Global Green: Sustainable Approaches for Climate Protection

Sustainable Energy in Scandinavia

UNIVERSITY OF WASHINGTON

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City of Seattle
Department of Planning and Development

City Green Building

Making green building standard practice in Seattle through education, technical assistance and incentives.

Energy Policies – Clear Priorities

1970's - Decrease oil dependency

1980's - Jobs and balance of payment

1990's – CO2 reduction

2000's – Kyoto compliance / liberalized energy markets

Sustainable Energy Strategies

- Consumption
- Distribution
- Generation

Energy Goals

DR Byen Danish Broadcasting Complex

- 75 to 80% reduction in energy for cooling through combination of groundwater cooling and natural ventilation.
- 50% reduction in peak cooling demand.
- 35% reduction in energy for heating.
- 50% reduction in energy consumption for lighting.

Natural Ventilation and Daylighting

Nykredit Building

Natural Ventilation and Daylighting

Nykredit Building

Danish Energy Targets

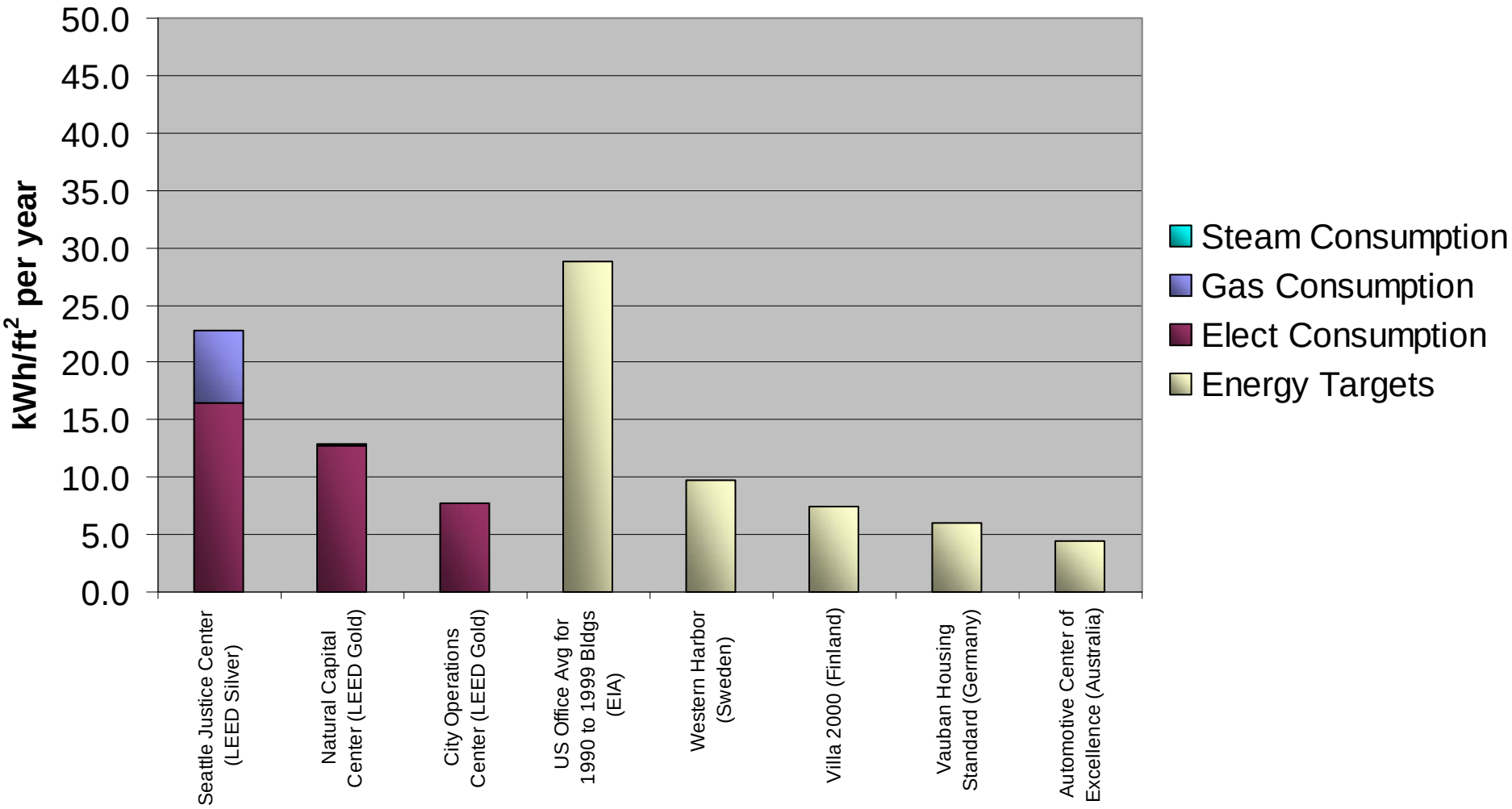
For offices and schools, the annual energy limit to cover space heating, hot water heating, ventilation, cooling and lighting is:

