



Energy management and sustainable energy planning in Stuttgart

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City of Stuttgart

590 000 inhabitants
total area: 207 km²
elevation: 207 to 549 m
over the sea
average temperature: 10 °C



municipal buildings
area: 2 million m²
1,441 buildings and 566 consumers needs

182000 MWh/a power

20.5 Mio. Euro/a

303000 MWh/a heat

15.8 Mio. Euro/a

1.9 million m³/a water

6.5 Mio. Euro/a

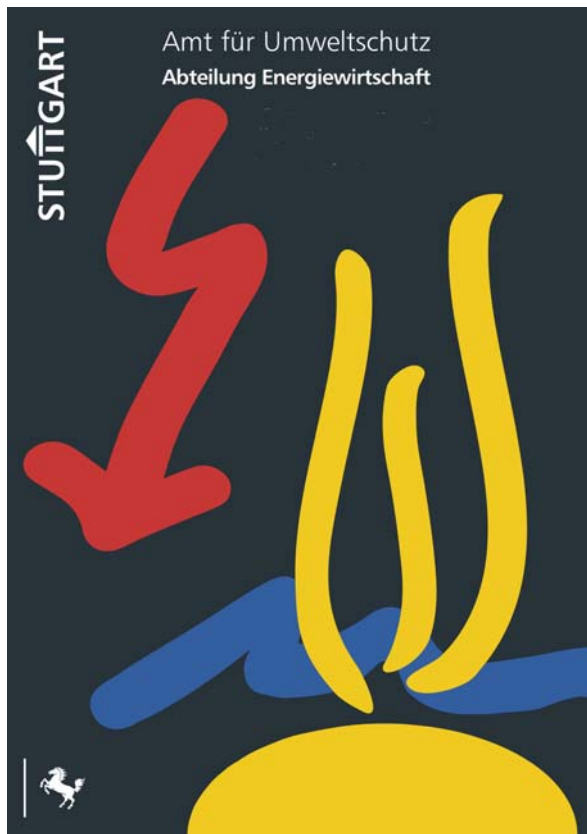


Why saving energy and water?

- climate protection
- reducing emissions
- saving resources
- saving energy costs
- investing in labor, not in energy
-



