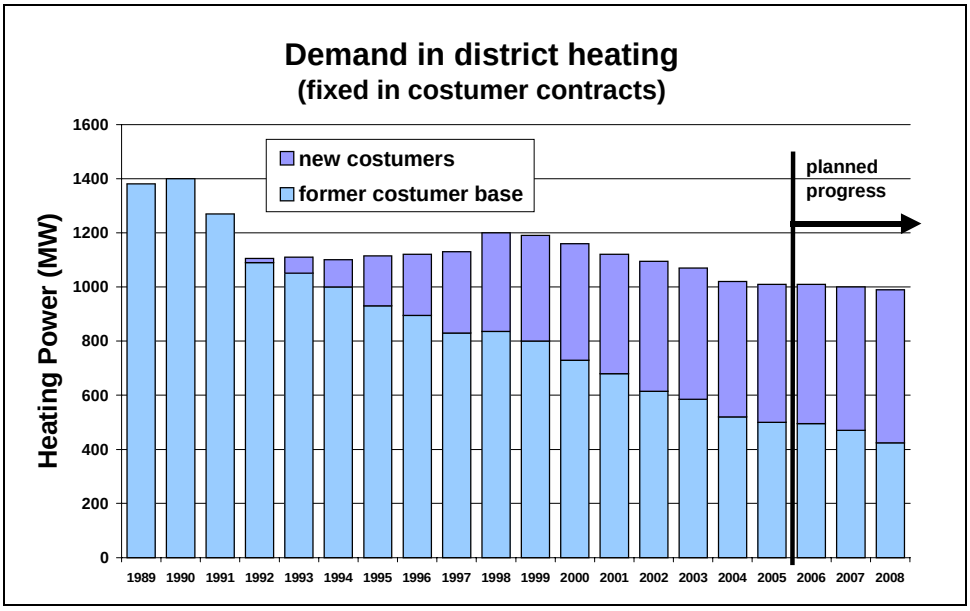


The local CO_2-reduction frame-programme was decided in 1998. It contains more than 30 activities. Single model measures are supported by a loan program so called "Innovation-Fund" with a budget of about 1 Mio. € p. a. The last implementation report for the frame-program was given in 2003 (see http://www.dresden.de/umwelt, pdf-file, 652 kB). The next update of this program should be done in 2007. Then the new CO_2-reduction targets for the period after 2010 which have been decided by the members of the Climate Alliance should be considered.

The only overachieved sector from above is the use of Renewable Energy Sources ("RES"). In Dresden the most important measures for CO_2-reduction by RES is the use of biomass and landfill gas. The most rapid increase we can find now in the installation of photovoltaic areas. A standard contract was developed for the roofs of the municipality. In this manner everybody and not only the owners of a house is able to use public roofs for his photovoltaic investments.
Further more, the highest output in the use of thermal solar energy is delivered by the windows of dwellings. This energy amount can reach more than 100 GWh during one heating period. This contribution of RES is generally not detected by RES-statistics because it is not measured and we do not have to pay for it.