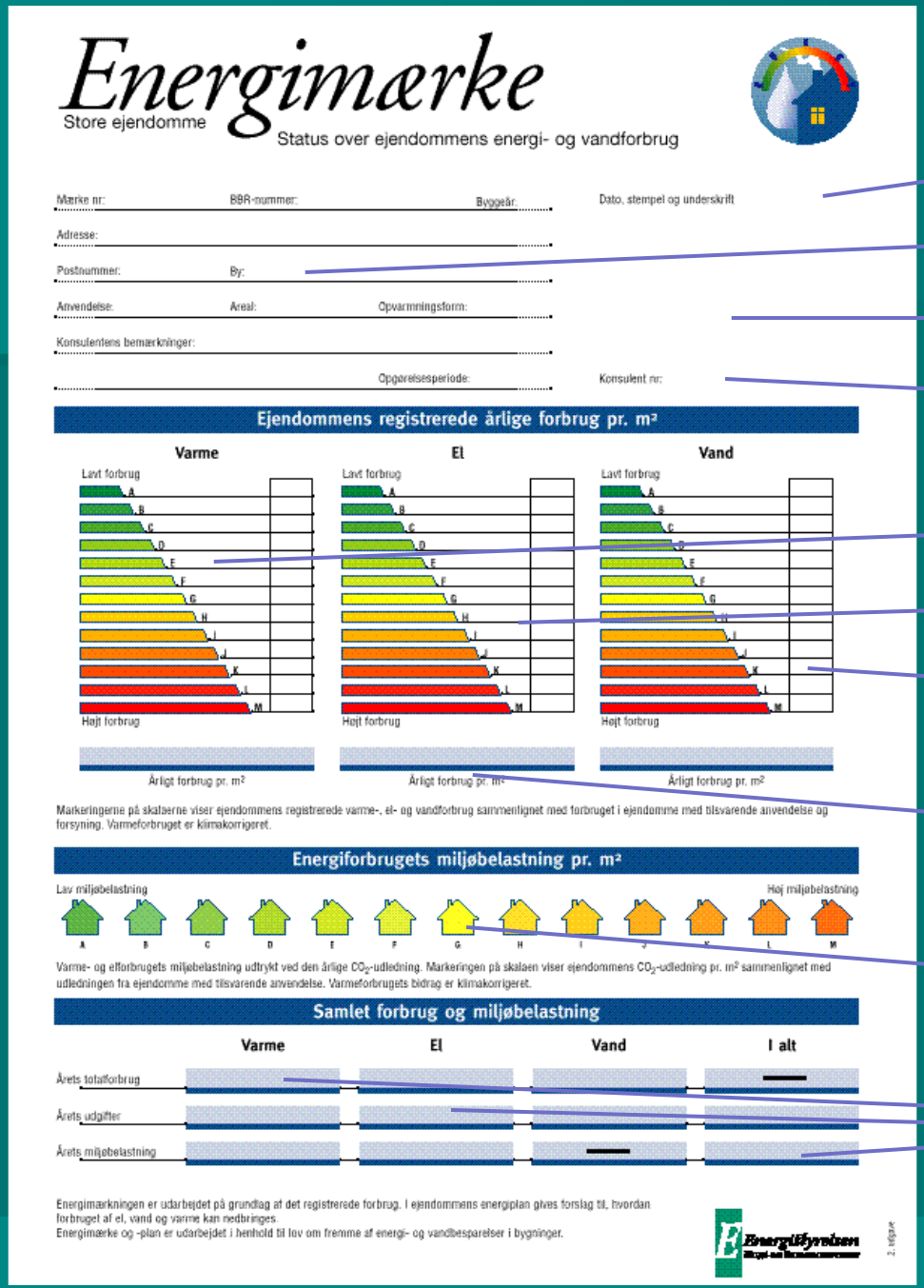
$95 + 2200/A$ kWh/m^2 per year,

where A is the total heated area.

