

Braunschweig – Reuse of treated wastewater and quality-proven sludge in agriculture

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Abwasserverband Braunschweig

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History of wastewater reuse in Braunschweig

- 1894 Initiation of the first irrigation fields
 - 1954 Formation of the Sewage Board (formerly called water and soil board)
 - 1955 – 1966 Extension of the 4 drainage areas approx. 3000 ha
 - 1955 – 1979 Sprinkler irrigation of mechanically pre-treated wastewater
 - 1979 – 1991 Construction of the treatment plant in 4 stages
 - 1985 – 1990 Modification of the irrigation fields
 - 2000 Construction of the sludge digester
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Sprinkling - Area

General plan

The area of the
Sewage Board

Irrigation

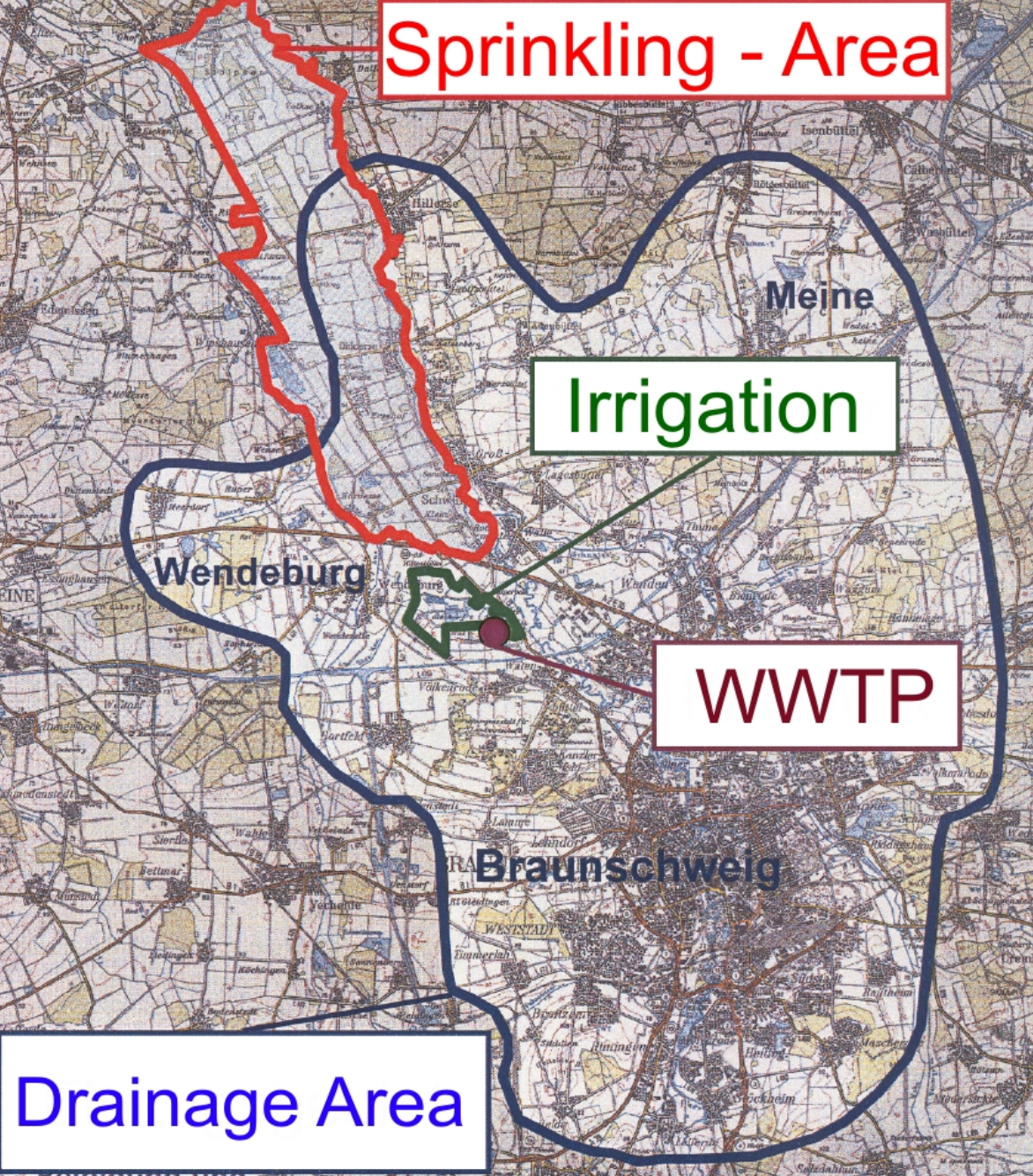
WWTP

Wendeburg

Meine

Braunschweig

Drainage Area

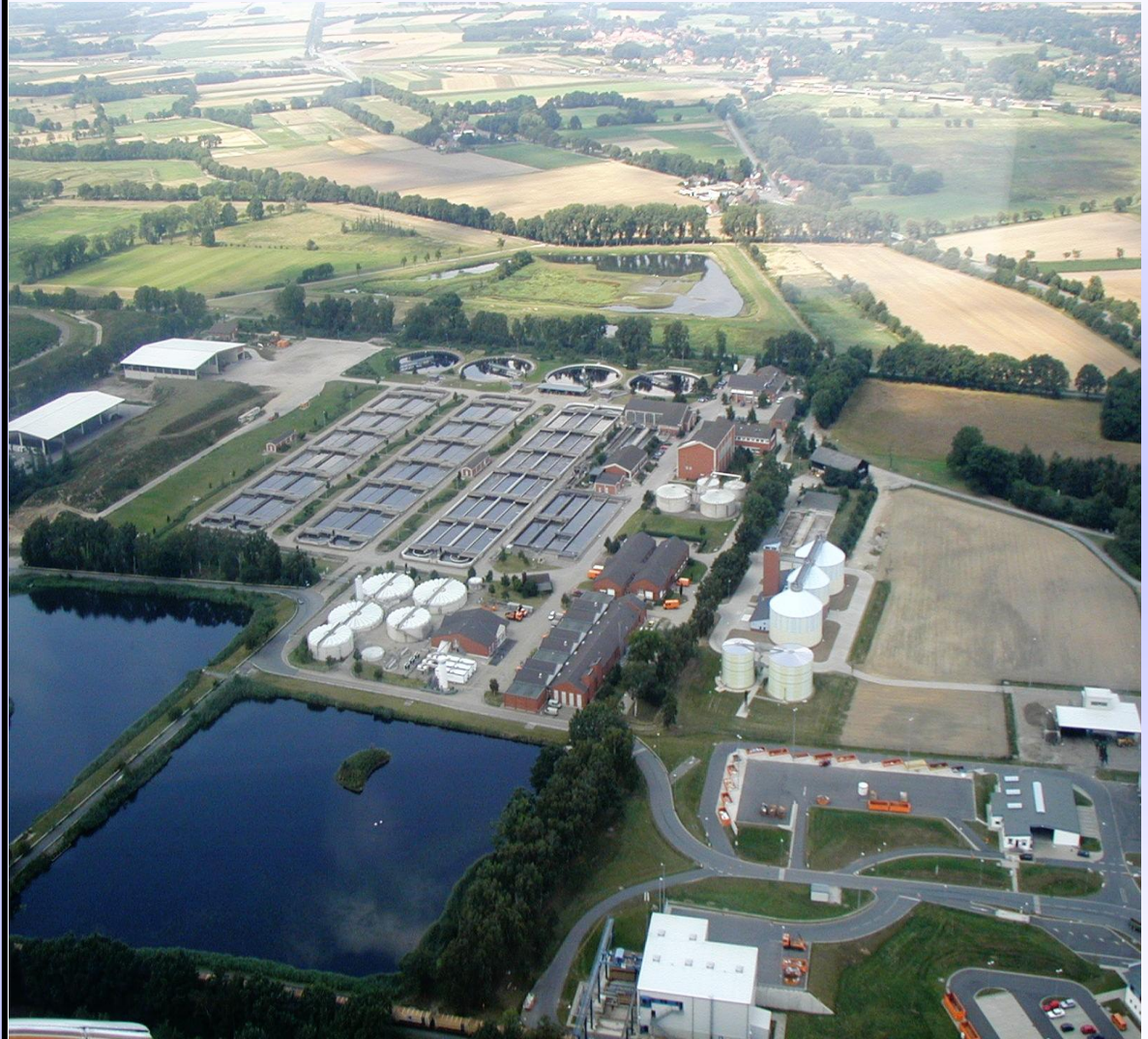


Treatment plant Steinhof

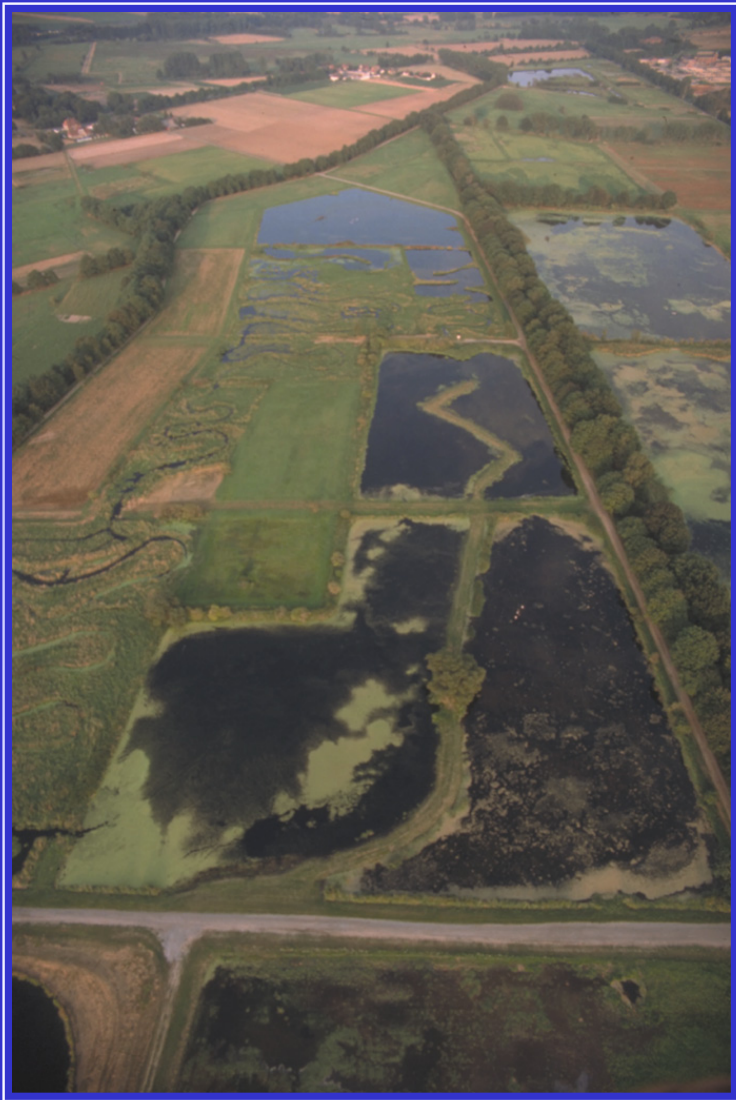