Main tasks of the department of energy management

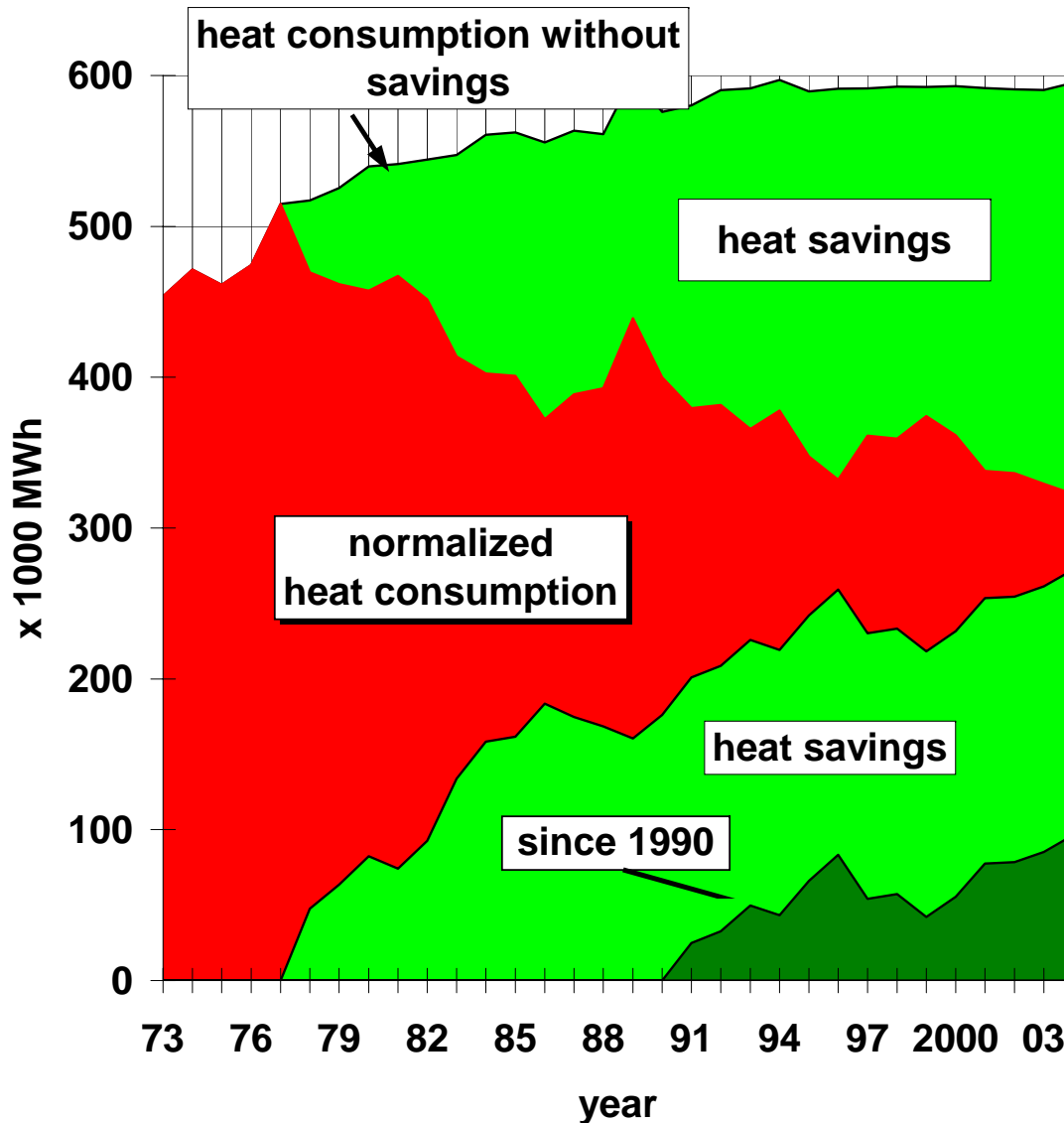


- surveying the energy and water consumption
- consulting the caretakers, technicians and departments
- purchasing energy and controlling energy supply
- research and demonstration projects
- developing guidelines
- change the behaviour of the users
- public relations

The **necessary** energy service must be supplied
with the required **quality**
during the required **time**
with the least possible **energy input.**



