What land use/climate change actions are being taken at the local level?

A municipal case study from Freiburg, Germany

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Freiburg – Facts and Figures

- Inhabitants: about 220,000
- Surface area: 153 km^2, of which 40% forest.
- Altitude above sea level: from 200 m to over 1,280 m (Schauinsland-mountain)
- Has been a university town for 550 years; currently 30,000 students
- Job situation: 57% in service sector, unemployment rate: 6%
- Tourism: 1 mio. overnight guests per year, of which 1/3 from abroad
- Electricity supply: 50% from combined heat/power generated in Freiburg itself
- Annual CO_2 emissions per capita in 2005: 9.3 t
- Number of passenger cars per 1000 inhabitants: 450, downward trend

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Leading by example

- Municipality as a stakeholder in its own companies
- Municipality as a developer and planner
- Municipality as a consumer
- Municipal council: Political decision-making body

= Municipality as a trendsetter, role model, motivator and coordinator

Milestones

1975	Antinuclear movement
1977	Eco Institute
1981	Fraunhofer Institute for Solar Energy Systems
1984	First environment-oriented map for local public transport
1986	Freiburg energy supply concept
1992	Low-energy building construction
1992	Award "German capital of environmentally friendly cities"
1996	Climate protection concept
2000	Participation in world exhibition EXPO 2000
2003	German champion in solar national league (until 2006)
2007	New energy efficiency and climate strategy
2008	New energy efficiency building standard – step-by-step plan

Climate Protection and Energy Supply

Dual Strategy

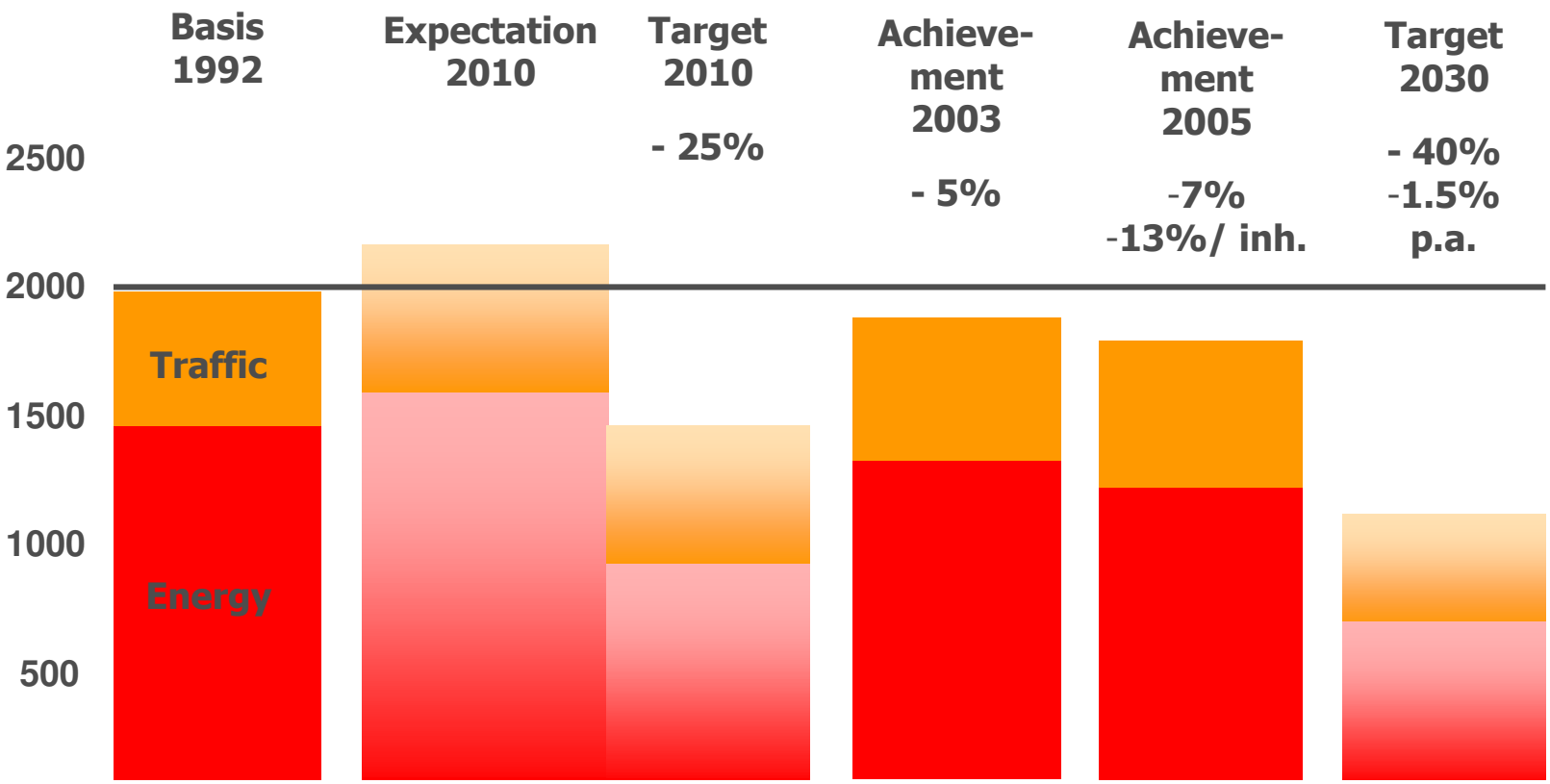
1. **Mitigation** – Avoid damage caused by climate
   = Reduce energy consumption and greenhouse gases

2. **Adaption** – Necessary adaptation
   = Handle consequences of climate change

Energy Efficiency and Climate Protection Concepts

- 1986 Energy Supply Concept
  - Conserve resources
  - Lower emissions
  - Withdraw from nuclear energy
  - Contribute to worldwide climate protection
- 1996 Climate Protection Concept
  - Climate protection target: -25% CO_2 until 2010
  - E^3 = save energy, produce energy efficiently, use renewable energy
- 2007 Climate Protection Strategy 2030
  - Climate protection target: - 40% CO_2 until 2030
  - Action plan, financing

Climate Achievement and Climate Targets



in 1,000 t CO2 Equivalent p.a.

