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# **Teollisen ekologian soveltaminen Perämerenkaaren metallurgiseen teollisuuteen - Kommenttipuheenvuoro**

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# Industrial Ecosystem

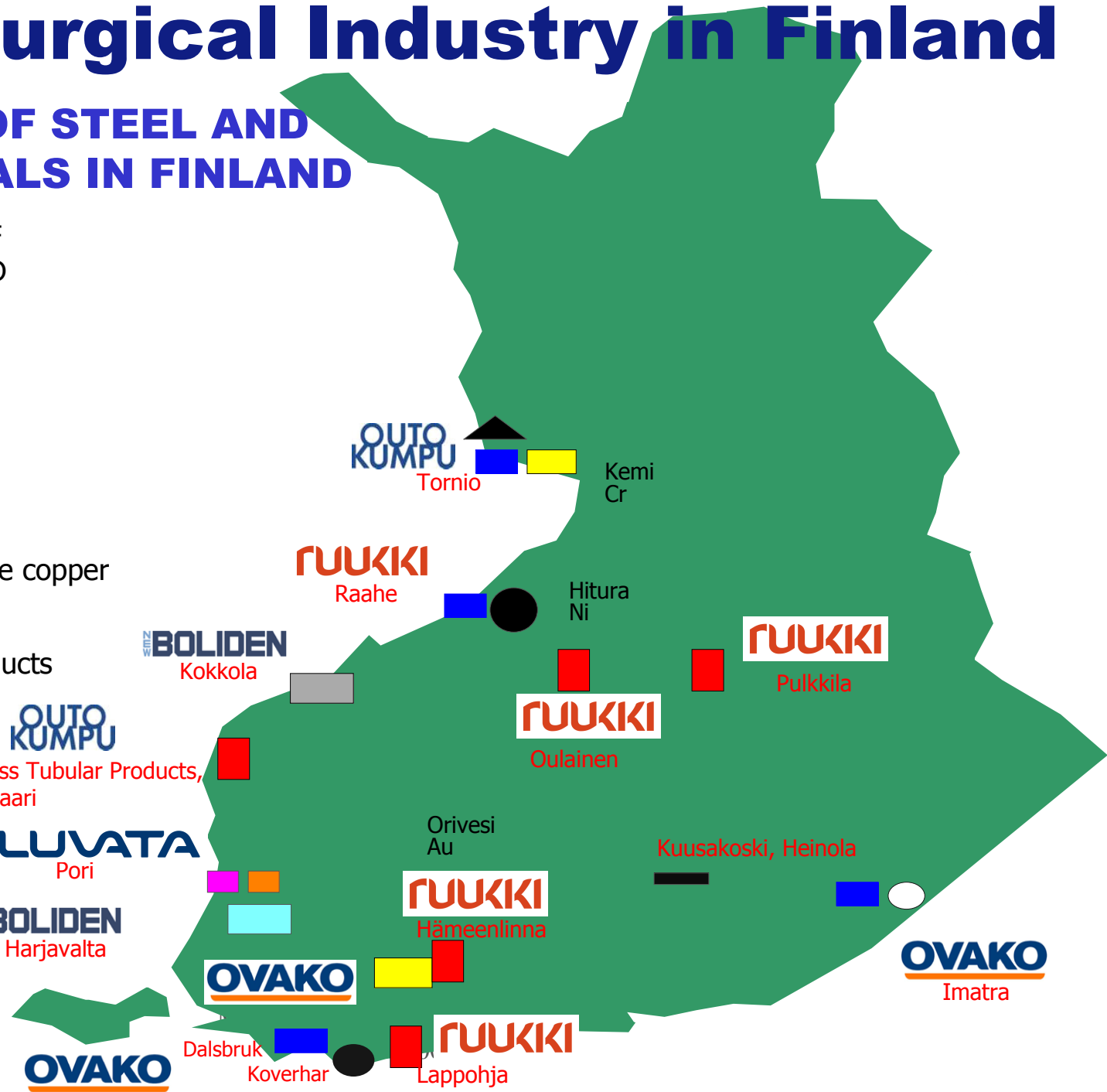
A system where the industrial actors use the natural recycling model and co-operate by using each other's material and waste energy flows to minimize the system virgin material and energy input as well as the waste and emission output from the system as a whole.

