Dipl.-Ing. Raimund Meyer, Head of Department Urban Drainage and Sanitation, Umweltbetrieb Bremen

Umweltbetrieb Bremen

Modern infrastructure for management of used water in Europe -

a result of a progressive implementation process

Integrated management of used-water and sanitation
Key elements for establishing livable and inclusive cities– *strategies, instruments and good practices* –
Symposium, 10.- 11. November 2015 in Bremen, Germany

Umweltbetrieb Bremen

Overview

- History of wastewater treatment in Bremen
- Sewerage catchment areas in the region of Bremen
- System characteristics today
- Development of the sewer system in Bremen
- Construction phases wastewater treatment plants Bremen Farge and Bremen Seehausen
- Performance of the wastewater treatment plants
- Discharge of storm water overflow into rivers
- Regulation for indirect discharge of industrial effluents
- Implementation of an energy saving concept
- Development of wastewater fees
- Outlook

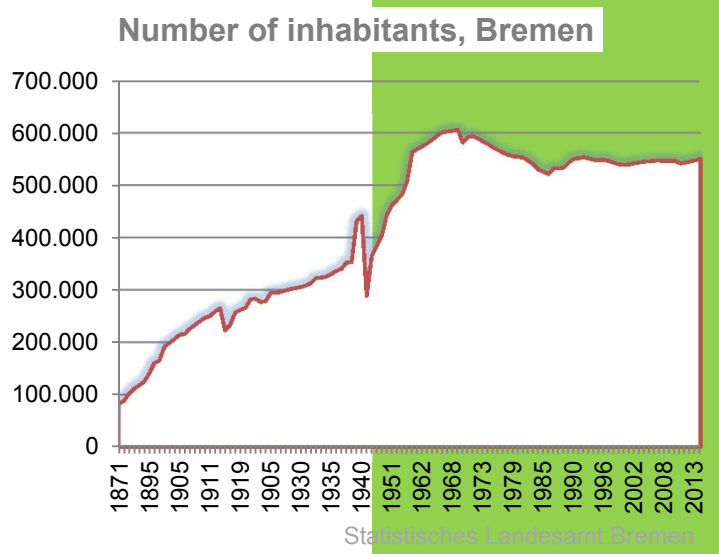
Umweltbetrieb Bremen

History of wastewater treatment in Bremen

In the second half of the 19th century in Germany the rapid industrialization and urbanization shows an increasing impact on the wastewater problem.

Sewage, household garbage and other refuses are collected in buckets and put on the streets. They are emptied and picked up by farmers.

Existing street-draining facilities are not dimen-sioned to handle the high quantities of wastewater produced in the now densely populated city.



Statistisches Landesamt Bremen


„Kladderadatsch“, Bremen 1854

Umweltbetrieb Bremen

History of wastewater treatment in Bremen

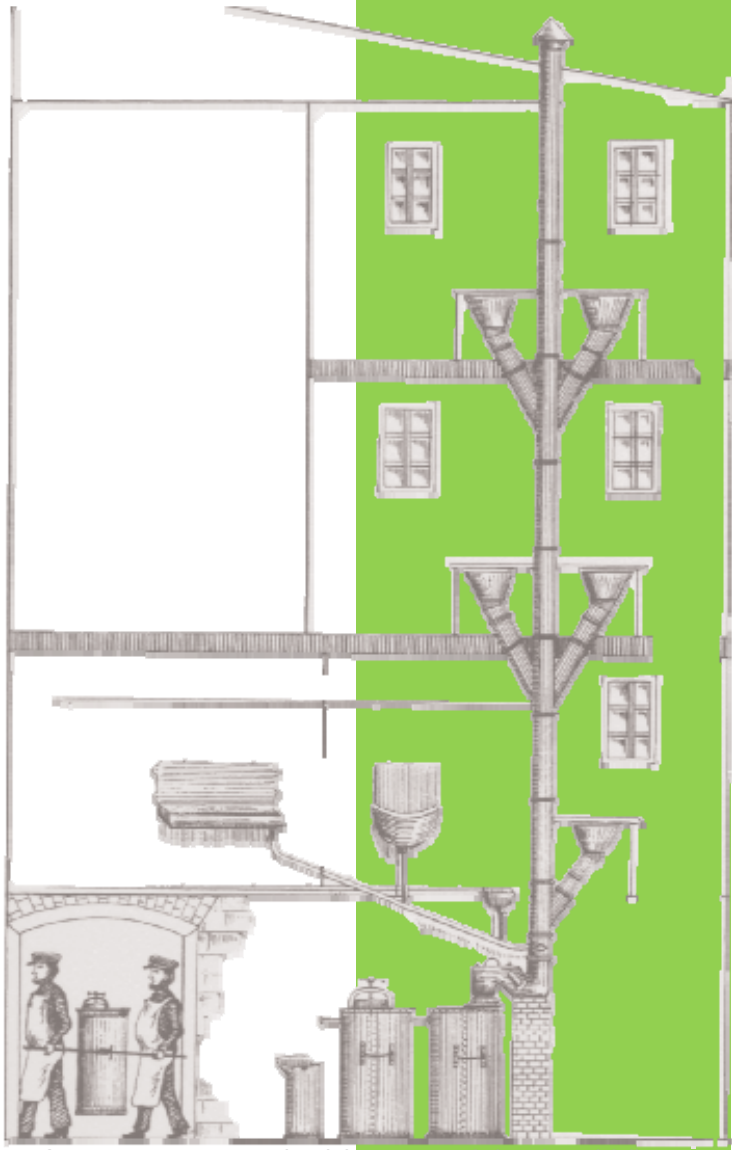
The poor sanitary conditions lead to water borne diseases, to the permanent presence of typhoid fever and cholera epidemics, which have their peak in 1892.