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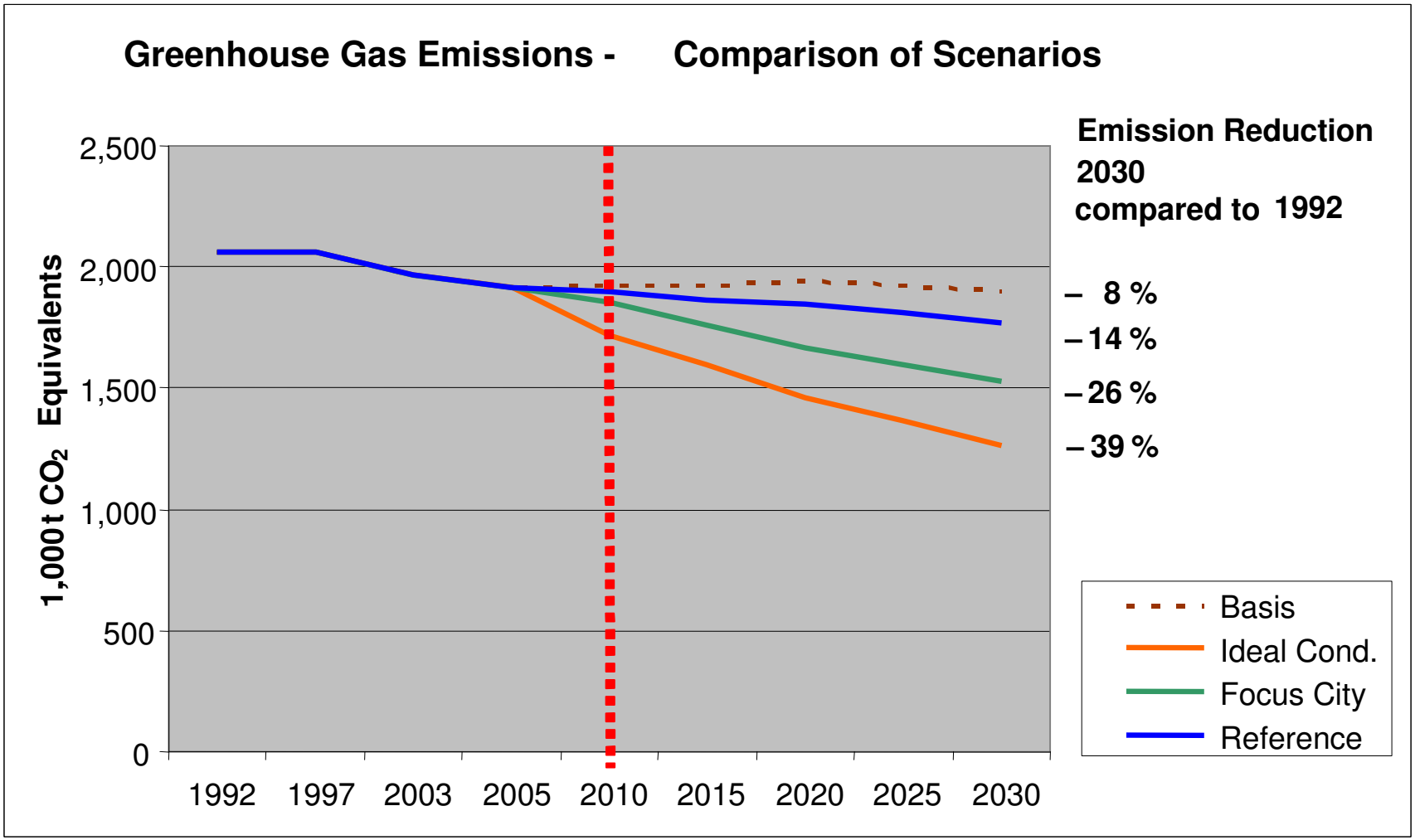
Climate Strategy 2007: Four Scenarios



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Climate Strategy 2007 - Financing

- from 2008:

  10 % of the annual concession levy of badenova AG
  (municipal energy supplier, currently 1.2 m. € p.a.)

  for other municipal projects

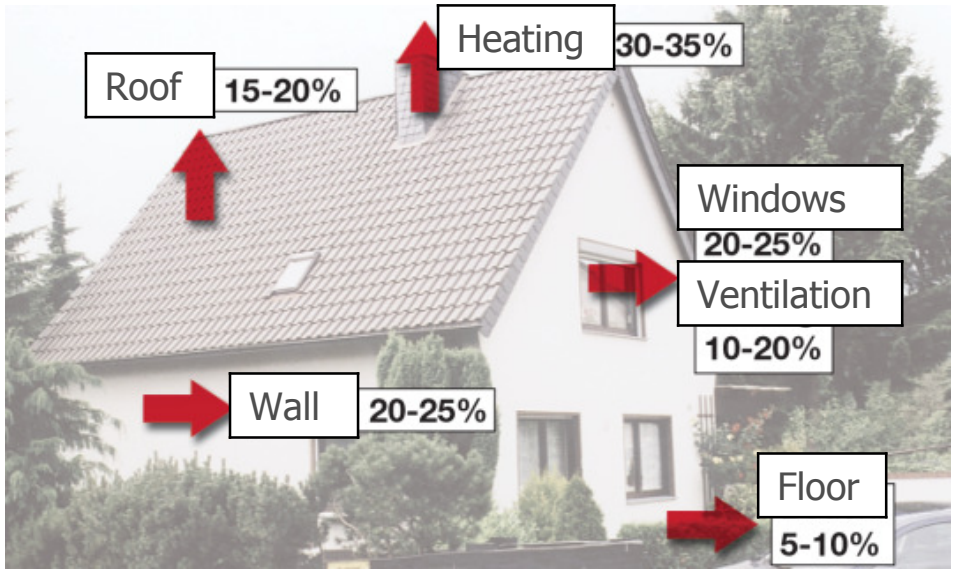
- In addition (cyclical):

  2 m. € p.a. (public money)

  for energetic redevelopment of public buildings

Why are Buildings so Important?