For 1,000 m^2 (10,737 sf) limit is 97.2 kWh/m^2
(equal to 9.05 kWh/sf, or about 30,900 BTU/sf)

Annual Energy Intensity





Energimærke

Store ejendomme

Status over ejendommens energi- og vandforbrug

Mærke nr: BBR-nummer: Byggeår: Dato, stempel og underskrift

Adresse:

Postnummer: By:

Anvendelse: Areal: Opvarmningsform:

Konsulentens bemærkninger:

Opgørelsesperiode: Konsulent nr:

Ejendommens registrerede årlige forbrug pr. m²

Varme El Vand

Lavt forbrug

A B C D E F G H I J K L M

Højt forbrug

Årligt forbrug pr. m²

Markeringerne på skalaerne viser ejendommens registrerede varme-, el- og vandforbrug sammenlignet med forbruget i ejendomme med tilsvarende anvendelse og forsyning. Varmeforbruget er klimakorrigeret.

Energiforbrugets miljøbelastning pr. m²

Lav miljøbelastning Høj miljøbelastning

A B C D E F G H I J K L M

Varme- og elforbrugets miljøbelastning udtrykt ved den årlige CO_2-udledning. Markeringen på skalaen viser ejendommens CO_2-udledning pr. m² sammenlignet med udledningen fra ejendomme med tilsvarende anvendelse. Varmeforbrugets bidrag er klimakorrigeret.

Samlet forbrug og miljøbelastning

	Varme	El	Vand	I alt
Årets totalforbrug				
Årets udgifter				
Årets miljøbelastning				

Energimærkningen er udarbejdet på grundlag af det registrerede forbrug. I ejendommens energiplan gives forslag til, hvordan forbruget af el, vand og varme kan nedbringes.
Energimærke og -plan er udarbejdet i henhold til lov om fremme af energi- og vandbesparelser i bygninger.