Development of heat consumption

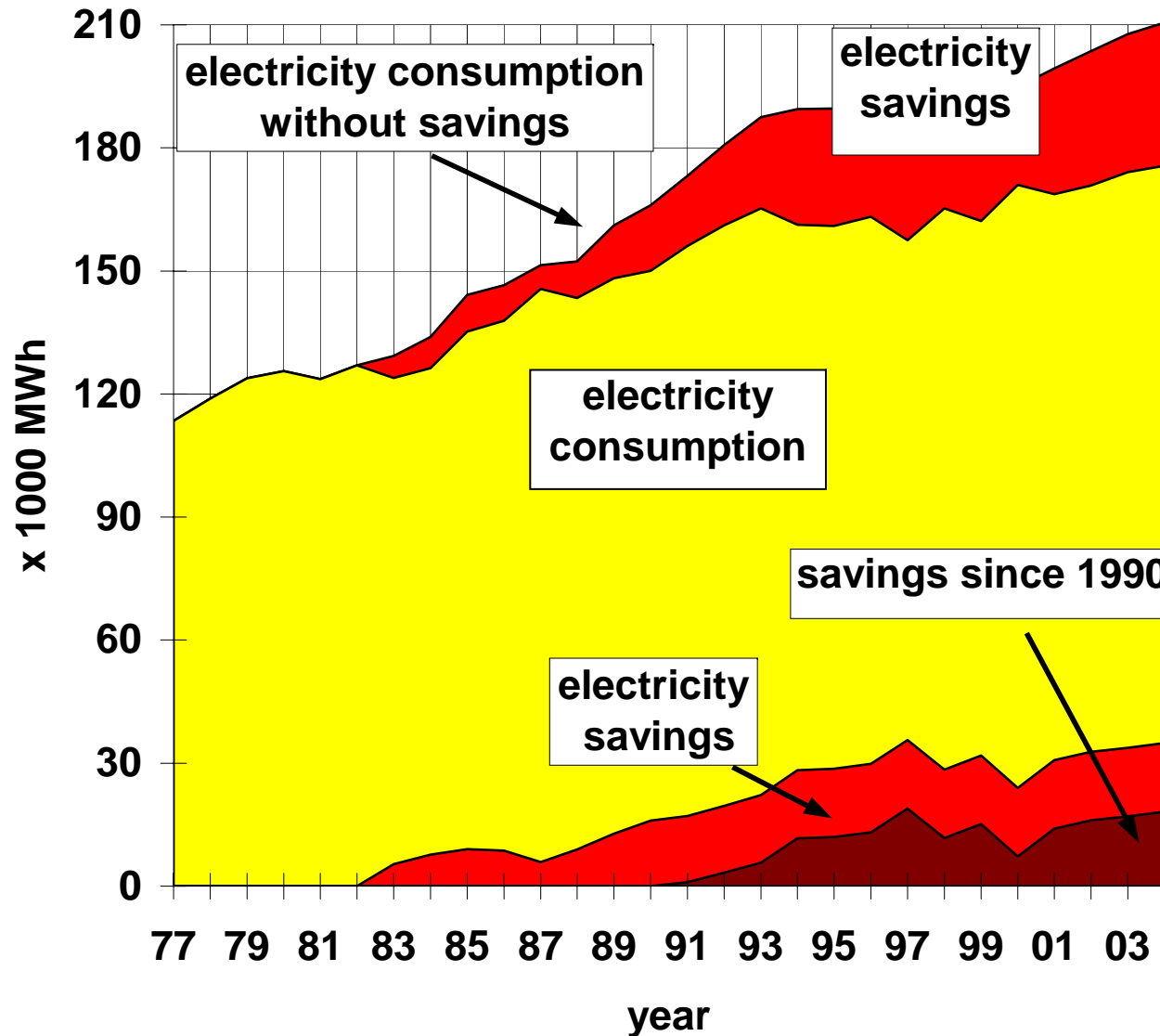


savings
2004: 272 449 MWh

since 1977:
4 988 908 MWh



Development of electrical energy

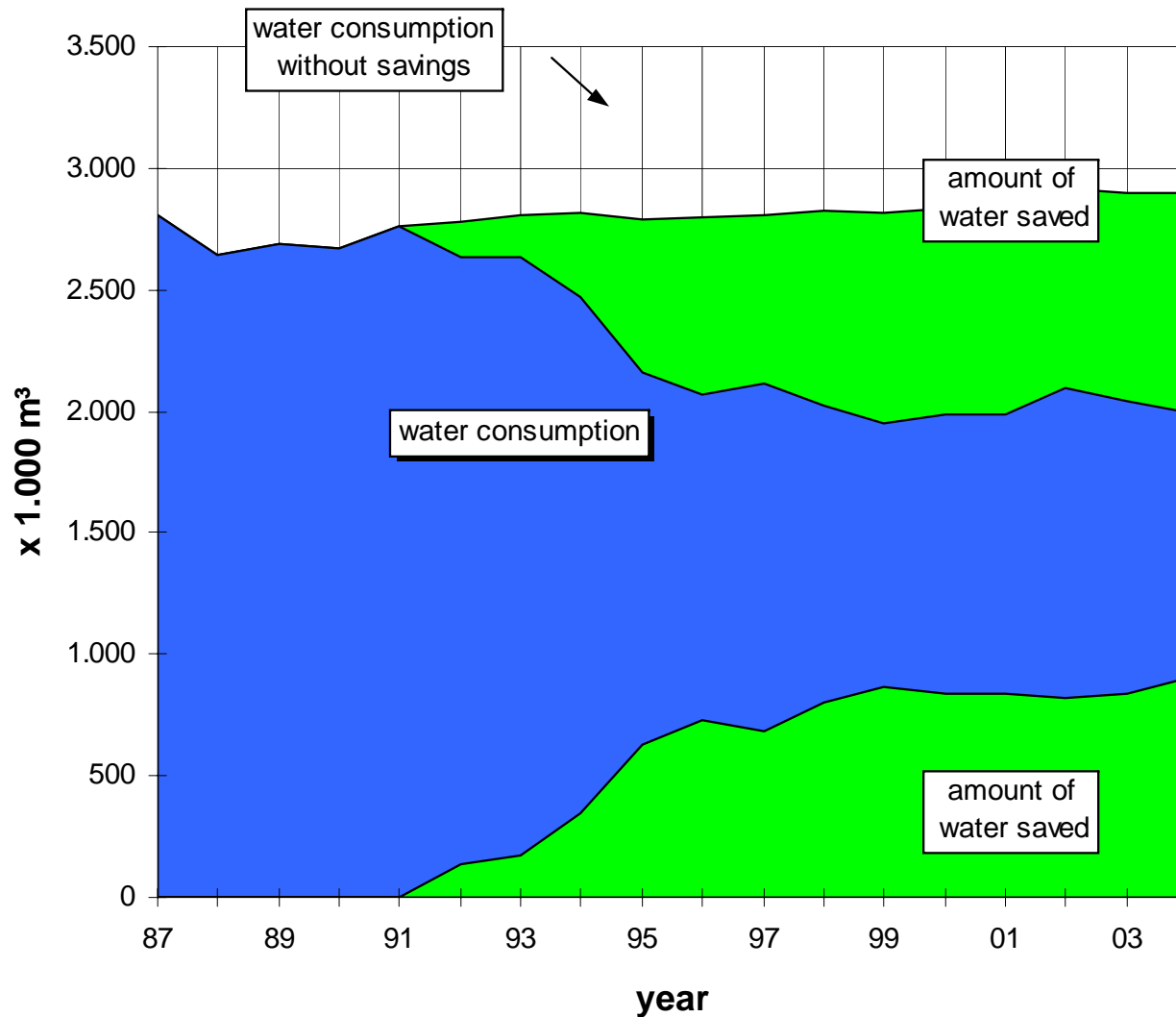


Savings
2004: 34 843 MWh

since 1982:
471 592 MWh