- Weak Spot Analysis



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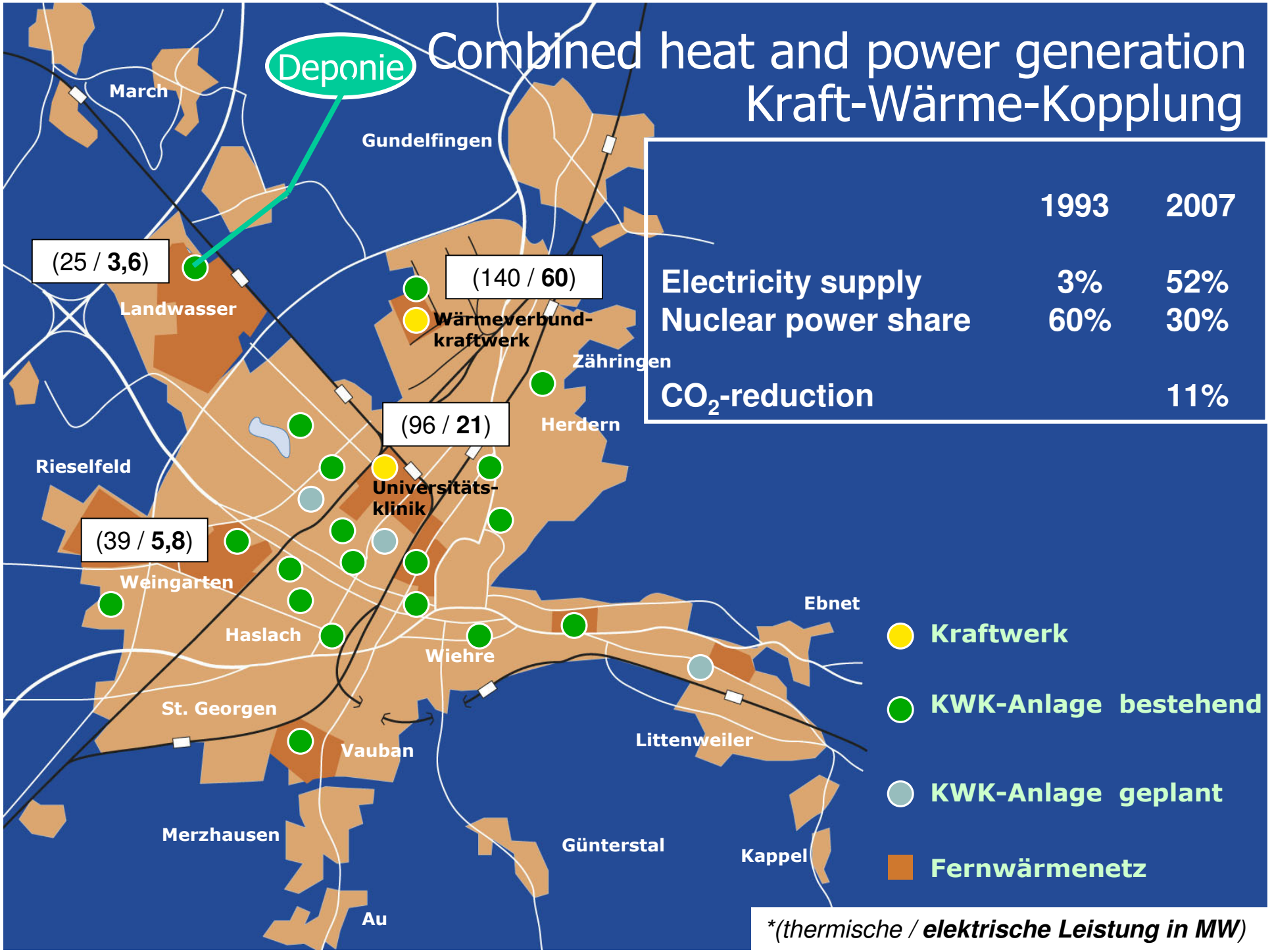
Promotion Program for Energy Efficient Building Rehabilitation

Promotion of energy efficiency initiatives in more than 300 buildings

1.3 mio. Euro in grants; total investment 13 mio. Euro

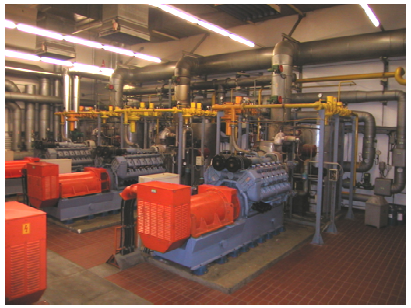
Business contracts for regional economy and craftsmen

CO_2 reduction per year: 2,500t (2008)


Combined heat and power generation
Kraft-Wärme-Kopplung
Deponie
March
Gundelfingen
(25 / 3,6)
Landwasser
(140 / 60)
Wärmeverbund-
kraftwerk
Zähringen
Herdern
(96 / 21)
Rieselfeld
Universitäts-
klinik
(39 / 5,8)
Weingarten
Haslach
Wiehre
Ebnet
St. Georgen
Vauban
Littenweiler
Merzhausen
Günterstal
Kappel
Au
1993 2007
Electricity supply 3% 52%
Nuclear power share 60% 30%
CO2-reduction 11%
Kraftwerk
KWK-Anlage bestehend
KWK-Anlage geplant
Fernwärmenetz
*(thermische / elektrische Leistung in MW)