Population
equivalents:
385 000

Treatment process:
mechanical
biological
nutrient removal

Flow:
60 000 m³/d



Irrigation fields Steinhof



Sprinkler irrigation

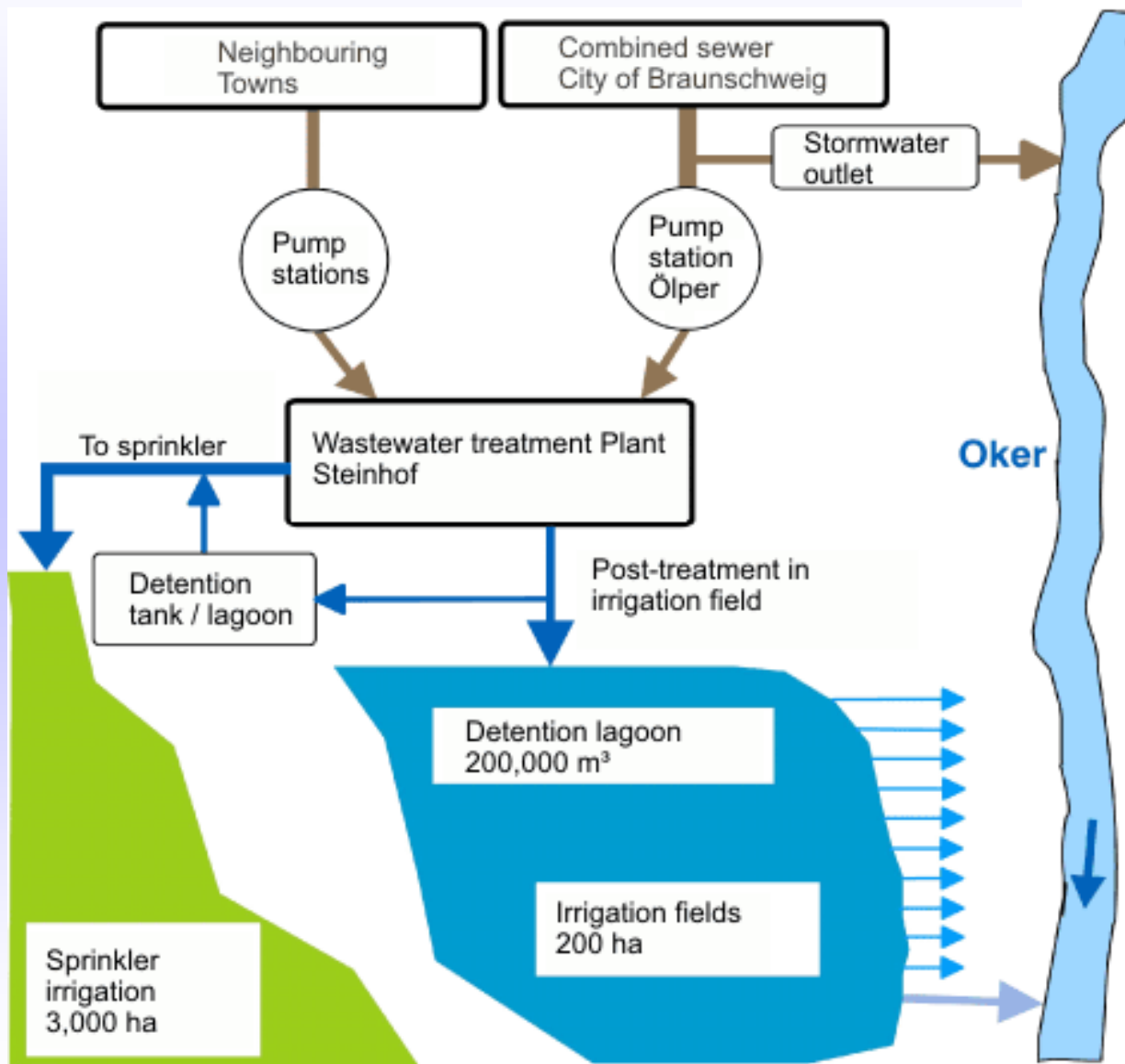
Sprinklers from 1956 - 1974



...and since 1974

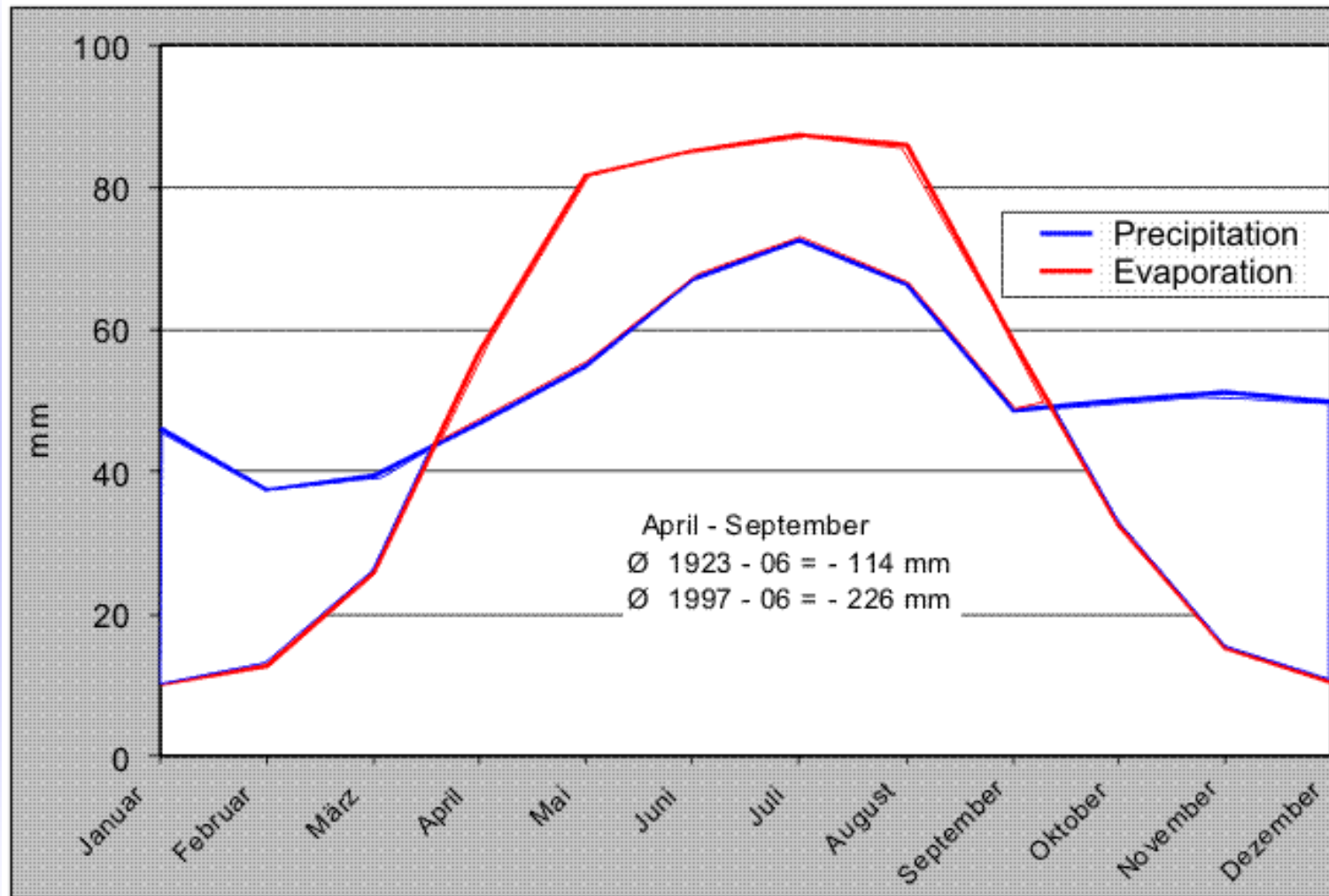


Concept for wastewater reuse

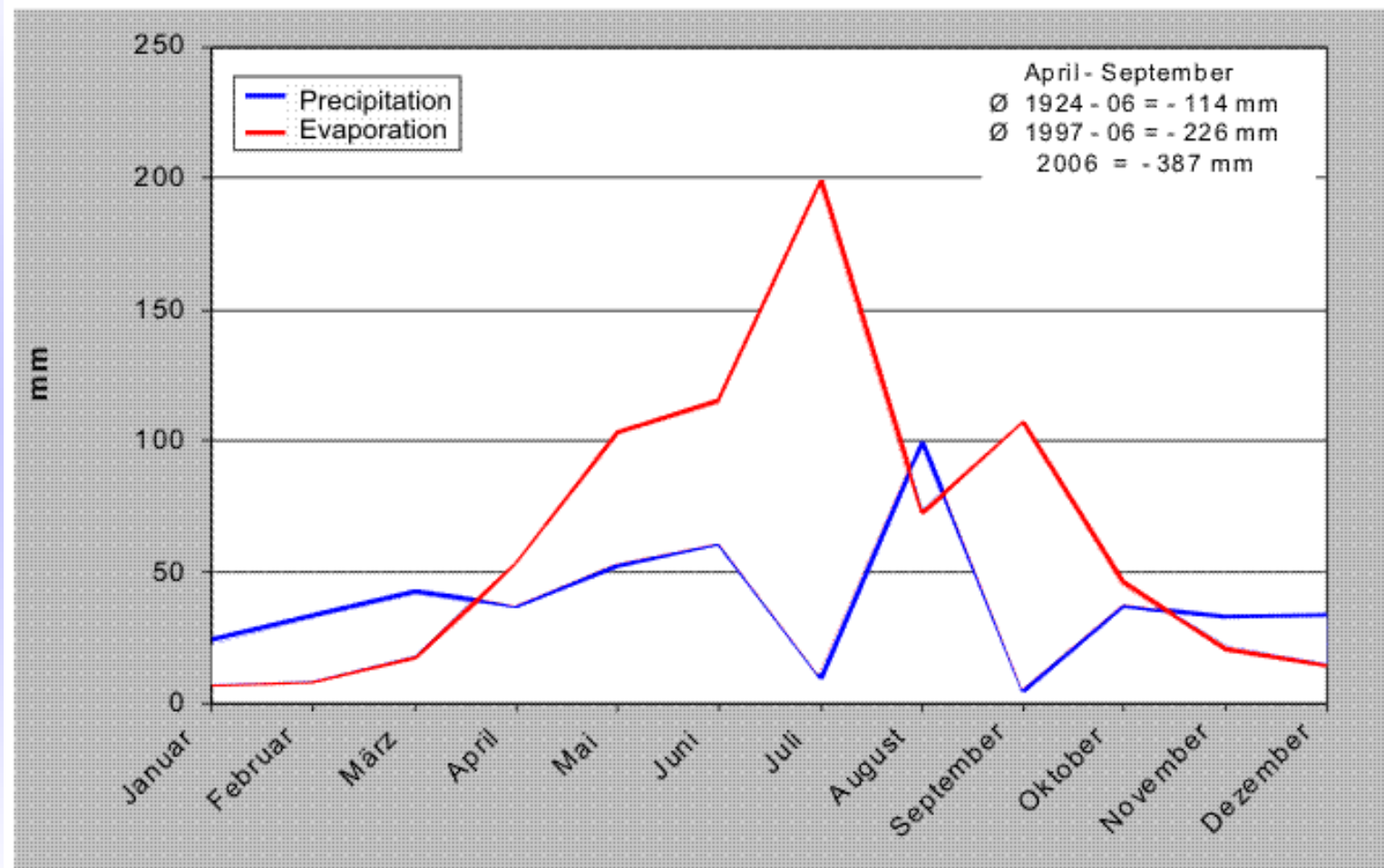


Necessity of irrigation and advantages of wastewater reuse in agriculture

Average water balance 1923 - 2006



Water balance 2006