To solve the problem and clean the streets and alleys from urine and faeces Bremen introduces a “bin-system” The “bins” are collected by one single company “Schieten-Alfes”, operating a “Poudrette-Factory”.

The demand for Poudrette-fertilizer is low, and the costs are high, the new inorganic fertilizers are in fashion. Another solution has to be found.

1903 Bremen decides to expand the sewer system to a water-borne sewerage system. Until 1906 the number of “bins” is reduced from 30.000 to 6.000.

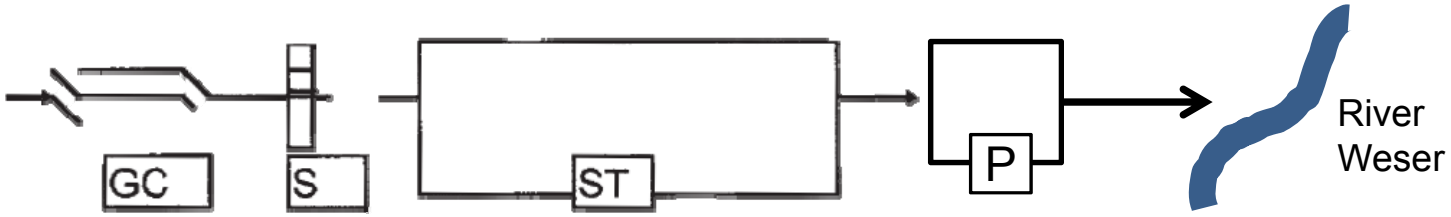
1910 The first public works authority is established.
A solution needs to be found how to drain the wastewater from low lying urban areas into the receiving waters.



cf: Bremer Entsorgungsbetriebe, Vom Aufstieg des Abfalls, 2003

History of wastewater treatment in Bremen

1911 The sewerage system is further extended.
Three **electrical pumping stations** are being installed from where the water is collected and pumped- via a 11 km forcemain - into the river Weser. To protect the pumps a “primary treatment” is implemented.



(GC) grit chamber , (S) screen, (ST) settling tank, (P) pumping station

modified according to Seeger, H. European Water Management, Volume 2, Number 5, 1999

1945 nearly 60% of Bremen‘s **infrastructure is destroyed**. The number of inhabitants has decreased to 290.000. Reconstruction of the sewer network is one main long-term objective.

In the following 20 years the number of inhabitants rises rapidly. New urban districts are being built and -in the outskirts- equipped with a **separate sewer system**.

Umweltbetrieb Bremen

History of wastewater treatment in Bremen

1966 The first **wastewater treatment plant** with a mechanical treatment is being built in Bremen-Seehausen.

1973 The **second wastewater treatment plant Bremen- Farge** for the catchment area Bremen-North is constructed with mechanical and biological treatment.

1976 The Weser **river** suffers from **anoxic conditions** and needs to be artificially aerated.

1980 The wastewater treatment plant Bremen Seehausen is being equipped with a **biological treatment** in order to increase the water quality of the Weser river.

1986 The rehabilitation programme "Mischwasser 90" is implemented as a **river-water protection** measure.

1988 The mass mortality of harbour seals in the North Sea serves as an incentive to implement strict regulations for nutrient reduction.

background image Bremen –Farge cf. hanseWasser Bremen GmbH

Umweltbetrieb Bremen

History of wastewater treatment in Bremen

1992 First “Earth Summit” held in Rio de Janeiro, Agenda 21 has an impact on local activities.

Foundation of the “Bremer Entsorgungsbetriebe” as a public utility

1993 Enhancement of the treatment plants **nutrient removal**

-1997 capacities (tertiary treatment).

1996 The wastewater fee increases from DEM 2,95 (2,06€) to DEM 5,10 (2,65€)

1999 **Partial privatization** of the “Bremer Entsorgungsbetriebe” and formation of the HanseWasser Bremen GmbH.