Local Heating Supply

District of Landwasser: 7,000 inh./3,500 hh

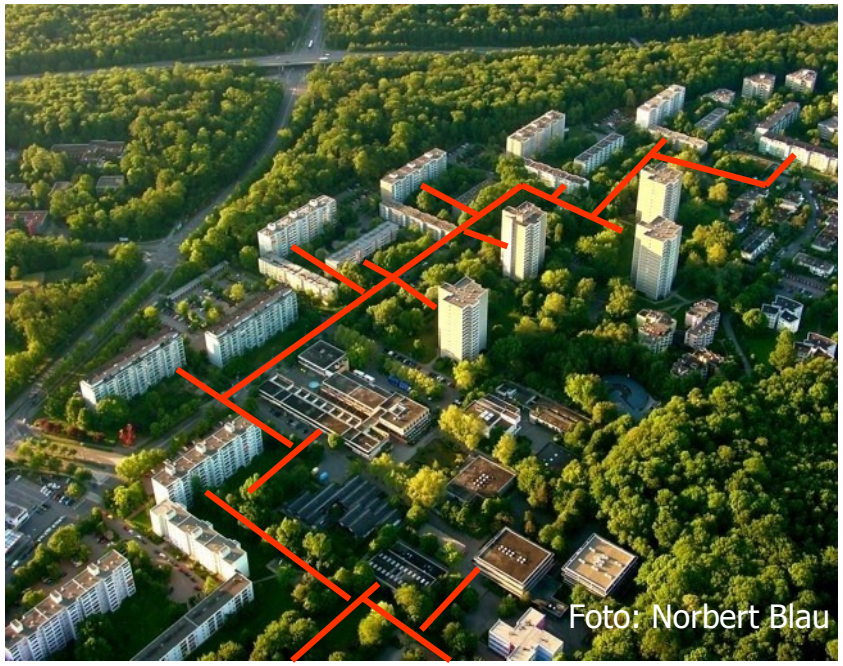


Natural gas and landfill gas CHP power plant

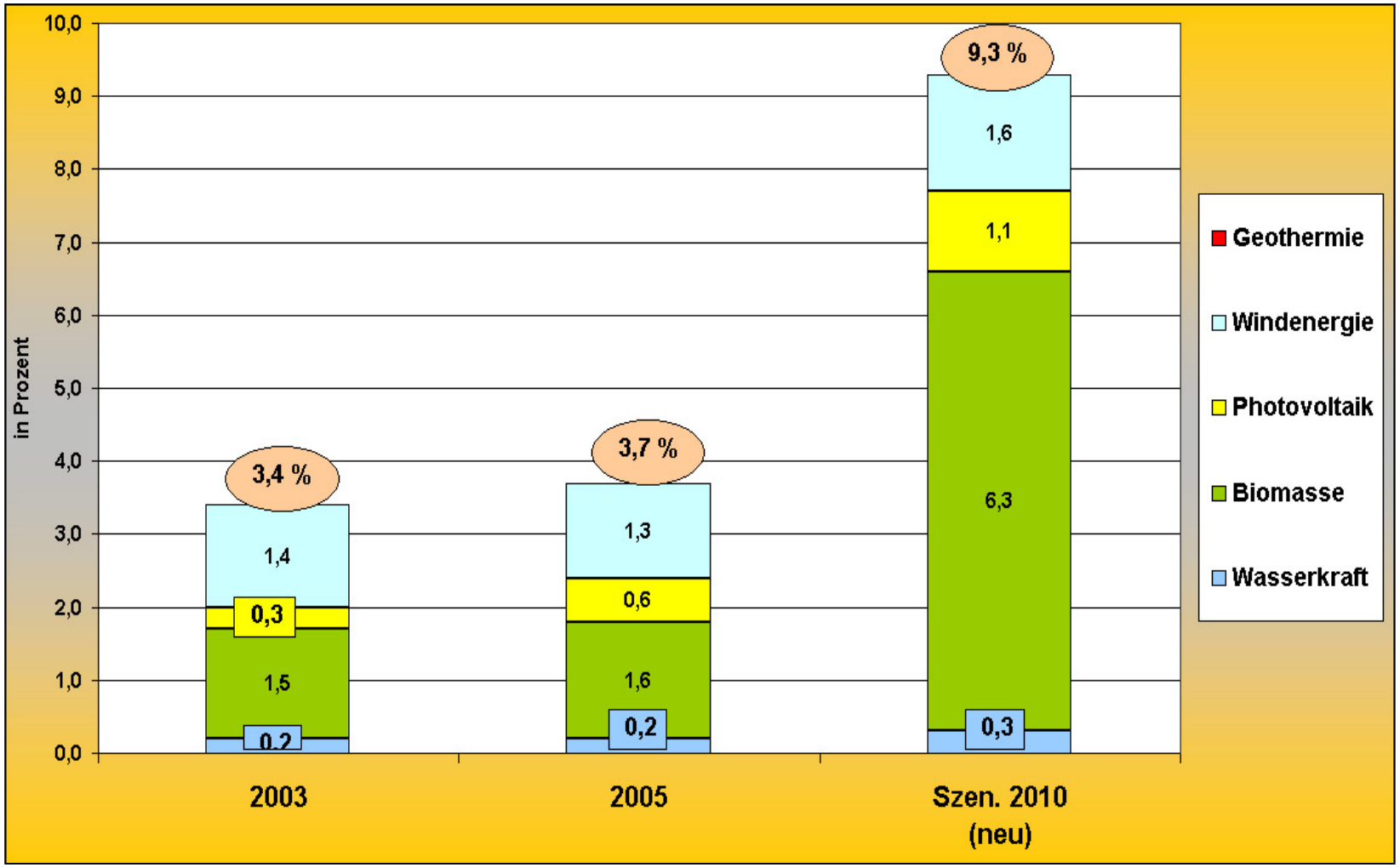
- Landfill gas: 5.3 mio. m³/a *downward trend*
- Electr. power: 2,000 kW; th: 3,200 kW

Energy Production

- Electr.: 15,600 MWh/a (4,000 hh)
- Heat: 35,000 MWh/a



Erneuerbare Energien – Zieldefinition 2004



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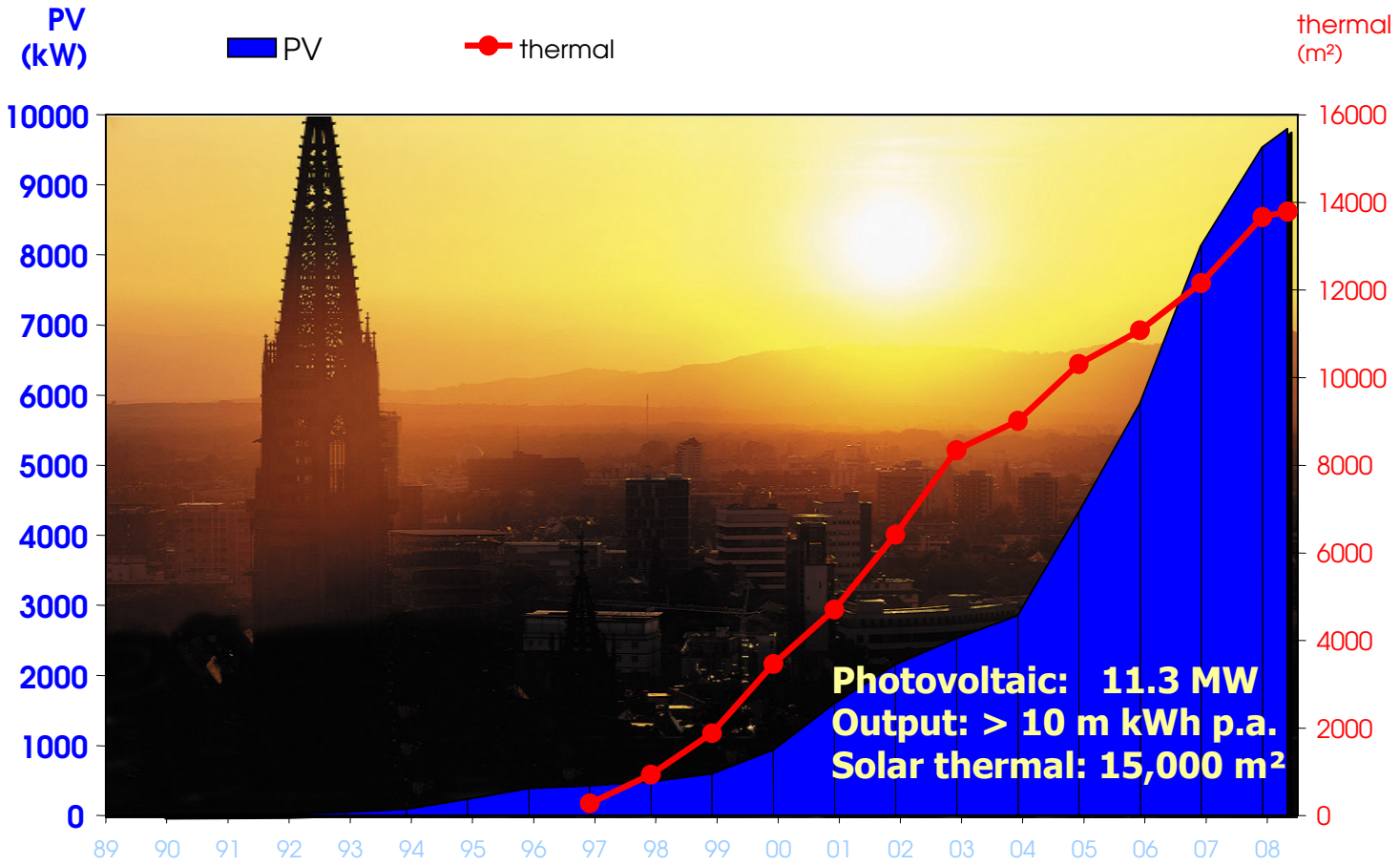
Erneuerbare Energie - Wirtschaftsfaktor