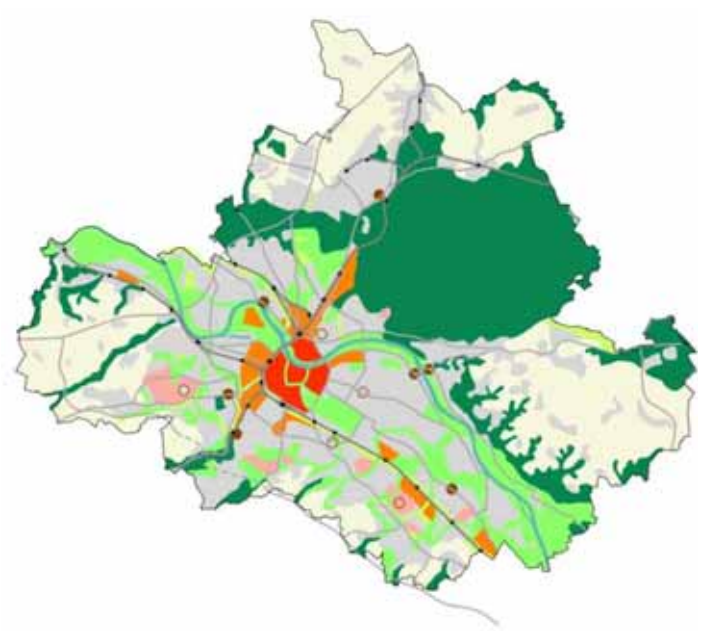
The retrofitting of buildings, however, is much more important for the attained CO_2-reduction (see figure "Comparison of CO_2-Reduction Potentials"). On one hand, more than 70% of all residential houses were reconstructed and about 90% of all windows were substituted by such of higher thermal insulation in the 1990s. Unfortunately, not all modernized buildings met a good level of heating energy demand. Therefore, a support programme was established from 1998 to 2003, in which more than 30 special skilled architects were integrated.
On the other hand the mean living area per capita has now increased from about 24 m^2 to more than 37 m^2. Thus, most of the decreasing energy consumption by buildings was compensated by increasing dwelling and shopping areas and the doubled stock of offices. As a result, the build-up of new houses with an extraordinary high energy standard will not reach the reduction potential by decreasing the energy consumption of existing buildings during the next 10 or 20 years. The first "passive-house-buildings" were erected between 2001 and 2004. Even a kindergarten was constructed with a demand level of a passive-house (heating energy < 15 kWh/m^2 p.a.).

Nevertheless, nearly 1/3 of all CO_2-reduction (-35 % between 1987 and 2005) could be reached through the heating sector. At first, more than 45 % of all dwellings are connected to the district heating system now. The thermal energy is very efficiently supplied by combined gas and steam turbines. More than 70 % of the needed electricity in the city is delivered by co-generation of heat and power ("CHP"). Some large new areas have been connected to the heating system in the 1990s. The length of the pipeline network has increased from 340 km in 1992 to 475 km in 2004. The acquisition of new customers in district heating, however, could not compensate the decreasing demand of heat, for example, in the industrial sector and for residential buildings.



Beside the reduced demand in heating power a main problem for the efficiency of traditional district heating systems is the very low demand in summertime. In Dresden, for more than 12 years this system has been used for new air conditioning equipment (see AMICA-Best-Practice: "Air-Conditioning Service by Using Thermal Energy from CHP"). Here we find an excellent connection between adaptation and mitigation measures.

Regardless of the success in some of these fields mentioned above, the key measures to reach a sustainability in climate protection (target of 2,5 t in $CO_{2\text{equivalent}}$ per capita and p. a.) can be found in the land use planning of the cities. We have to consider that in the current direction of urban development the level of energy demand of the inhabitants in these areas will be fixed for about one century. This leads to a higher traffic and also to a higher level of needed heating energy in one-family houses predominantly outside the former city (see chapter 3).



Therefore, the new Integrated Concept of Urban Development shows the favoured areas for new buildings (coloured red and orange in the figure) in the centre of Dresden and along the main routes of public traffic (esp. by brownfields restoration).

An useful overview of well implemented and missing mitigation measures can be found in the spread sheets of the climate compass in the annex of the next chapter.

3. Mitigation Scan

Introduction

The organisation of the first day in Dresden enables the group to understand the urban and environmental issues of the city of Dresden. After a theoretical presentation of the city of Dresden, we saw examples of the city's best practices as empirical answers of theses issues (air conditioning by use of thermal energy, the energy concept for the sewage plan, the environmental association's house, etc.).
After that, the team was able to analyse the global climate policy of Dresden, with the climate compass matrix, during the second day. In this chapter the discussion about its style and substance will be analysed, first of all, the framework of the matrix, and secondly, the climate scan of Dresden.