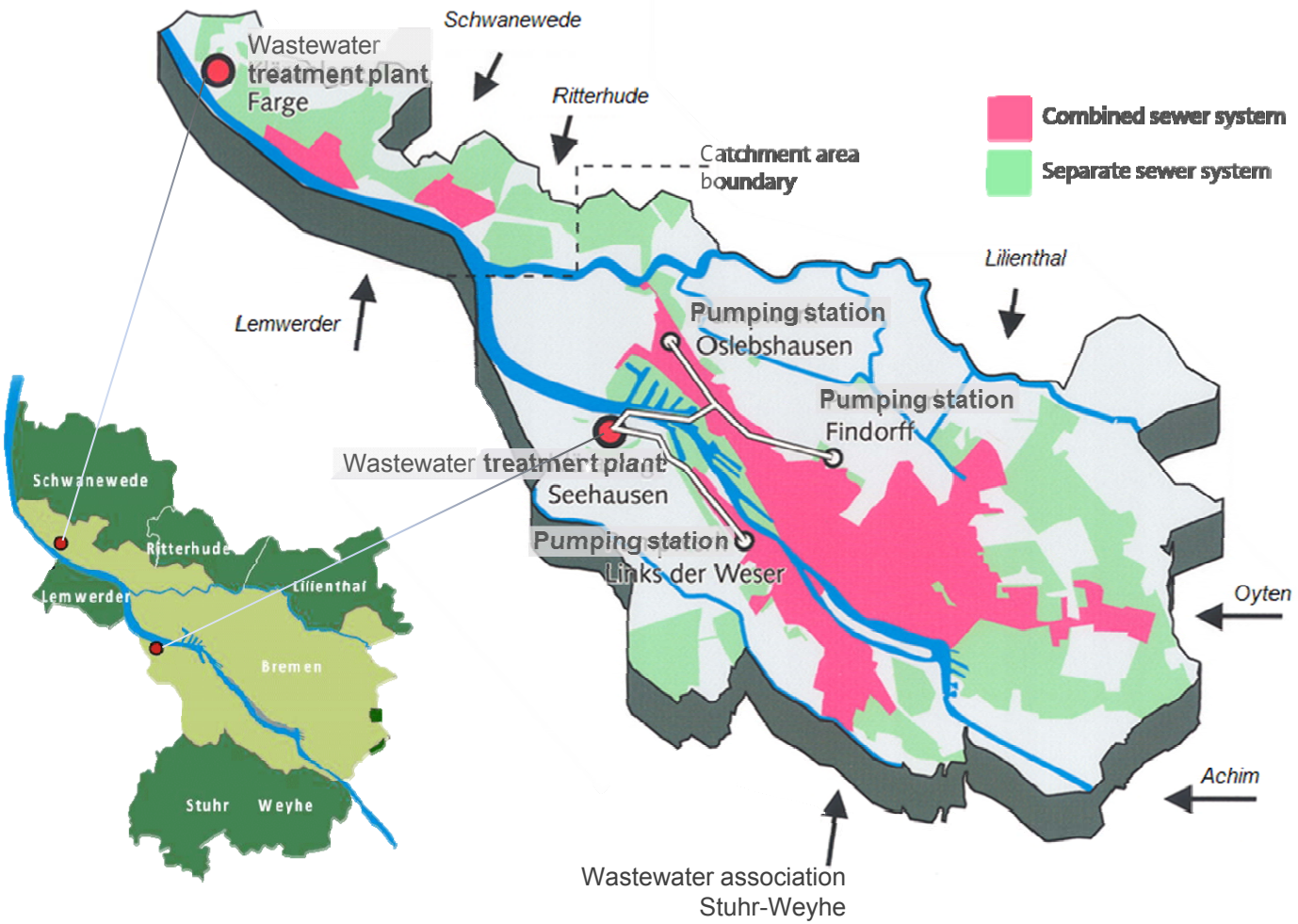
2000 **European Water Framework Directive** - increase of environmental policy requirements

2010 HanseWasser sets the goal to reach **carbon neutrality** in 2015

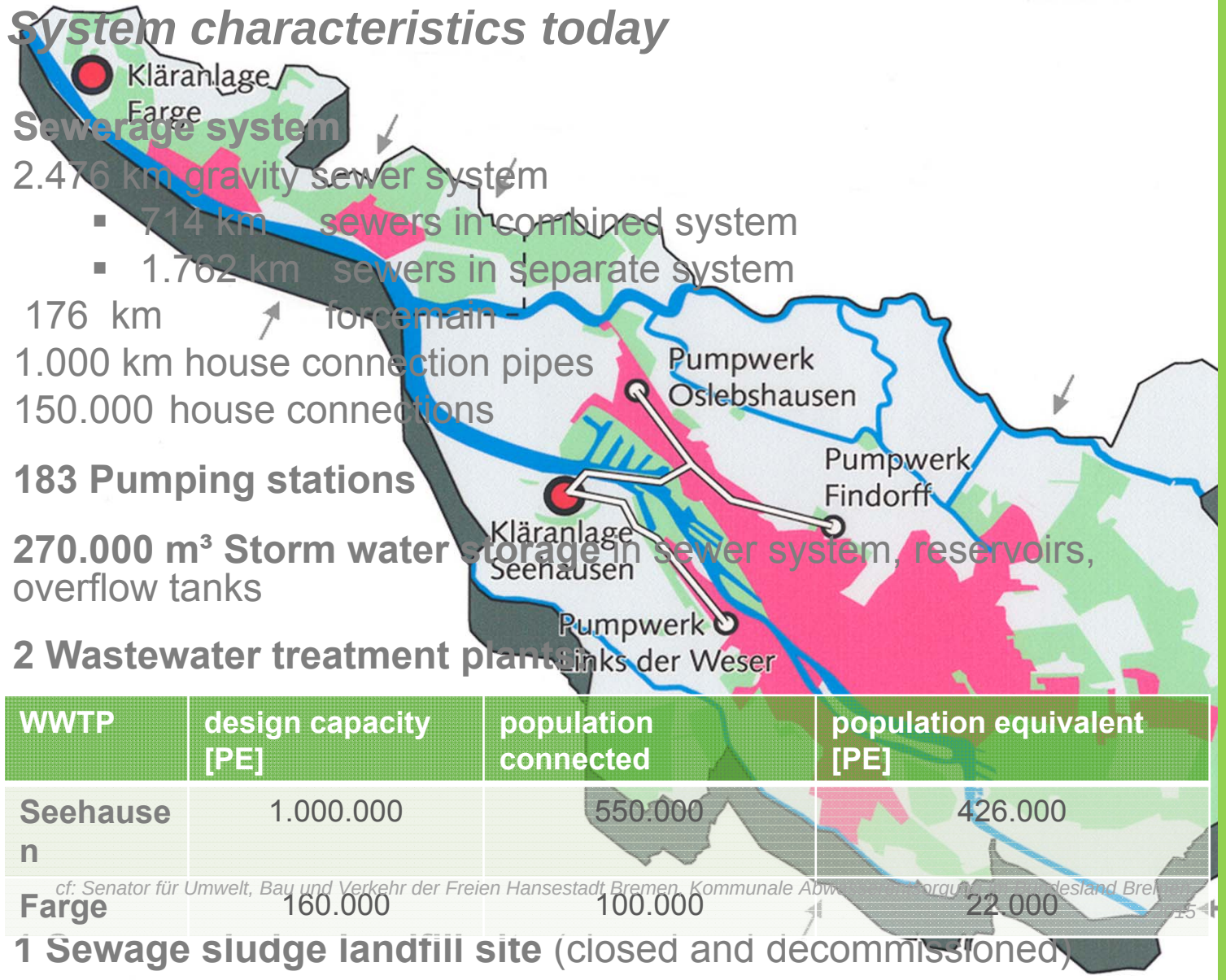
2014 Carbon neutral treatment of up to 80 Mio m³ wastewater per year at WWTP - Seehausen.