(Korhonen et al. 2001 s. 145)

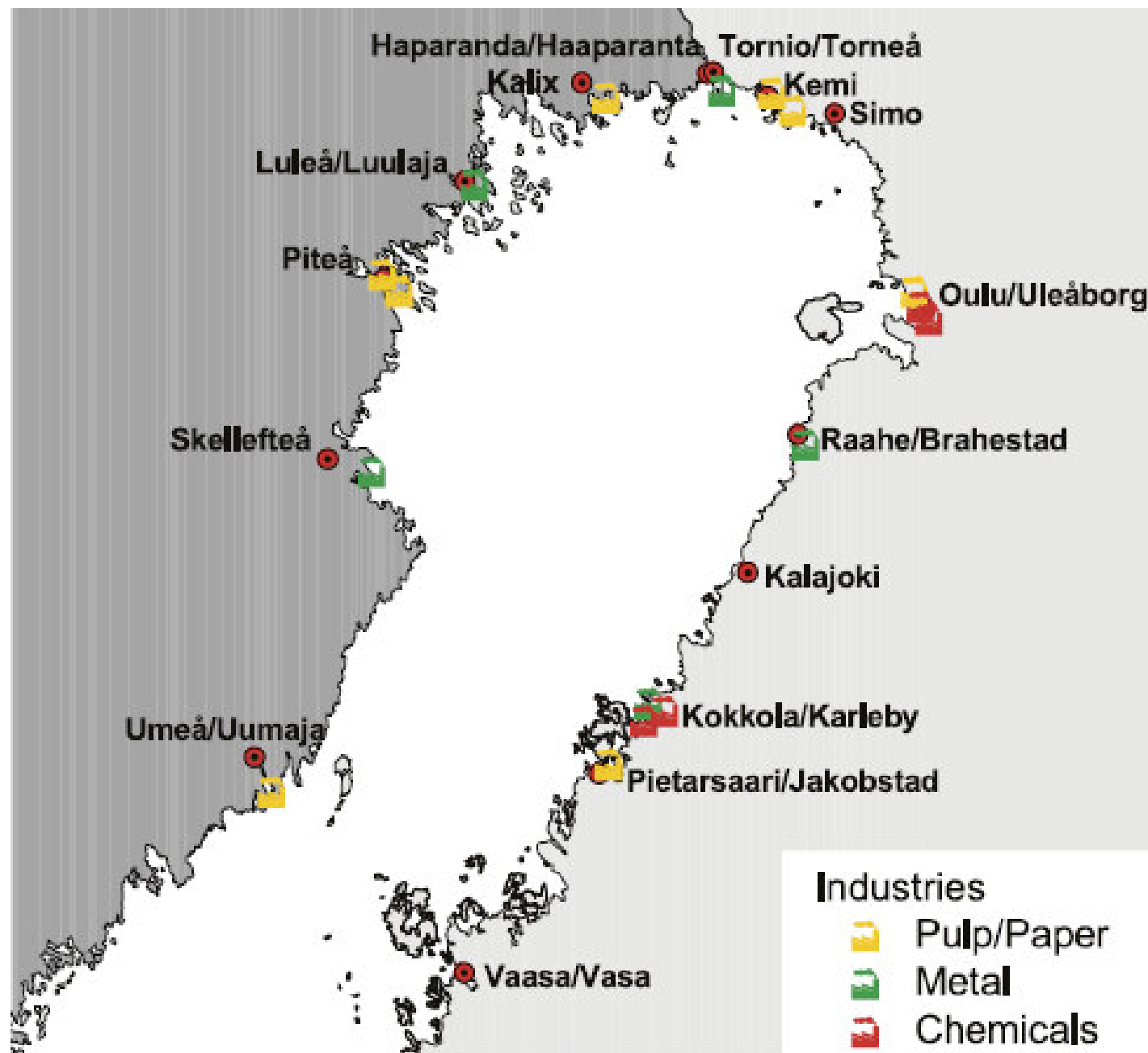
# Metallurgical Industry in Finland

## PRODUCERS OF STEEL AND COLOUR METALS IN FINLAND

- Steel billets, BOF
- ▲ Steel billets, AOD
- Steel billets, EAF
- Hot rolling mill
- Cold rolling mill
- Pipe factories
- Aluminium
- Nickel and coarse copper
- Cathode copper, copper half-products
- Electrolysis
- Zinc



METALLINJALOSTAJAT  
09/2006



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# Bothnian Arc Industrial Ecology Enterprise

Should the Harjavalta Industrial Park be included in the system, because:

- some Co-containing by-products are treated in Kokkola,
- some Cu and As containing by-products are treated in Harjavalta,
- scrubbing acid and sludges of the Harjavalta acid plant are treated in Kokkola,
- products of the Harjavalta acid plant are used by the Bothnian Arc Enterprises?

# Kokkola Industrial Park (KIP)

- Boliden Kokkola Oy: Zinc Plant,
- OMG Kokkola Chemicals Oy: Co and Ni salts, cobalt powder,
- Kemira Oyj,
- YARA (Former Kemira Growhow),
- KemFine Oy,
- Tetra Chemicals Oy,

# Kokkola Industrial Park (continued)

- Fortum Oyj, Kokkola Power Plant,
- Kokkolan Voima Oyj,
- Neste Oil Oyj,
- Nordkalk Oyj Abp,
- Oy Polargas Ab,
- Oy Woikoski Ab,
- etc.