General Analysis of the framework of the matrix

The group agreed on the necessity to relate the experiences of the city, in order to illustrate the matrix. The question was about the form: should a new column be added to relate the measures of the city, or should they indicate the relevant experiences in each box. The group chose to have a precise summary of these measures in each box.
It was also discussed to add report of «worst experiences» as well as «best practices» in the matrix. All of theses measures have to be considered at the same level in order to estimate the policy in its integrity, and see where the city has to improve itself.
Dresden has to complete its matrix with these bit-detailed examples of its adapting and mitigating measures. It will send this recomposed matrix to the other European partners.
Another point discussed during the meeting (about the framework of the matrix) was the comparison of the partners advancement. To conclude, it has been showed that it is not relevant to compare cities, because their adaptation and mitigation policies are traditionally too different. For instance, the step 3 in France ("forging ahead") may correspond to a step 1 ("getting started") in Germany. Therefore, the most important is:

- to help other cities by giving them advices about adding good practices to be carried out
- to analyse for each city the strides made from a designated national (or regional) «standard point» throughout the AMICA Project.

Climate scan of the city of Dresden

The city of Dresden presented its work about the thematic of «urban development» and «energy». The group discussed about the application of the measures proposed by the Climate Compass Matrix.

a) Urban development

First of all, it is important to note that Dresden proposed a «under evaluation» of its actions in the matrix. We can probably explain this «under evaluation» through its difficulties to evaluate the nuances between the measures proposed by the Climate Compass Matrix.

Secondly, the peer review dredged up the major malfunctioning of the city of Dresden, namely the lack of involvement of citizen in urban planning policies which involves different kinds of issues:

- An urban density issue and a rise of individual cars traffic
  Although it saw a rise of population since two years, the city of Dresden has not yet managed to attract inhabitants enough in the town centre. In fact, lots of new and old buildings are empty. People prefer to settle in the suburbs. Dresden studies expose that living in outskirts represents a traffic rise of 80 % (traffic to go to the activities in the city and shopping areas) and a heating rise of 60 % (individual habitats are larger energy consumers than collective habitats and need larger supplies). Therefore, this involves a large problem with the growth of CO_2 traffic emissions.

- Involvement in urban major projects
  The city has different kind of legal forms to involve the consultation of people, but as often seen in such big city the people are hardly interested in it. In the case of the topic of climate change such as the new bridge over the river Elbe the people often decide on voting against climate policy because of a lack of awareness.

So, the matrix does prove that Dresdens urban development policy in terms of reduction of emissions is technically excellent, but it is very important to note that it will be difficult to continue urban development without the will of the inhabitants.

b) Energy

The original way to fill the matrix of energy (more detailed explanations) is interesting and could generally be adopted for the AMICA project. They define a scaling inside each box of the matrix with the next levels :

- partly implemented
- temporarily set into action
- link to adaptation measures for climate change could be found

Dresden also thought about three “additional measures” connected to CHP, cooling and within the companies. Development of efficient cooling systems in the field of nonelectric air conditioning is an excellent link between mitigation and adaptation.
Secondly, the “B row” (institutionalize your energy policy) is a very hard question to analyse and to answer, because some staffs need to add the energy responsibility in their working load.

Another point raised was the thematic of consultation and information of citizens which does not seem very highly supported by Dresden. We could explain that because

- the city is late with the recognition of this problematic (of consultation and information)

or maybe
- there are other kinds of structures not included in the matrix (associations by instance) which have this role of information and consultation. Therefore, we can not evaluate their progress in term of measures to consult and inform population with this matrix.

With the help of the LA21-process (see: http://www.dresdner-agenda21.de, only in German) which is not implemented in the administration structure the information and consulting processes are supported, for example the round table for energy topics since 1999, many discussion events for possible strategies in traffic and the so called “future workshops” for Dresden.

Conclusion

The filling of the matrix has pointed out very good and very interesting technical measures adopted by Dresden. The presentation of those measures was excellent too with pedagogical and technical value. It was shown that some activities about climate change worked better in the past, so it might appear adequate to reactivate this knowledge and practice. Also, some steps of the climate compass matrix have not been carried out whereas others of a higher level have been fulfilled.
The most difficult subject to improve that we noticed corresponds to the consultation and information of the population. Therefore, the city should make efforts to involve population in policy making. They have to bring to their awareness the impacts of their modern lifestyle (individual housing), which increases traffic and heating CO_2-emissions.