background image: cf. Senator für Umwelt, Bau und Verkehr der Freien Hansestadt Bremen, Kommunale Abwasserentsorgung im Bundesland Bremen, 2015

Sewerage catchment areas in the region of Bremen



System characteristics today



Sewerage system

2.476 km gravity sewer system

- 714 km sewers in combined system
- 1.762 km sewers in separate system

176 km forcemain

1.000 km house connection pipes

150.000 house connections

183 Pumping stations

270.000 m³ Storm water storage in sewer system, reservoirs, overflow tanks

2 Wastewater treatment plants

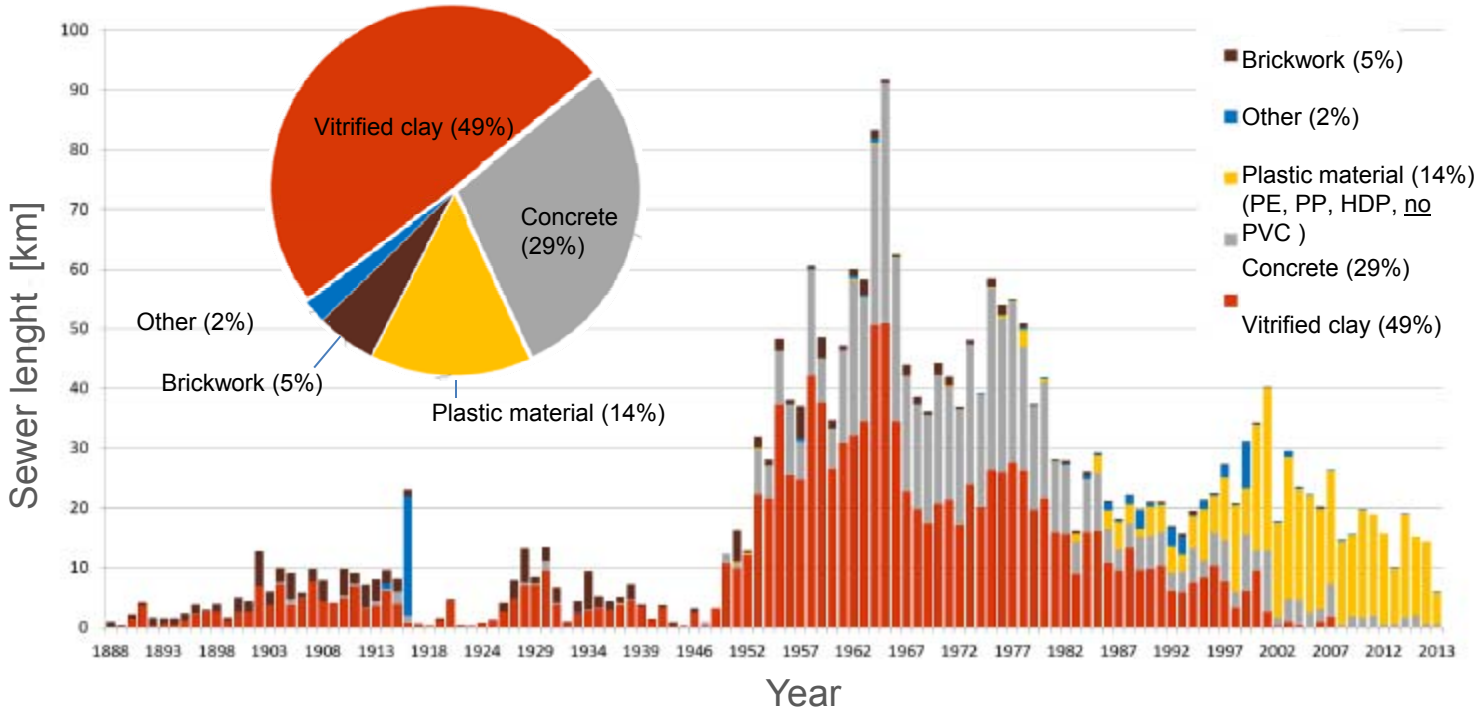
WWTP	design capacity [PE]	population connected	population equivalent [PE]
Seehausen	1.000.000	550.000	426.000
Farge	160.000	100.000	22.000

1 Sewage sludge landfill site (closed and decommissioned)

cf: Senator für Umwelt, Bau und Verkehr der Freien Hansestadt Bremen, Kommunale Abwasserentsorgung im Bundesland Bremen

Development of the sewer system in Bremen

Sewer system; year of construction and materials used



cf: hanseWasser Bremen GmbH, Kanalgipfel 01.10.2015

Construction phases treatment plant Bremen Farge

Treatment of
15.714 m³/d
5,74 Mio ³/a
(2011)