- Regional energy company: Subsidies for renewable energies
- Municipality: Provide suitable areas for example wind turbines
- Municipality: Favourable property conditions for innovative businesses

Solar Energy – Energy Production



History of Urban Development

Until late 80s

Focus on exterior development:

- until 1993, there have hardly been any planning restrictions, e.g. no regulating force in urban land-use planning

90s

Major projects for residential and commercial areas:

- Housing shortage due to influx of new population, planning of the new districts Rieselfeld and Vauban

2002– FNP 2020

Land-efficient urban settlement development

- major projects are mostly completed
  city is running out of urban land reserves
  multitude of legal and planning restrictions
  land-efficient urban settlement development despite growth due to interior development on the basis of municipal land management scheme

SETTLEMENT DEVELOPMENT
NEW DISTRICT OF RIESELFELD

- 4,200 new flats in low-energy construction for 10 to 11,000 people
- 1,000 jobs
- since 1997 connection with city railway

Foto: E. Meyer

SETTLEMENT DEVELOPMENT
DISTRICT OF VAUBAN

- New flats for ~4,300 people have already been completed
- multiple social infrastructure facilities
- since 2006 connection with city railway

District of Vauban

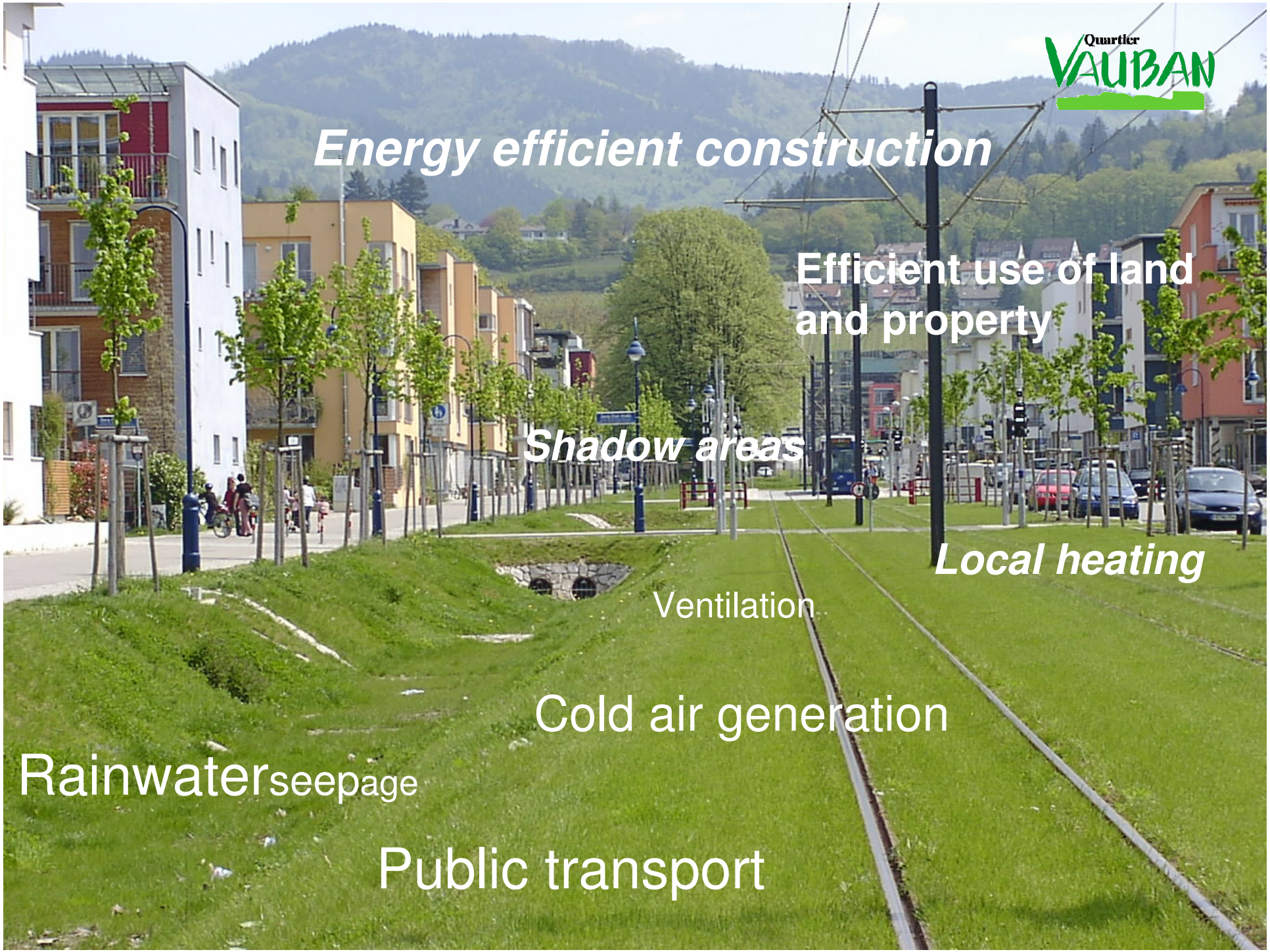
Weighing the Conflicts of Aims

How urban is the climate-improved city to be…?