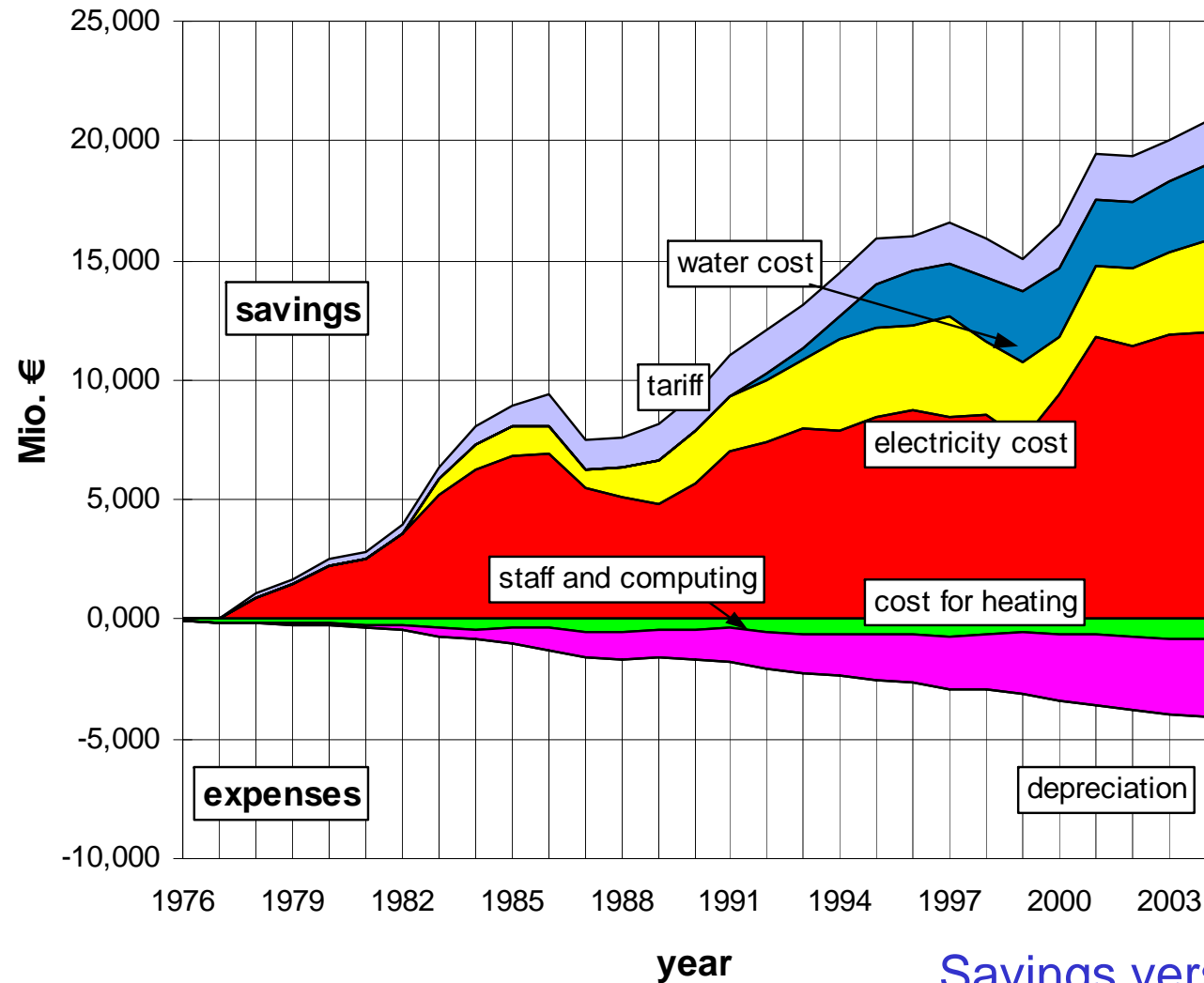
Development of water consumption



Savings
2004: 906 519 m^3
since 1991:
8 649 082 m^3



Savings versus expense for staff and investments



savings
2004: 20.815 Mio. €

since 1976:
282.5 Mio. €

expenses

2004: 4.05 Mio. €

since 1976:

53.2 Mio. €

Savings versus expenses: 1 zu 5.1



How can you reduce the energy consumption?

- **optimizing operation**
 - optimal use of technology installed
- **investments**
 - technical improvements
- **changing the user behaviour**
 - information, motivation, sharing the savings