1968-1973 First construction phase

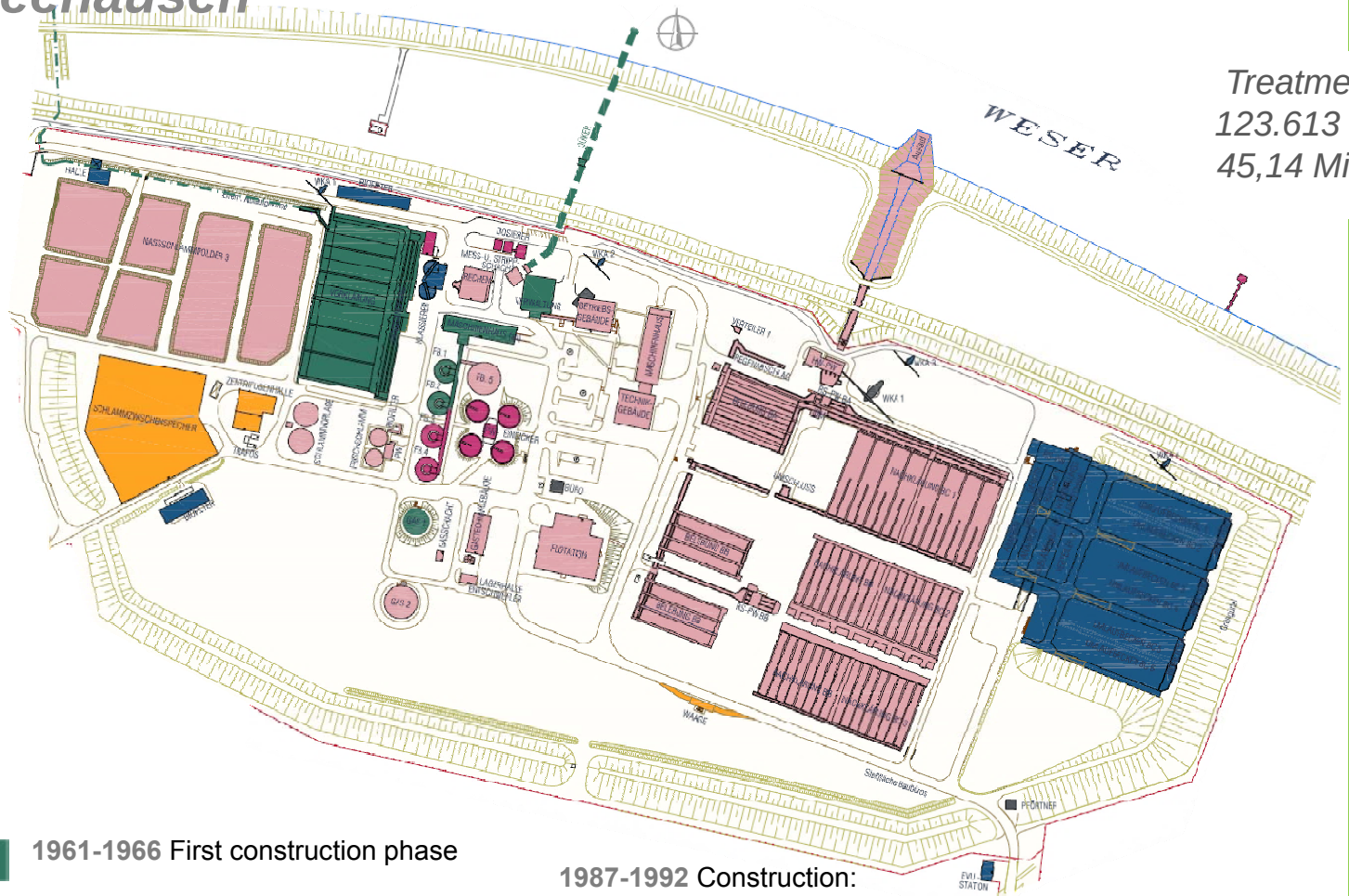
until **1992** extension and retrofitting

1993-1994 implementation tertiary treatment
1993-2010 renovation measures

2012 construction of a new sludge dewatering station and a sludge thickener

cf: PFI Planungsgemeinschaft GbR, Kläranlage Bremen-Farge, Lageplan mit Ausbauphasen, 2013

Construction phases treatment plant Bremen Seehausen



Treatment of
123.613 m³/d
45,14 Mio ³/a
(2011)

1961-1966 First construction phase

1967-1979 Extension and Reconstruction

1980-1986 Construction: biological treatment and sludge treatment

1987-1992 Construction:
new sludge storage (sludge utilisation in agriculture)