Loose, low, open, sunny	⟷	dense, high, green, shadowy
Shadowing avoided, ventilation preserved	⟷	Efficient use of land and property
Orientation towards the sun	⟷	Cooling by shadowing
Green spaces and air flow channels preserved	⟷	Traffic avoided
Photovoltaic and solar thermal installations	⟷	Façade and rooftop greenings

Conflicts of Aims – e.g. Building Position

- Solar optimization: orientation towards south
- Noise protection: shielding off the noise source
- Ventilation: towards mountain or hillside winds or towards main wind direction or towards air flow channel
- Urban development design: edges in space, axis of vision, city entrances...
- Historical references: taking up existing structures....

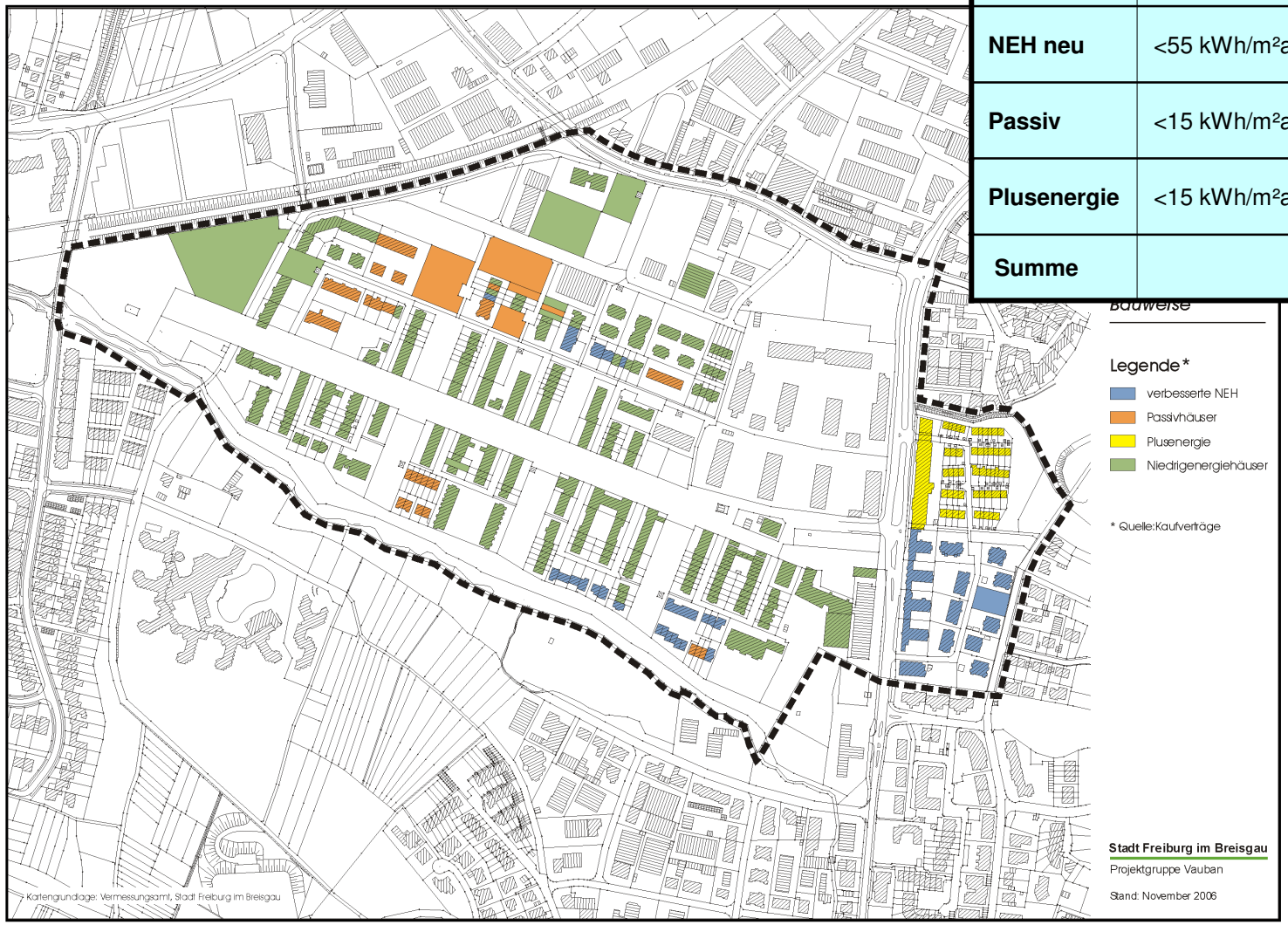

Quartier
VAUBAN
Energy efficient construction
Efficient use of land
and property
Shadow areas
Local heating
Ventilation
Cold air generation
Rainwaterseepage
Public transport

District of Vauban

Shadowing avoided, ventilation preserved (green links)	+	Efficient use of land and property (site occupancy index (GFZ) 1.2-1.4)
Orientation towards the sun	+	Cooling by shadowing
Green spaces and air flow channels preserved	+	Traffic avoided (connection with city railway)
Photovoltaic and solar thermal installations	+	Façade and rooftop greenings

Stadtteil Vauban

Gebäudestandard		Häuser	WE
NEH alt	<65 kWh/m²a	164	849
NEH neu	<55 kWh/m²a	32	341
Passiv	<15 kWh/m²a	32	197
Plusenergie	<15 kWh/m²a	51	60
Summe		279	1.447