A good measure to improve this point should be to create an “official ideas conveyor belt” between city policies and the life of citizen.

The complete matrix for the city of Dresden is herewith attached.

4. Identification of 3 additional measures

Recommendations

1. Energy saving in buildings

1.1 Implement the municipal energy efficiency standard for buildings (the insulation standard is 25% higher than the national level).

Consult legislation for new buildings to develop the standards (see Climate Alliance Report „Energy efficiency and solar energy used in building planning").

1.2 Vocational training of local workers in building sector as well as architects and planners

1.3 Setting control procedures to enable the energy regulations being respected (personal capacity, fining systems etc.)

A good example is the „Energy forum banks and office" from the **city of Frankfurt**. Aim of the project, with the cooperation of architects, specialised technical and internal investors, is decreasing the heat and electric consumption in big offices and banks buildings reaching the best European standards.

The **city of Frankfurt**, **Germany**, has carried out the project: "energy efficiency in public buildings" reaching 54% energy savings, with a pay back in 8 years for the initial investments.

1.4 Real time display of energy consumption in public buildings

124 European towns and cities of 21 countries participate in the display campaign (http://www.display-campaign.org) whose aim is to encourage local authorities to publicly display the energy and environmental performances of their public buildings using the same energy label that is used for household appliances. The aim is to make the citizens more conscious of their energy consumption in order to reduce energy use.

1.5 Emission trading scheme for trading of CO_2-emissions within the city administration.

2. Mobility management

In the field of traffic management there have been many discussions in Dresden. There is a plan to build a new bridge which would facilitate individual car traffic, rather then discourage it. It is, therefore, important to be careful when making proposals of mobility management (whether they are feasible and adequate to the current situation).

2.1 Awareness raising campaign for clever mobility (i.e. family party - mobility market, company newsletter on mobility) → *See examples of European Mobility Week 2005*

2.2 Pilot project in public administration (car pooling or job ticket)

2.3 Analysing institutional cooperation among municipal (and private) companies (i.e. INFINION in Dresden) to bring down ticket prices.

2.4 Free test ticket (for a duration of one or two weeks) for the journey to work.

2.5 Commuters' forums to self-organise car pooling solutions.

3. Urban Planning

3.1 Awareness raising campaign for living in the city

3.2 Making the inner city more attractive and more liveable by providing necessary infrastructures (water supply, district heating supply, schools, leisure activities etc.)

3.2 Living streets initiatives

Example: Camden **London** City District, committed to close every year one more street to cars traffic as a traffic-calming measure in the area.

ENERGY

	Step:	1: getting started	2: moving forward	3: forging ahead	4: taking the lead
A	**Define your energy policy and adopt targets**	Define fundamental objectives of your energy policy	Lay the ground for your energy policy, formulate the action programme	Adopt detailed targets for individual sectors or subjects	Adopt the target: 100% renewable!
B	**Institutionalise your energy policy**	Define responsibilities and allocate staff	Install cross-sectoral cooperation structures within the administration	Involve municipally owned companies in the energy policy	Install a local/regional energy agency
C	**Use innovative financing schemes**	Inform yourself about national and European funding opportunities	Identify first buildings for energy performance contracting (EPC)	Analyse results of your first contract and potentials for enlargement to additional buildings	Reform financial framework conditions to facilitate internal EPC and apply it to all public buildings
D	**Bring your own facilities up to scratch**	Check selected own facilities in terms of energy use and saving potentials	Establish energy perfomance standards for municipal buildings	Install an energy management system for all municipal buildings, including energy audits	Improve energy performance standards for public buildings
E	**Become a model for sustainable energy use**	Define a package of sustainable energy measures with low initial investment or very short pay-back time	Define a package of sustainable energy measures that require higher initial investments	Purchase green electricity to supply a portion of your energy demand	Resolve uopn the continuous progression of the share of green electricity
F	**Provide "green" public lighting**	Analyse potentials for immediate savings in public lighting	Formulate a public lighting policy plan focussing on energy efficiency	Purchase green electricity for public lighting	Implement the policy plan and move forward to 100% RES target for your public lighting network
G	**Support the implementation of renewable energy projects**	Generate a share of your municipality's electricity and/or heat demand in own RES plants	Set up a land register for the potentials of RES use	Create an offer of green electricity for your citizens	Implement a long term action programme for RES and CHP to achieve a 100 % community
H	**Inform and involve the citizens**	Inform the citizens about your energy policy and give hints for own contributions	Install a local energy advice centre	Organise targeted campaigns on energy efficiency	Mainstream energy in education and professional training