Energistyrelsen

2. udgave

Date

Building

Consultant

Signature

Heat rating

Electricity rating

Water rating

Consumption per m²

CO2 Impact

Consumption

Sustainable Energy Strategies

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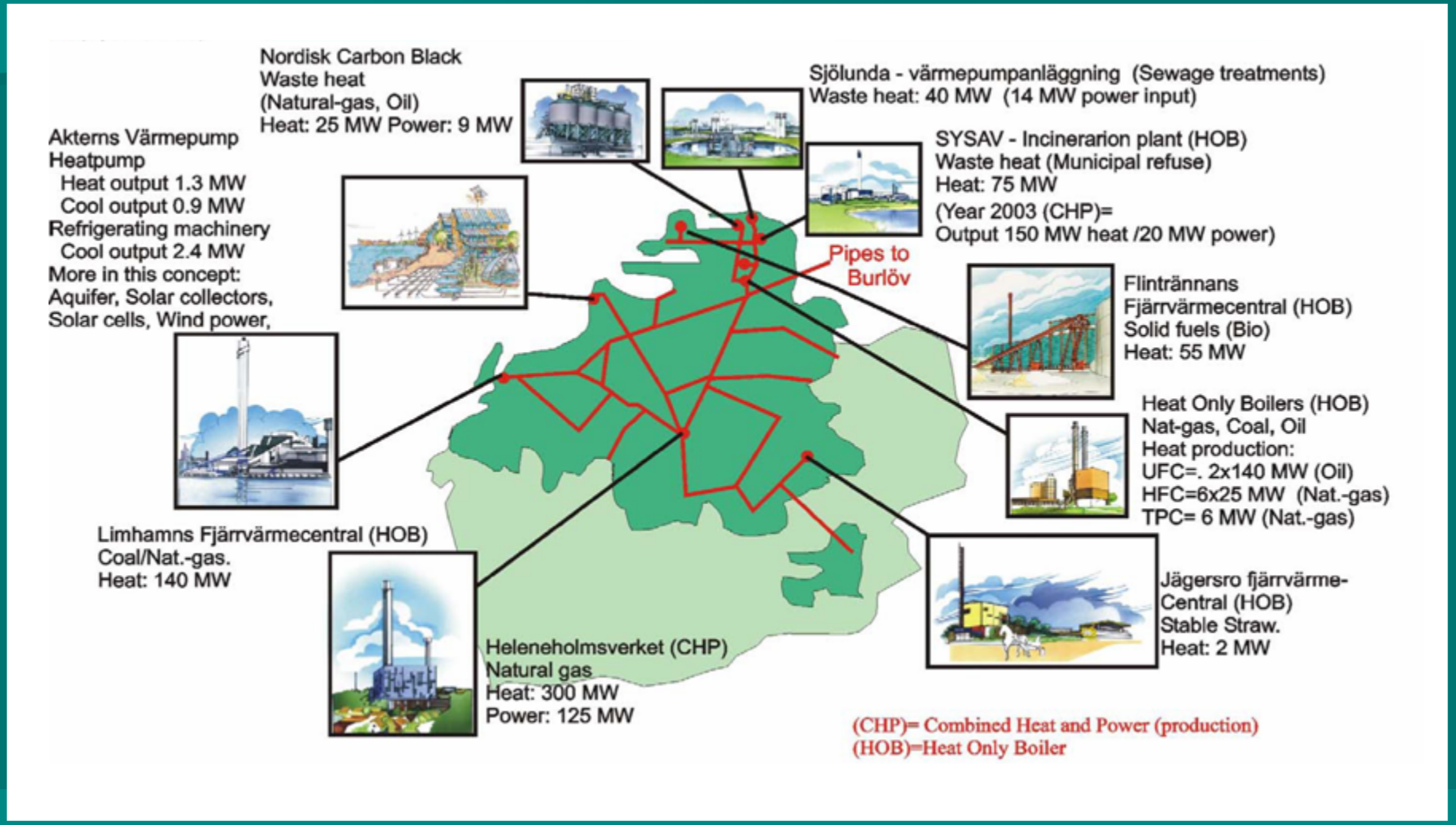
Sustainability can only be achieved if we can move thermal energy as efficiently as electrical energy

District Heating and Cooling

- Provide heating and cooling for residential, commercial and industrial users, replacing boilers and hot water heaters.
- Thermal energy becomes a commodity, just like electricity.
- Systems can serve thousand of customers, and span hundreds of miles.
- Reduces air pollution and CO2 emissions.