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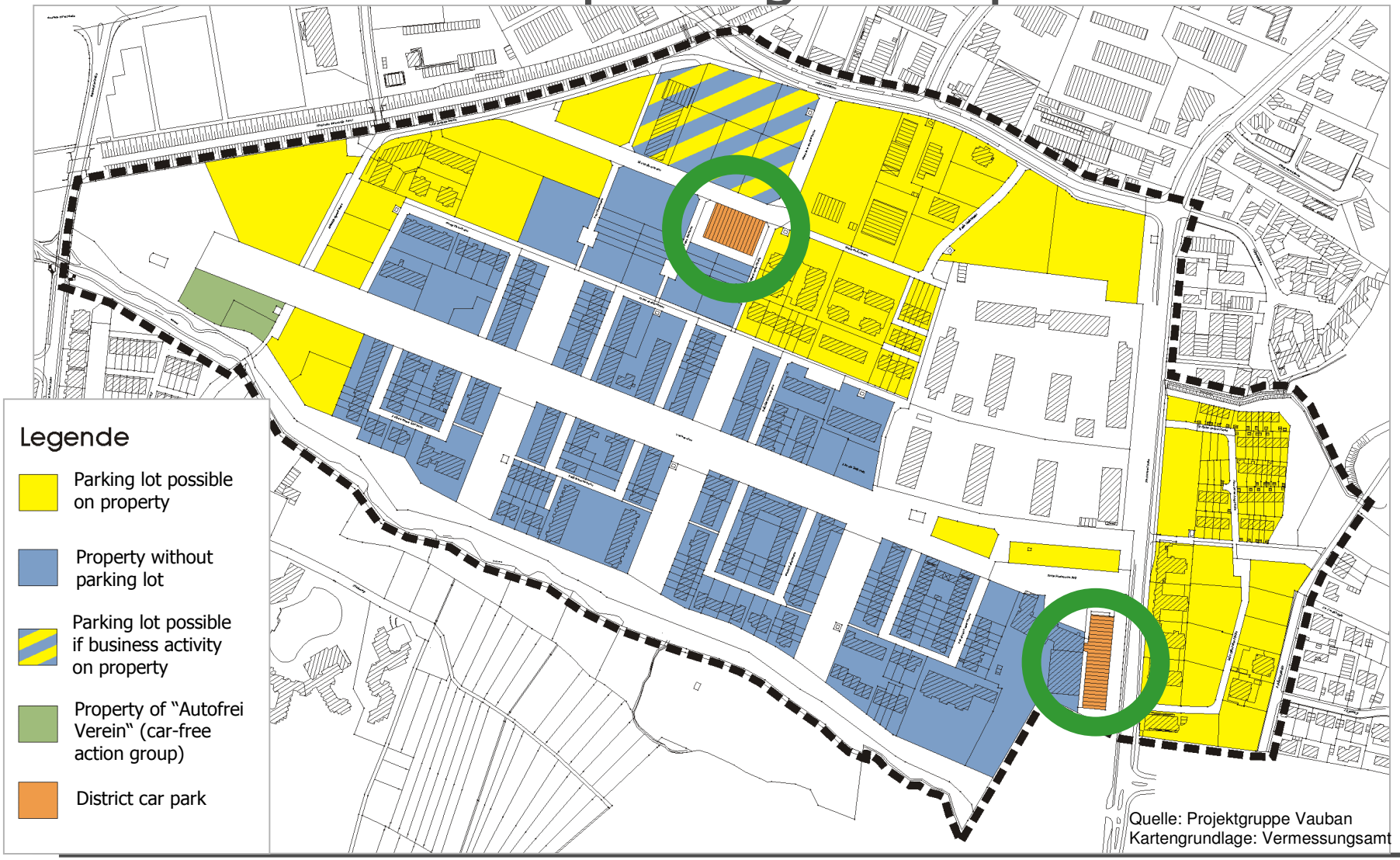
Vauban – vehicle parking concept



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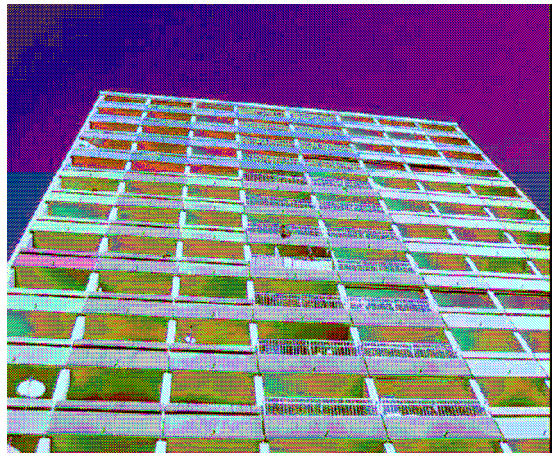
Municipal Building Society



Initiatives in Urban Development
(Selection)

- Weingarten 2020 – rehabilitation into passive house
- kfw60 as a general standard for rehabilitations
- Passive house projects for planned new building construction
- Roof surfaces for photovoltaics (500 kwp)
- General analysis of energy supply variants, also in the case of heating system renewals, including CHP, renewable energies

freiburger stadtbau gmbh

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Regional Energy Supplier

- PR initiatives on energy efficiency
- Cooperation with university CHP for use and further development of existing district heating
- 90% of photovoltaics systems installed in the greater area of Freiburg are subsidized by badenova
- Innovation fund: 1.8 m. € annually to promote climate protection projects; total subsidies so far 14.4 m. € (this triggered investments of more than 70 mio. €)

badenova
Energie. Tag für Tag

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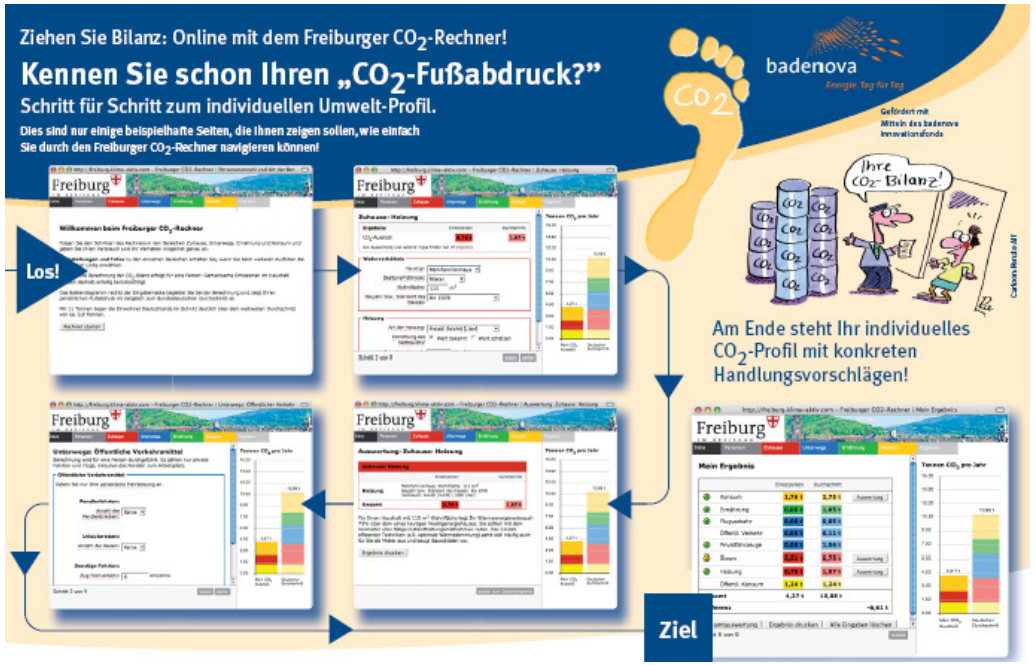
Communication - Cooperation