Elements of the energy management in Stuttgart



Computer - System called SECM



Measurement technology



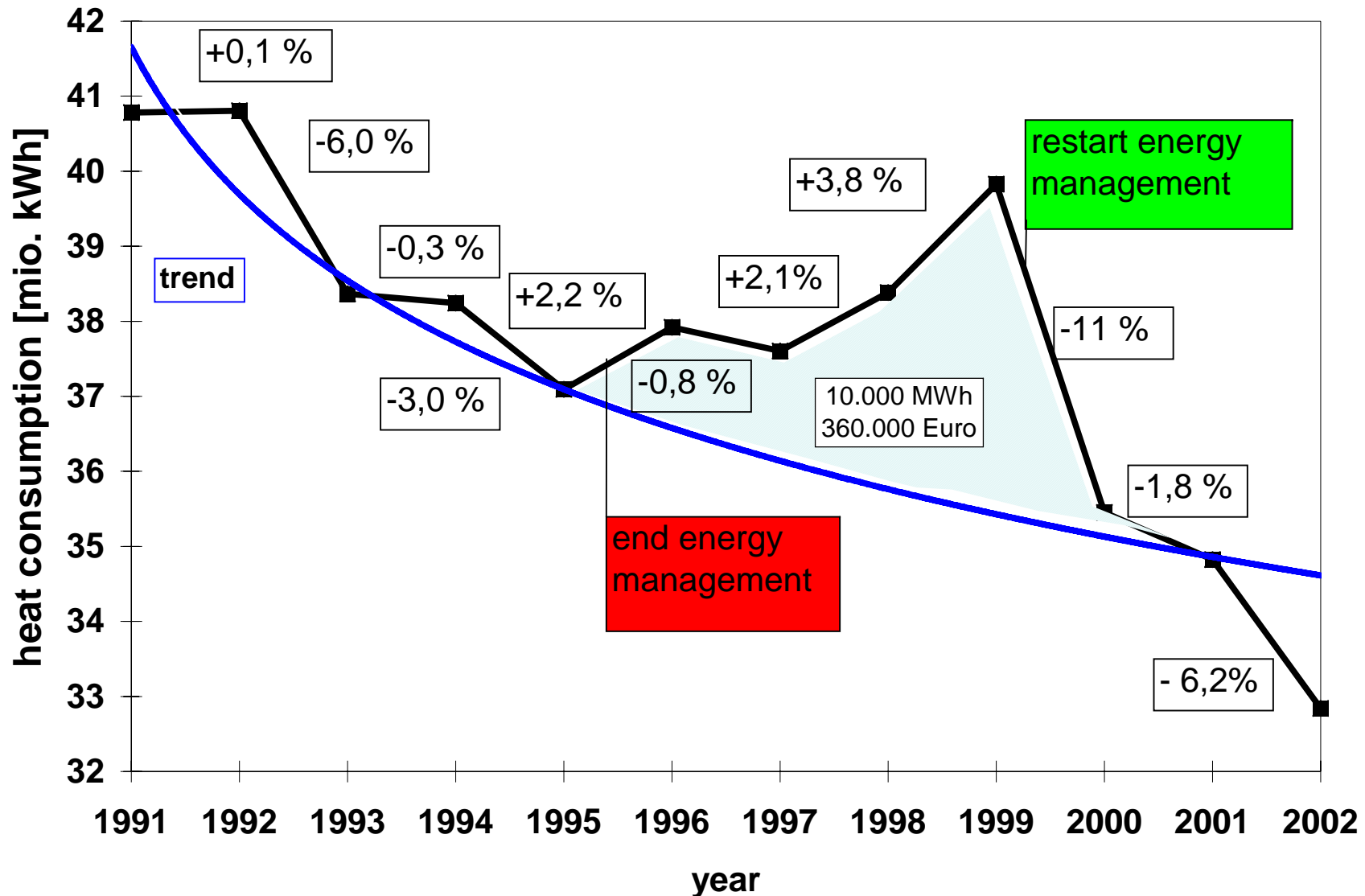
Support through city government



**Motivated staff
with good know how**

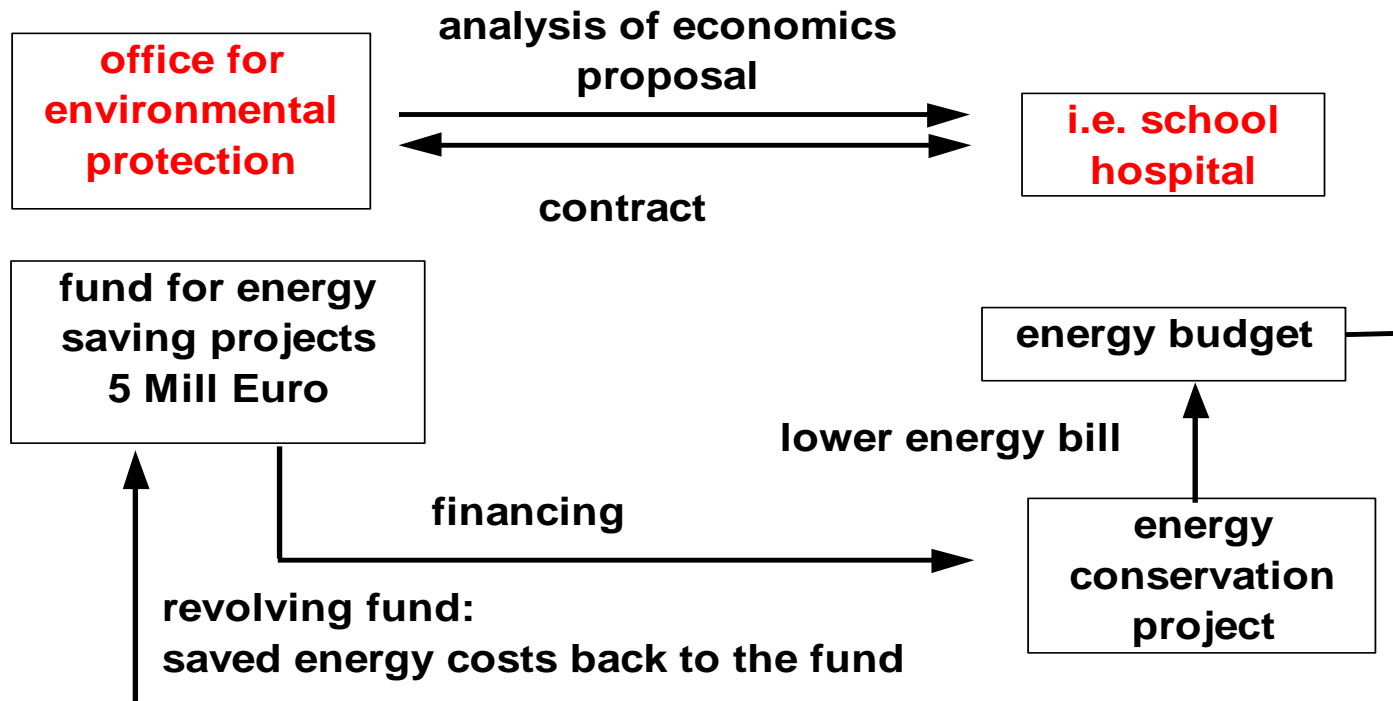


Heat consumption **with** and **without** energy management





The principle of internal contracting (intracting)



Thermal insulation of top floors



ideal unheated attics

- big surface
- technically simple
- building physics: ok
- cheap
- do it yourself possible

target: $U\text{-value} < 0.2 \text{ W/m}^2 \text{ K}$

old: $2.5 \dots 1 \text{ W/m}^2 \text{ K}$

until now: 30 schools with 30000 m^2

savings: 2.5 million kWh/a, 94400 €/a, 514 t CO₂/a

investments: 419,000 €

--> pay back time: 4.4 years





Biomass: concept for using wood chips for heat generation

- using municipal material ca. 11000 m³/a
- reducing costs for disposal
- CO₂-reducing 1500 t CO₂/a
- reducing energy costs 230000 €/a
- investment 1.93 million €