I	**Refurbish existing housing stock**	Inform house-owners about the potentials to increase energy efficiency of their building	Collect data and set up a land register for energy use in the housing stock	Label the housing stock according to their energy efficiency and offer targeted advice and recommendations	Set up a loan programme for retrofitting the housing stock in terms of energy efficiency
J	**Work on green office buildings**	Promote your energy management system towards external companies	Investigate an establish energy performance standards for offices	Set up demonstration projects	Establish energy forums and offer energy performance services
K	**Work with SMEs**	Inform and consult local companies and organisations on energy efficiency and RES	Work with the Chamber of Crafts on branch specific measure recommendations and campaigns	Offer specific training for craftsmen, technicians and engineers	Give financial support to business activities on sustainable energy use
L	**Collaborate with "powerful" partners (large-scale energy consumers)**	Inform large-scale energy consuming companies about your energy policy	Adress corporate clients with targeted advice	Set up agreements on the use of RES in plants/sites of such companies	Set up a joint project on efficient energy use (cogeneration, industrial waste heat, etc.)
M	**Monitor your progress**	Check data availability and define indicators	Monitor CO_2 reduction impact of individual measures and report, incl. own facilities	Prepare a rough CO_2 inventory every two years and publish it in a report, including the indicators	Monitor your CO_2 emissions in detail every year and publish the full set of indicators
	Additional measures for the City of Dresden in the energy sector				
	Use of partly owernership in the local or regional energy supply enterprise ("recommunalization")	Saving the majority as a shareholder in the company	Fixing of sustainable energy targets in the foundation and concession contracts for the company	Establishing of cooperation in programmes supporting innovative energy projects and energy-saving-activities	Transformation the company into a "energy-service-enterprise" and establishing of a suitable management
	Targets in CHP and district heating	Saving of existing CHP and district heating systems	Use of further termal waste energy (esp. of energy intensive compenies)	Enlargement of district heated areas by CHP	Establishing of many decentral/local block-type heat and power plants
	Developement of efficient cooling systems in the field of nonelectric air conditioning	Use of waste energy of CHP and solar thermal energy for cooling	Efficient cooling outside of the district-heated-areas by gas-heat-pumps	Efficient cooling outside of the district-heated-areas by gas-heat-pumps in combination with thermal solar energy	Reduction of cooling demand in buildings by adequate innovativ architecture and facility management

Status for the City of Dresden in 2000 to 2006	**is partly implemented**	no results, no general comment possible or an exact definition necessary	**was temporarily set into action**
Status only for the own buildings	**is partly implemented**		**was temporarily set into action**

Bridge to adaptation measures for climate change could be found (exampel in the comment)