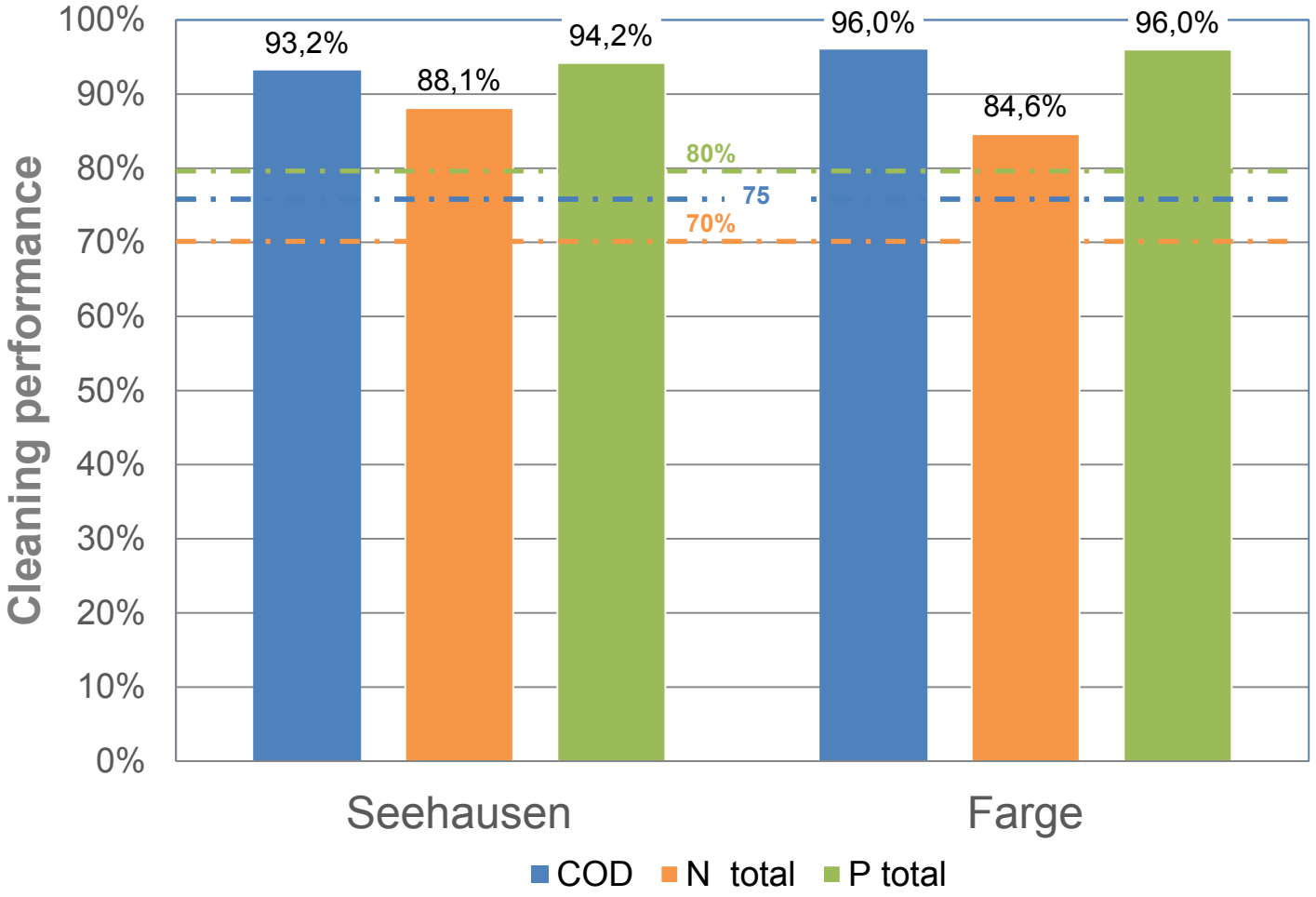
1993-1997 Construction:
advanced treatment (nutrient removal)

since 1999 further (re-) constructions

cf: hanseWasser Bremen GmbH, KA Bremen-Seehausen, Gebäudeplan Errichtungsphasen, 2012

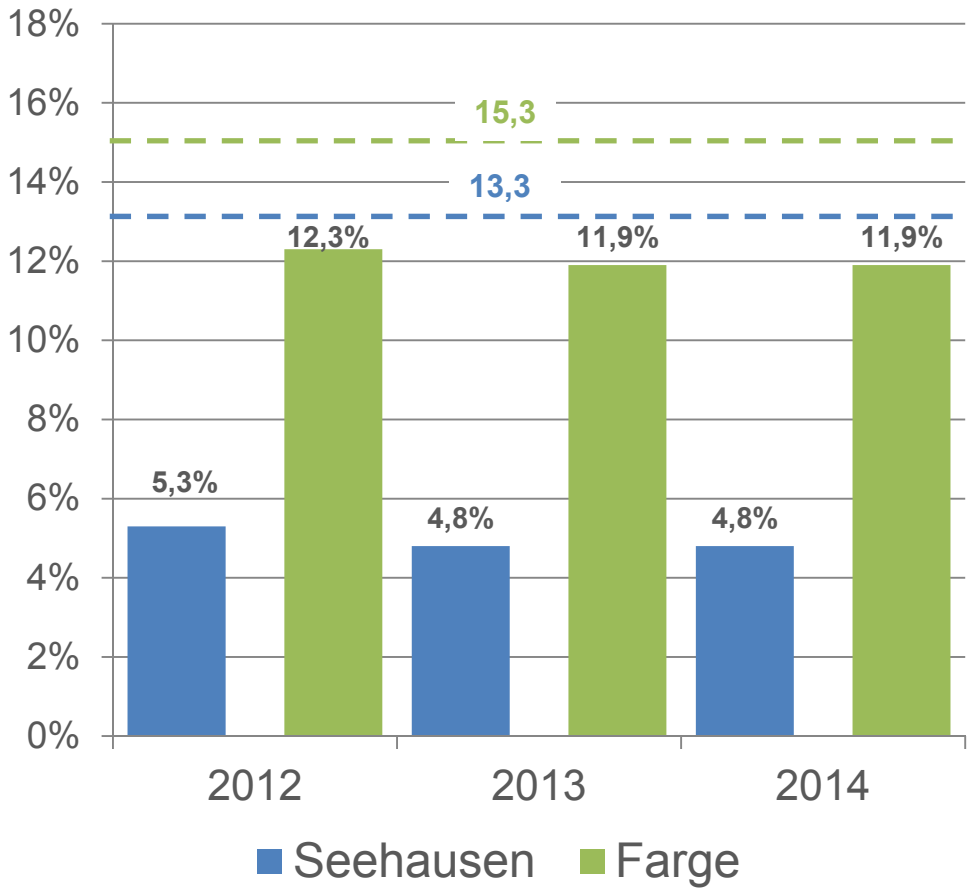
Umweltbetrieb Bremen

Treatment performance of the wastewater treatment plants



cf: Senator für Umwelt, Bau und Verkehr der Freien Hansestadt Bremen , Kommunale Abwasserentsorgung im Bundesland Bremen, 2015