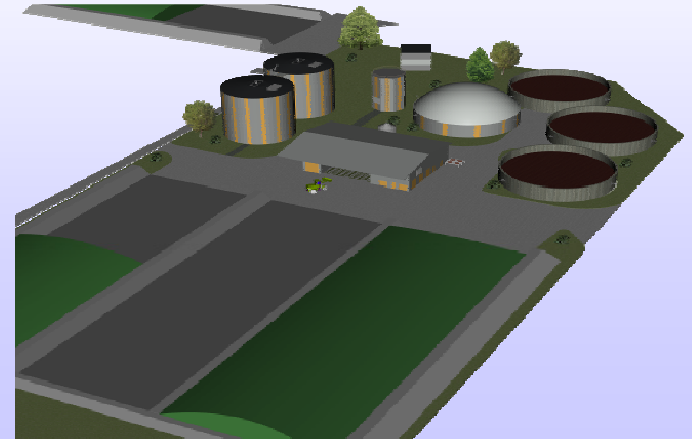


Cultivation in the irrigation area

	1950	1970	1990	2007
	%	%	%	%
Crop	42	39	60	30
Potatoes	26	20	6	6
Sugar-beets	6	16	25	19
Maize	0	2	2	38
Other	26	23	7	7

Cultivation of renewable resources

On approx. 38 % of the total “Sewage board-area” renewable resources for the generation of biogas are cultivated.



Features of the biogas plant Hillerse

- total capacity 2,5 MW_{el}
- 2 x 1 MW_{el} at Ölper (BS Energy)
- 20 km gas pipeline from Hillerse to Ölper powerplant