URBAN DEVELOPMENT

	Step:	1: getting started	2: moving forward	3: forging ahead	4: taking the lead
A	**Define targets for overall planning**	Review the relevant policies in the fields of land use, transport and environment	Identify opportunities, but also hindrances of your current planning policy	Review and eventually adjust existing institutional frameworks	Integrate and amplify planning competences within your local authority
B	**Establish structures for cooperative planning**	Inform the public about upcoming planning processes	Establish a working committee with political representatives, relevant administration departments and external stakeholders	Develop and offer plausible and transparent participation schemes for citizens	Negotiate agreements on plans with the different stakeholders
C	**Define visions for a sustainable development of your urban area**	Identify general guidelines for the future development of your city/municipality	Assess priority areas for development and check for incorporation of energy, transport and land use criteria	Decide about urban growth boundaries and develop strategies for infill and brownfield sites	Resolve on a vision for an efficient resource use city/municipality and define indicators for future monitoring of progress
D	**Install energy efficiency as a basic principle in urban planning**	Introduce basic energy criteria for all planning processes including the sales of municipal real estates	Include energy as obligatory theme/section in all planning documents	Ensure the energy strategy in all planning processes and tenders	Ensure an innovative energy strategy in the planning process including preferential treatment of district heating, CHP and RES
E	**Assign a firm place to Renewable Energy Sources (RES) in urban planning**	Remove administrational barriers towards renewables (permissions, procedures)	Include the use of renewables energy when planning new residential or business areas	Investigate possibilities for the use of thermal water geothermal heating / cooling and underground storage	Identify and reserve locations for renewable energy (e.g. wind) in land-use planning and actively seek for investors
F	**Opt for energy efficiency in transport planning**	Include overall principles for your urban planning processes regarding transport	Study transport performance when (re)designing residential areas or for housing projects	Plan in favour of pedestrians and cyclists, traffic calming as well as energy efficient goods deliveries and responsible car use	Implement the most energy efficient variant from the transport performance study
G	**Reduce transport demand by sustainable land use planning**	Introduce criteria for urban planning that aim at reducing transport demand ("smart growth" to avoid urban sprawl)	Implement most important criteria, such as preferential development along existing public transport, mixed land uses etc.	Apply urban planning criteria for any urban development	Seek for innovative models of urban design regarding transport (car free residential areas, etc.)
H	**Stimulate the development of sustainable business areas**	Investigate existing (policy) tools on possibilities to stimulate sustainable business areas	Consult with local companies about sustainable business areas and develop an action programme	Implement the action programme to stimulate sustainable business areas	Define a policy for business areas aimed at further improving sustainability

Urban development / tourism

	Step:	1: getting started	2: moving forward	3: forging ahead	4: taking the lead
I	**Develop a local strategy for sustainable tourism**	Develop a vision and adopt targets for sustainable tourism in your city / municipality	Integrate the strategy for sustainable tourism into the local planning framework	Identify priorities and develop a specific action plan for tourism in your city / municipality	Promote the vision for sustainable tourism in your city's / municipality's marketing
J	**Involve the providers of touristic infra-structure or services**	Inform hotels, restaurants, etc. about your climate policy and about the potentials and benefits for this branch of business	Establish a joint working group with representatives of the tourism branch to develop further the action programme	Set up joint information campaigns both for employees in the sector of tourism and the visitors	Set the frame for instruments to maximise local income, while limiting the number of visitors to the ecological carrying capacity of your area
K	**Minimise the environmental impact of tourism**	Offer sector specific advice on energy efficiency, RES use or measures to reduce waste and water consumption	Develop measures for touristic facilities (hotels, gastronomy, sports, etc.) to limit/reduce CO2 emissions	Develop incentives for arriving by public transport and transport services to enable a car free holiday in your city/municipality	Develop strategies to reduce "hit and run" tourism and to prolong the season in your city / municipality

Mitigation Indicators for Dresden

Some facts, that could act as an indicator for the state of local climate protection measures

(proposal for climate scan by Andreas Drack, UA)

Nr.	field	value in 2005	measuring unit
1	CO_2-equiv. or CO_2/capita	**10,1** (includes nearly 2 $t_{CO2\text{-}equiv.}$/capita of aviation!)	$t_{CO2\text{-}equiv}$./capita
2			
a	share of different local renewables: PV	0,028%	percent of electricity consumption
b	water power	0,029%	
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d	biogas	0,17%	
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3	area solar collector (PV, ~~thernmal~~)/ capita	0,013	$m^2_{(PV)}$/capita
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