Storm water overflow discharge



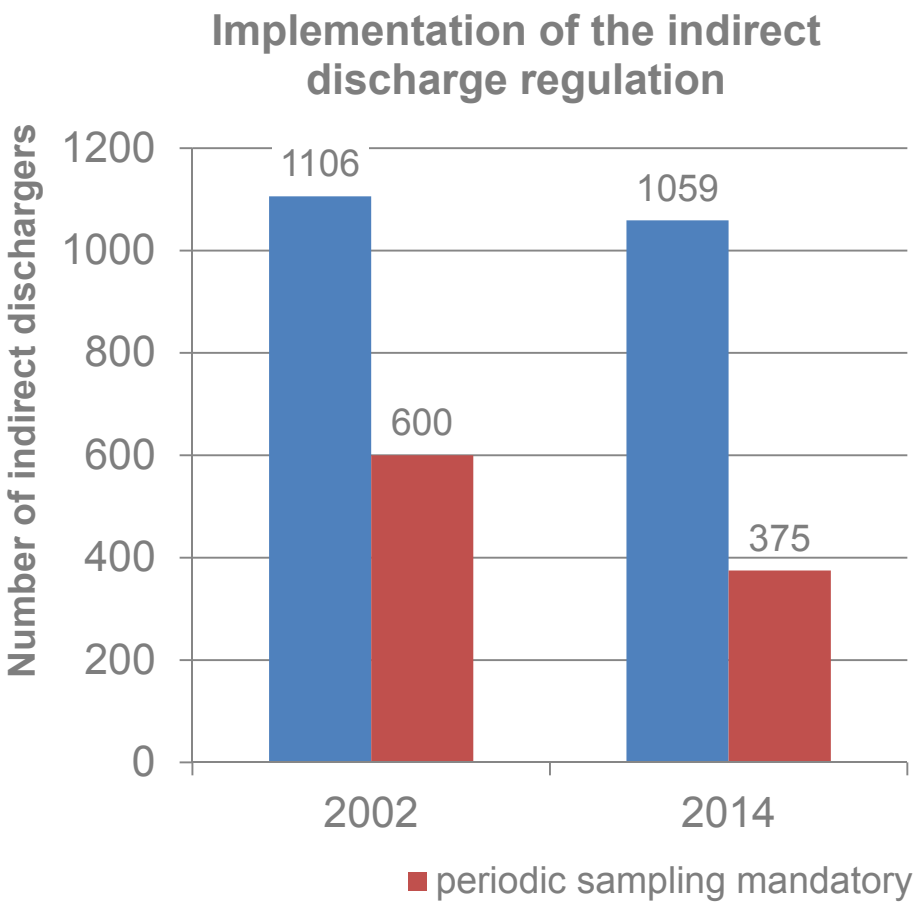
The annual storm water overflow discharge rates are lower than the legal provisions.

The overflow from storm water reservoirs is mechanically pre-cleaned.

Since 2002 the discharge can be monitored and remote-controlled automatically in the control centre at WWTP-Seehausen.

cf: hanseWasser Bremen GmbH, Umweltbericht 2015

Implementation of the indirect discharge regulation



Industrial waste water is polluted by various production processes and usages.

Substances that can only be inadequately treated in a municipal sewage plant (such as heavy metals) need to be pre-treated in appropriate treatment facilities before being discharge into the sewer network.

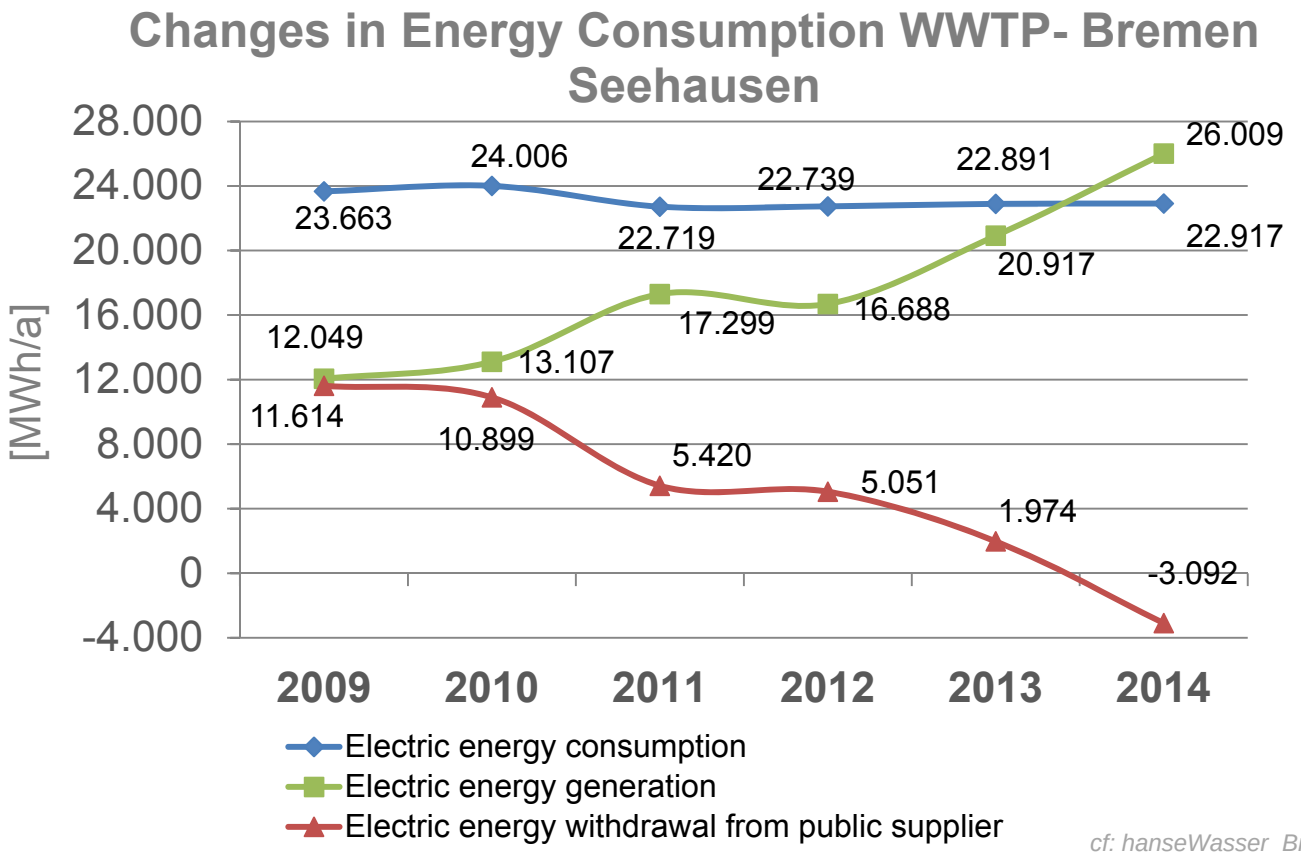
Indirect dischargers need to be monitored and the compliance with threshold value verified.