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# Eco-efficient features in the Finnish metallurgical industry

- Conservation of energy and intelligent use of non-fossil energy sources
- Minimizing the impact on air, water, soil
- 6 BAT's = Best Available Technologies
- ASM Historical Landmark Award for the Outokumpu Flash Smelting Process in 2002
- About 50 % of the World copper and 30 % of nickel is produced by Flash Smelting,
- Cleantech Finland Award for the Ferrochromium Process.



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# Treatment of dusts, scales and sludge of steel plants

- partly treated in the sinter plant, partly in the blast furnaces and BOFs
- some zinc containing dust are treated by plasma smelting,
- some Tornio dusts and sludge treated by Scandust,
- Tornio pickling acid regenerated chemically.

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# Treatment of Metallurgical Slags

- carbon steel slags are utilized for road construction and agriculture,
- zinc fuming slags for road construction,
- ferrochromium slags for insulating materials and road construction,
- granulated nickel slags for sand blasting.

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# Emissions of CO<sub>2</sub> in Finland and Sweden

- total emissions 70 Mt in Finland in 2007
- under emission trading 42.5 Mt in Finland and 15 Mt in Sweden in 2007
- Raahe 4.5 Mt and Tornio 0.7 Mt in 2007
- free emissions in 2008 –2012 in Finland 37,6 Mt/a and 20 Mt/a in Sweden
- free emissions in 2008 -2012 in Raahe 4,7 Mt/a and SSAB 6,5 Mt/a

# Outokumpu Tornio Works

## The most integrated stainless steel works in the world (Outokumpu Tornio works)

- Own chrome – safe supply
- Stable FeCr quality
- Liquid FeCr and use of own CO saves primary energies
- FeCr-converter increase melting capacity and saves energy
- Hot slab charging in Hot Rolling Mill
- Short processing time and lower logistical costs
- Savings in product handling
- Integrated southbound and northbound logistics
- Terneuzen Mill close to main markets