Malmö District Energy System



Sustainable Energy Strategies

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Renewable Fuel Sources

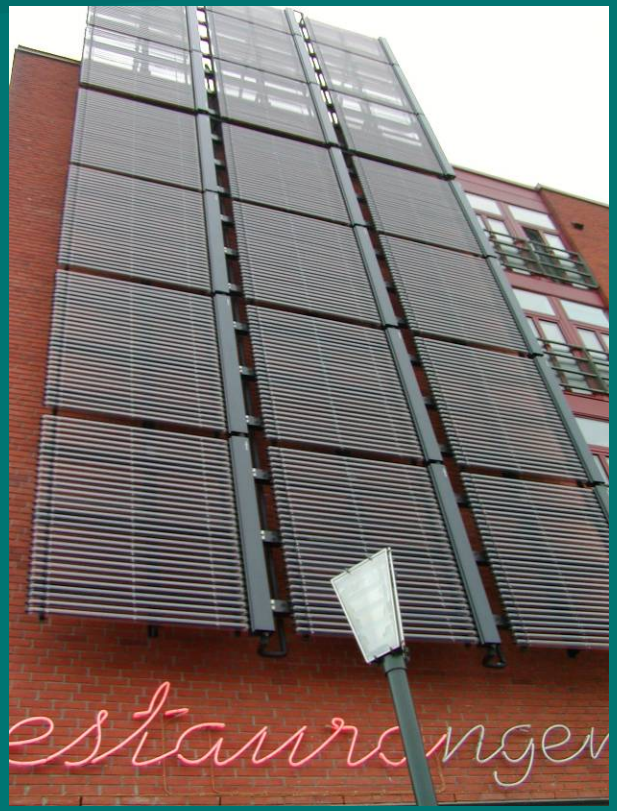
Wind Energy

Wood Chips

Municipal Solid Waste

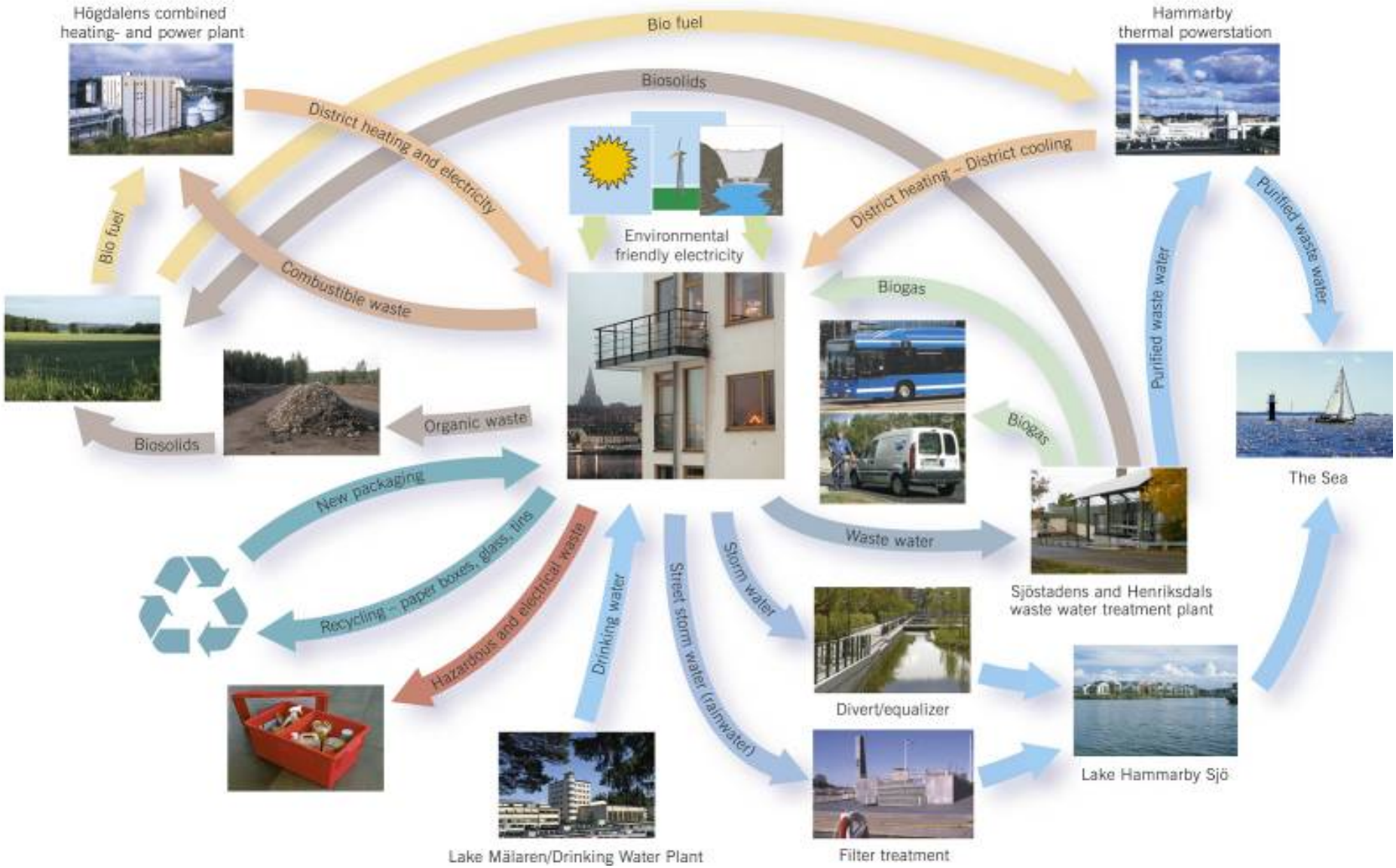
Western Harbor – Malmö

A 100% Renewable Energy District

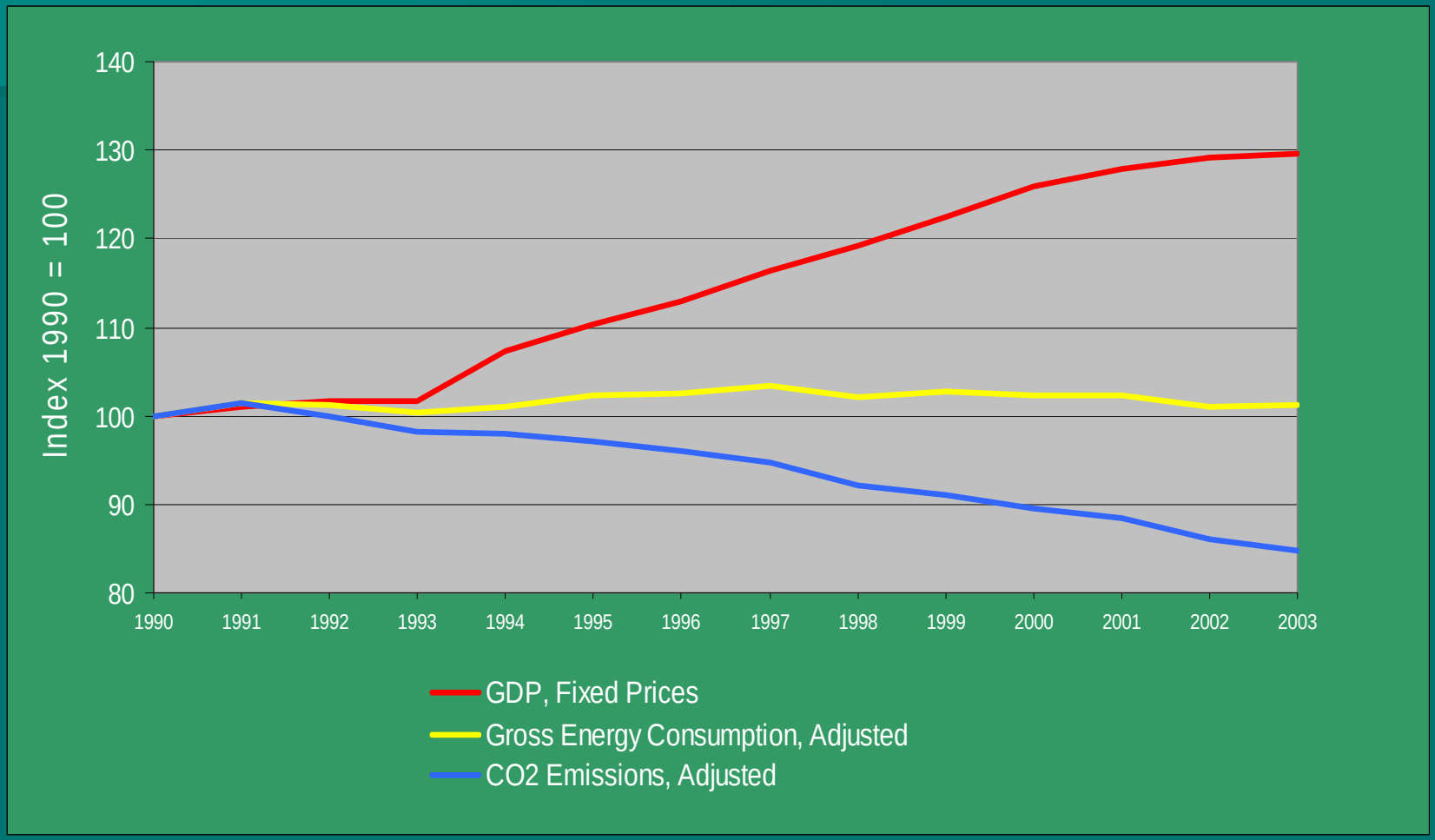


- Buildings are designed to annual energy target of 9.75 kWh per sf.
- Groundwater aquifer heat exchange system for heating and cooling
- 2 MW wind turbine provides electricity for 2,000 homes
- Biogas and photovoltaic panels provide 1% of energy needs
- Thermal solar collectors (vacuum tube and flat plate) – 1,400 m^2 on 10 buildings provides 15% of expected heating loads
- Tied to regional electrical grid and district heating/cooling system

Hammersby Model



Trend in Key Indicators



There is a direct correlation between energy efficiency and global competitiveness – “Energy efficiency is not an alternative to growth, it is a precondition.”

- Svend Auken, former Danish minister of Energy and the Environment

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