Regular annual inspections are necessary.

cf: Senator für Umwelt, Bau und Verkehr der Freien Hansestadt Bremen , Kommunale Abwasserentsorgung im Bundesland Bremen, 2015

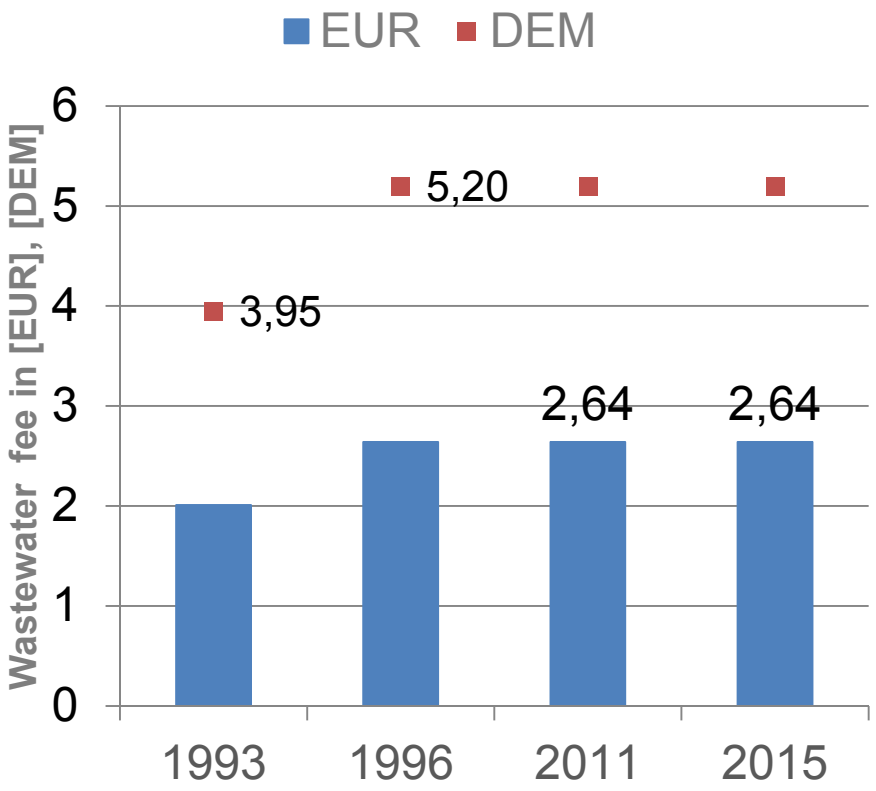
Implementation of an energy saving concept

The challenge in Germany nowadays is, to reach 100% self sustain-ability for the sewage treatment.
Therefore energy generation must be risen and energy consumption reduced.



cf: hanseWasser Bremen GmbH,

Development of wastewater fees



cf: hanseWasser Bremen GmbH, Kanalgipfel 01.10.2015

Since 1996 the wastewater fee is stable in Bremen.

2011 a split fee is implemented:

Rainwater 0,72 €/m²

Sewage 2,31 €/m³

In comparison, the rate of price increase has risen from 1999 until today up to +125%.

In the same time the corresponding volume of fresh water is reduced by 10%.

Umweltbetrieb Bremen

Outlook

Future challenges:

- Investment strategies for sewer network and wastewater treatment plants.
- Integrated storm water management – storm water flood simulation.
- Micro-pollutants control – is a fourth treatment required?
- Sewage sludge strategy – phosphorus recovery?

Umweltbetrieb Bremen

Thank you, enjoy your day in Bremen!

Umweltbetrieb Bremen
Eigenbetrieb der Stadtgemeinde
Willy-Brandt-Platz 7
28215 Bremen
Telefon +49 421 361-9319
Telefax +49 421 361-9517
E-Mail office@ubbremen.de
www.umweltbetrieb-Bremen.de

Administrative organisation of wastewater management in the City of Bremen