- 1 x 0,5 MW_{el} at Hillerse

Relevance of wastewater reuse and its ingredients for resources conservation

Wastewater flow



Annual amount of treated water 21 Mill.m³/a

Hereof: reused by sprinkler irrigation 15 Mill.m³/a

artificial groundwater recharge 6 Mill.m³/a

Additional water demand for irrigation

approx. 100 mm on 3000 ha 3 Mill.m³/a

Total amount of water for artificial
groundwater recharge

12 Mill.m³/a

This corresponds to the drinking water demand in the area of
the sewage board!

Amount of sludge generated

Primary sludge and activated sludge	6,800 t TS/a (total solids/year)
Reduction by 30 % by digestion anaerobic digested sludge	2,050 t TS/a 4,750 t TS/a
hereof: ~ 60 % sprinkler irrigation in the „Sewage board-area“	2,750 t TS/a
~ 40 % elsewhere reused in agriculture	2,000 t TS/a

Ø Nutrient load and nutrient demand 2006 (kg/ha)

	Load	Demand
• Total nitrogen N	87	
• Ammonium, nitrate	50	142
• Phosphate P ₂ O ₅	69	70
• Sodium K ₂ O	78	130
• Sulphur S	105	25
• Magnesium MgO	38	45
• Calcium CaO	318	380