3 big plants (2000 W) in operation



Using rainwater Gottlieb-Daimler-Stadium



roof area 14225 m²

tank 350 m³

water saving 4400 m³/a 10200 €/a

investment 222000 €

pay back period 21.8 a

using period: 43 a



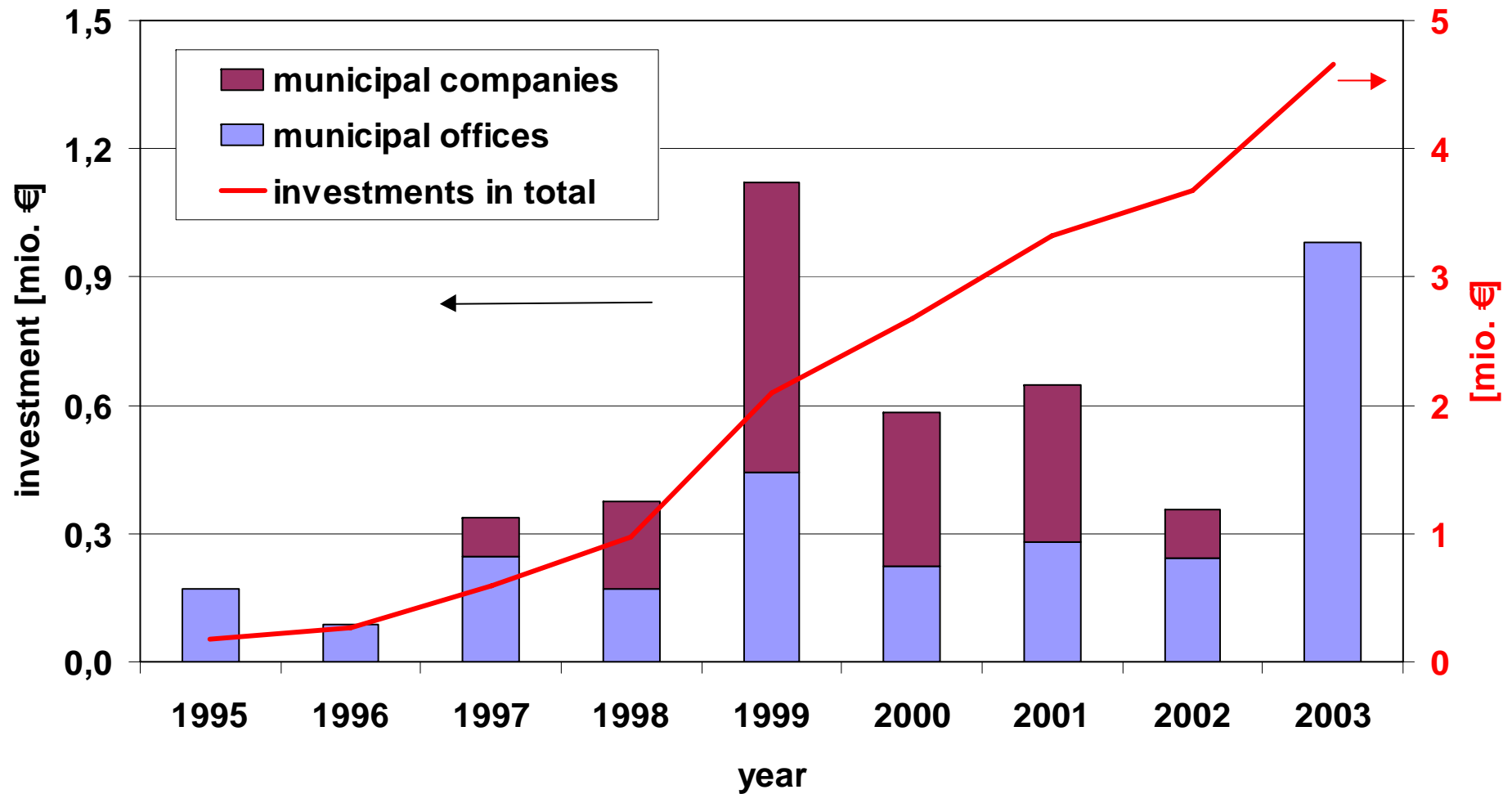


Further examples for intracting

- new controls for heating, ventilation or lighting
- insulation of walls or top floors
- cover of pools
- heat recovery systems
- renewal of lighting
- street lighting
- thermostats
- investment in water saving
-
-



Investment in intracting projects



209 contracts

fund: 5 Mio. €

pay-back time: 5,7 years



What can we do in the future?

- reduce the energy demand dramatically (up to 75 %)
- energy supply with renewables
- create a lighthouse: retrofitting an existing school as a Plus-Energy-School
- disseminate the results to other buildings in Stuttgart, in Germany and all over the world

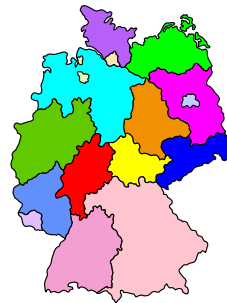
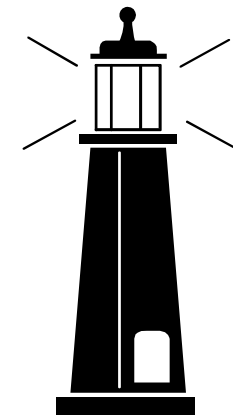




Foto : ESA

That is what we have to save, because we have only one of it