- Advisory Council (representatives from politics, industry, science, NGOs)
- Project network (regular meetings, exchange of experience)

- "Solar tourism": Visitor groups from all over the world, political delegations, experts, students, journalists
- Information center
- Projects at schools
- Training community SolarRegion Freiburg
- International cooperations, e.g. “energy meetings“ of Upper Rhine region city partners and twinned towns
- PR activities, e.g. campaign for solar thermal installations

Communication

www.freiburg.de/CO2



Freiburg "CO2 Diet"

- CO2 calculator to determine "Personal CO2 Footprint"
- Tips on how to reduce personal CO2 emissions
- Useful local addresses and practical guidelines
- Dealing with various topics such as living, mobility, nutrition, consumer behaviour

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Solar Systems on Roofs of School Buildings

- Project launched in 2002 in 20 out of 90 Freiburg schools
- Result: 90kW photovoltaic electricity = annual electricity consumption of a school
- Display panels provide information on daily electricity production
- Inclusion in teaching programs and school projects




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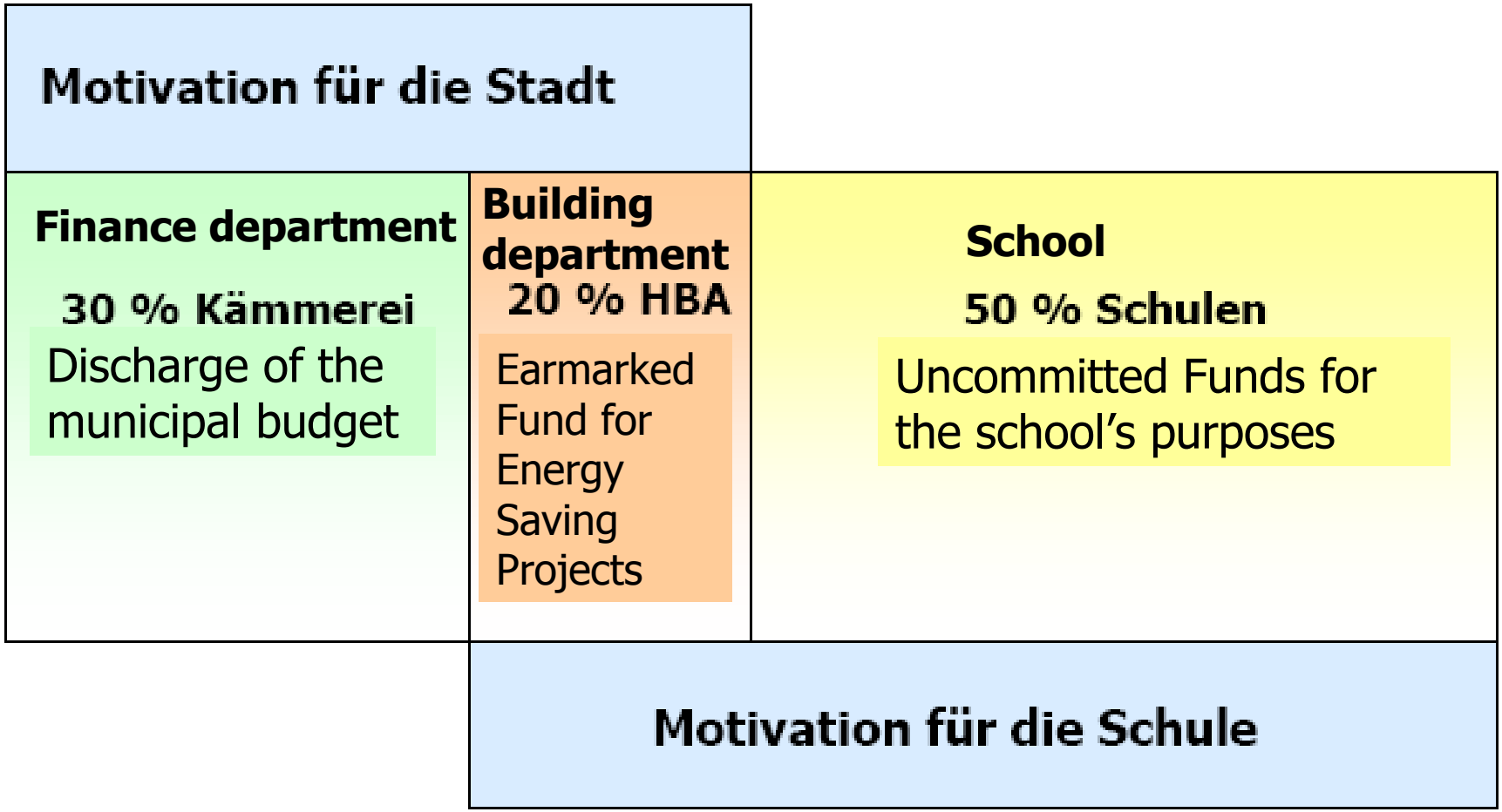
Fifty-Fifty: Shared Profit Energy Saving in Schools



Conclusions

- Analysis: Basic data evaluation: Status quo, state of knowledge, stakeholders
- Vision: Where do you want to go?
- Targets: Realistic, achievable in defined period of time
- Focus: Starting points – Pilot projects? Key actions!
- Strategy: Action plan – timeframe and responsibility
- Monitoring: Adjustment if necessary, regularily
- Implementation 1: Decision by City Council
- Implementation 2: Create staff unit! Organise processes and understanding in administration itself
- Networking: Partners? Involve stakeholders! Cooperate! Learn from other cities
- Be positive: City as "role model" – Involve and inform citizens
- City planning: Early consideration of energy aspects