Organic Substance 640 kg/ha

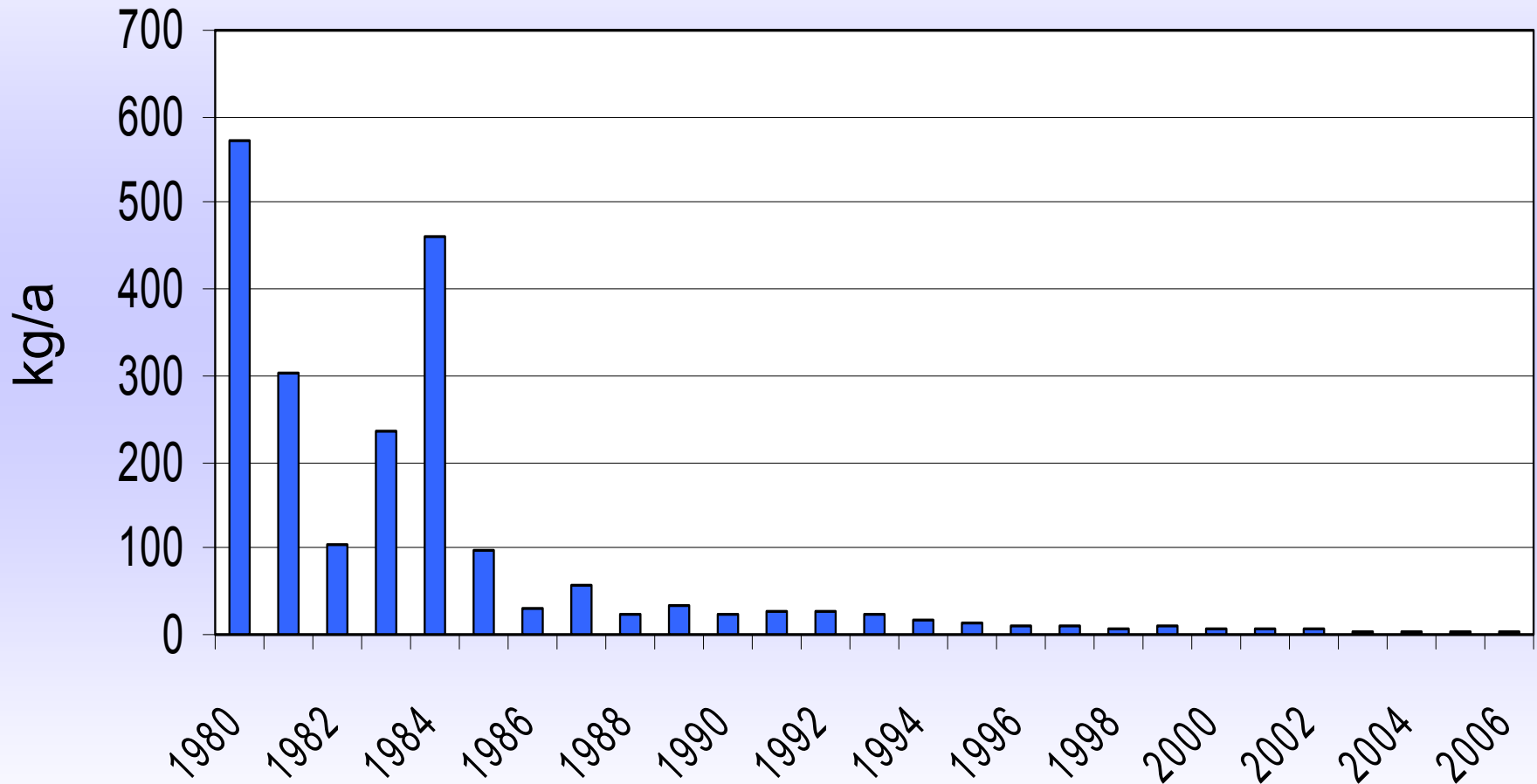
This corresponds to about 2.3 t/ha compost.

Arrangements for the protection of soil and groundwater

Indirect discharger monitoring in Braunschweig for 25 years

• Dry-cleaner	2
• Glass processing	6
• Breweries	1
• Chemical Companies	1
• Print shops	16
• Food industry	6
• Institutes and Laboratories	26
• Metal industry	10
• Garages, petrol stations etc.	262
• Hospitals	7
• Waste disposal sites	3
• Water treatment plants	20
• Varnish production	6
• Other	35
• Sum Discharger	401

Cadmium-load in digested sludge



Consultancy for farmers



- Support of cultivation of intertillage to hold nutrients in the soil during groundwater recharge
 - Fertilisation tests of sugar-beets, winter wheat, winter rapeseed und maize
 - N_{\min} -analysis to determine the subsequent supply of nitrogen of the soil
 - Extensive information on the fertilisation-effect of the sprinkler-water in the „sewage board-area“ due to weekly analyses
 - Balance of total amount of sprinkler-water and allocation of the nutrient load (approx. 12,000 checks/a)
-

Water-monitoring



For 45 years:

Testing of 6 discharge points from 500 ha drained area and groundwater testing of 3 of 33 observation wells by the water authority (analysis of 4 samples / year)

Parameters: pH, electrical conductivity, dissolved oxygen, total-P, nitrite-N, nitrate-N, ammonium-N, organic bound nitrogen, TOC, COD, BOD5

Receipt of QLA-certificate (quality assurance) for agricultural sludge utilisation 5.02.2007



Résumé and outlook

Advantages of water reuse

For inhabitants

- high treatment efficiency
- no filtration necessary
- solution for sludge disposal

For water re-users (farmers)

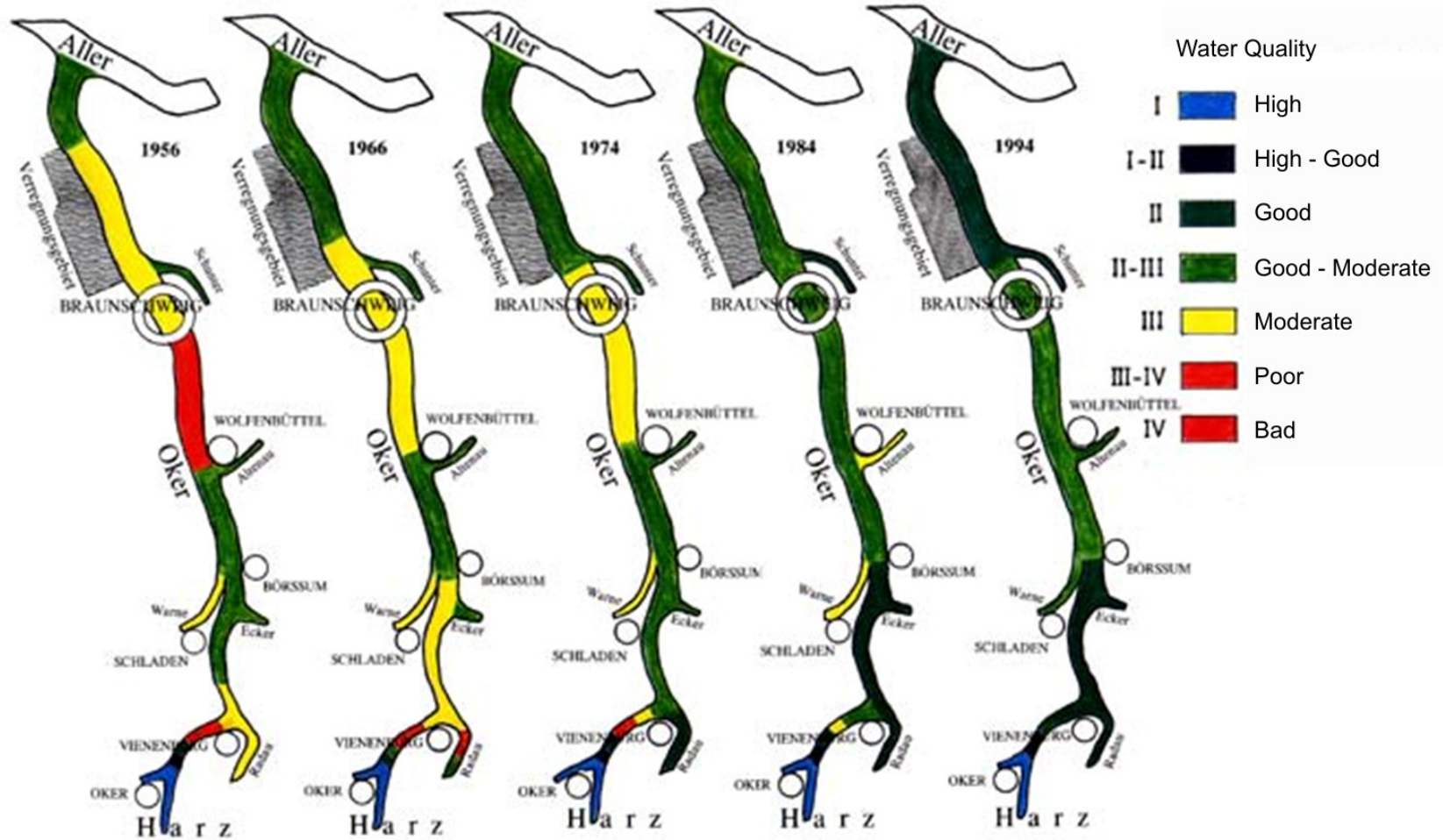
- supply and application of sprinkler water
 - use of nutrients
 - use of organic ingredients
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Advantages of water reuse

For the environment

- Ecology / water resources
 - Resources conservation
 - Prevention of contamination of rivers
 - No groundwater extraction
 - Promotion of groundwater recharge
 - Closed loop recycling management
 - Dual use of water
 - Reclamation of ingredients
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Water quality of the Oker river



Thank you for your attention!