Challenges of Eco-efficiency, 5.12.2006, VTT Espoo



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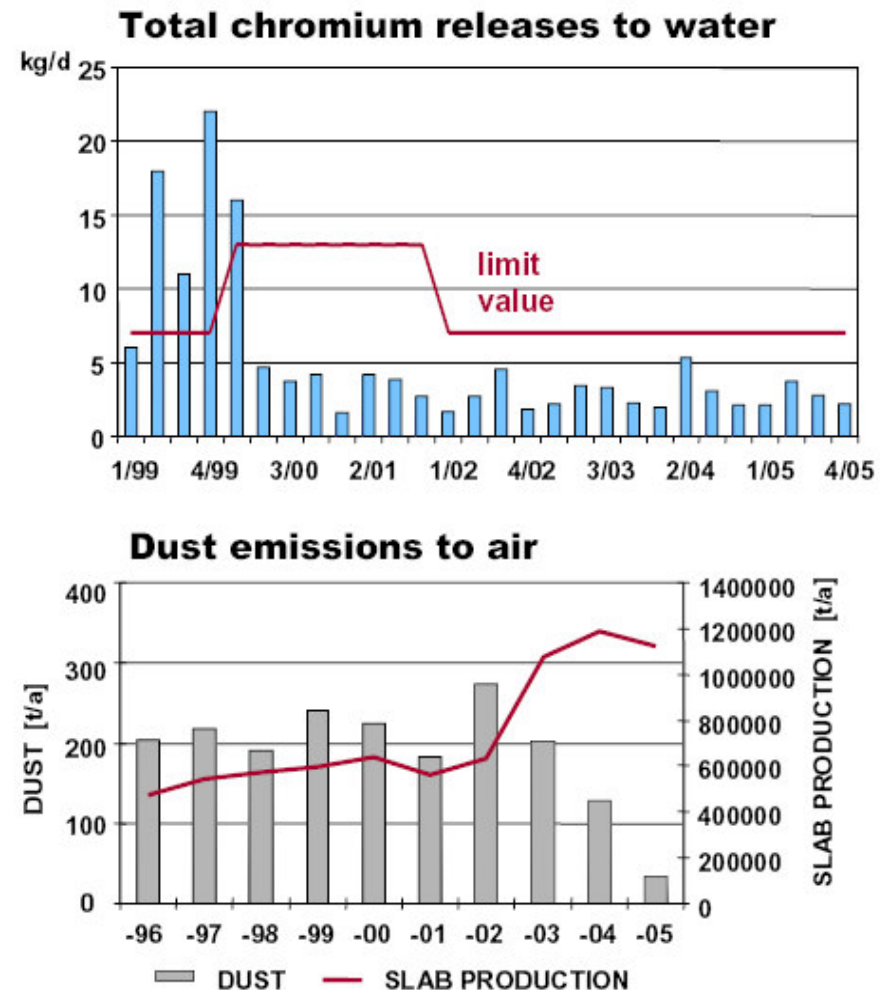
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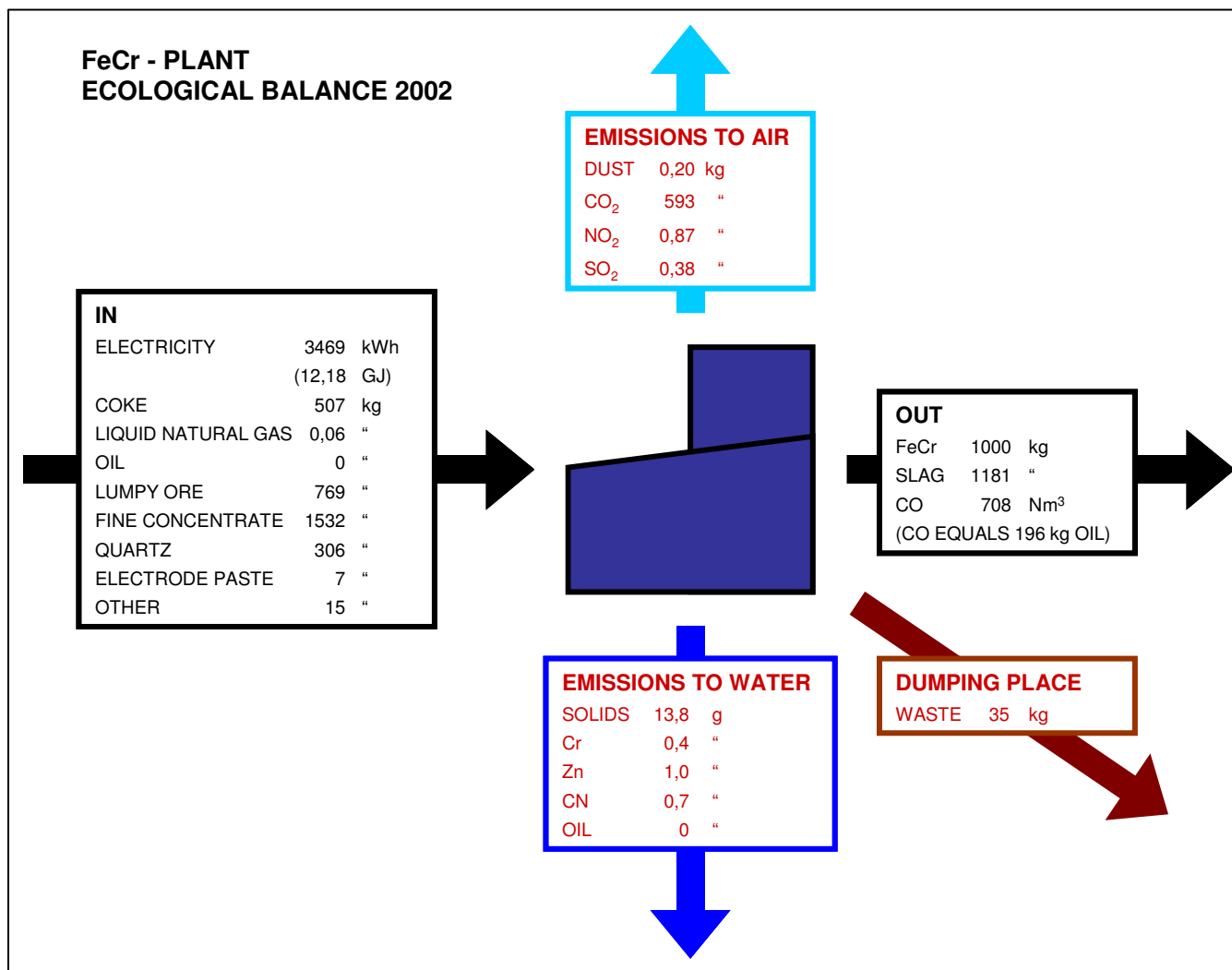
# Main principles of environmental management in Tornio

- Improvement of material efficiency and utilization of byproducts
- Improvement of energy efficiency
- Continuous improvement: ISO 14001 and R&D as tools
- Utilization of best available technology (BAT) to keep the emissions at low levels
- Active co-operation with authorities

⇒ Aim is to be the best in eco-efficiency

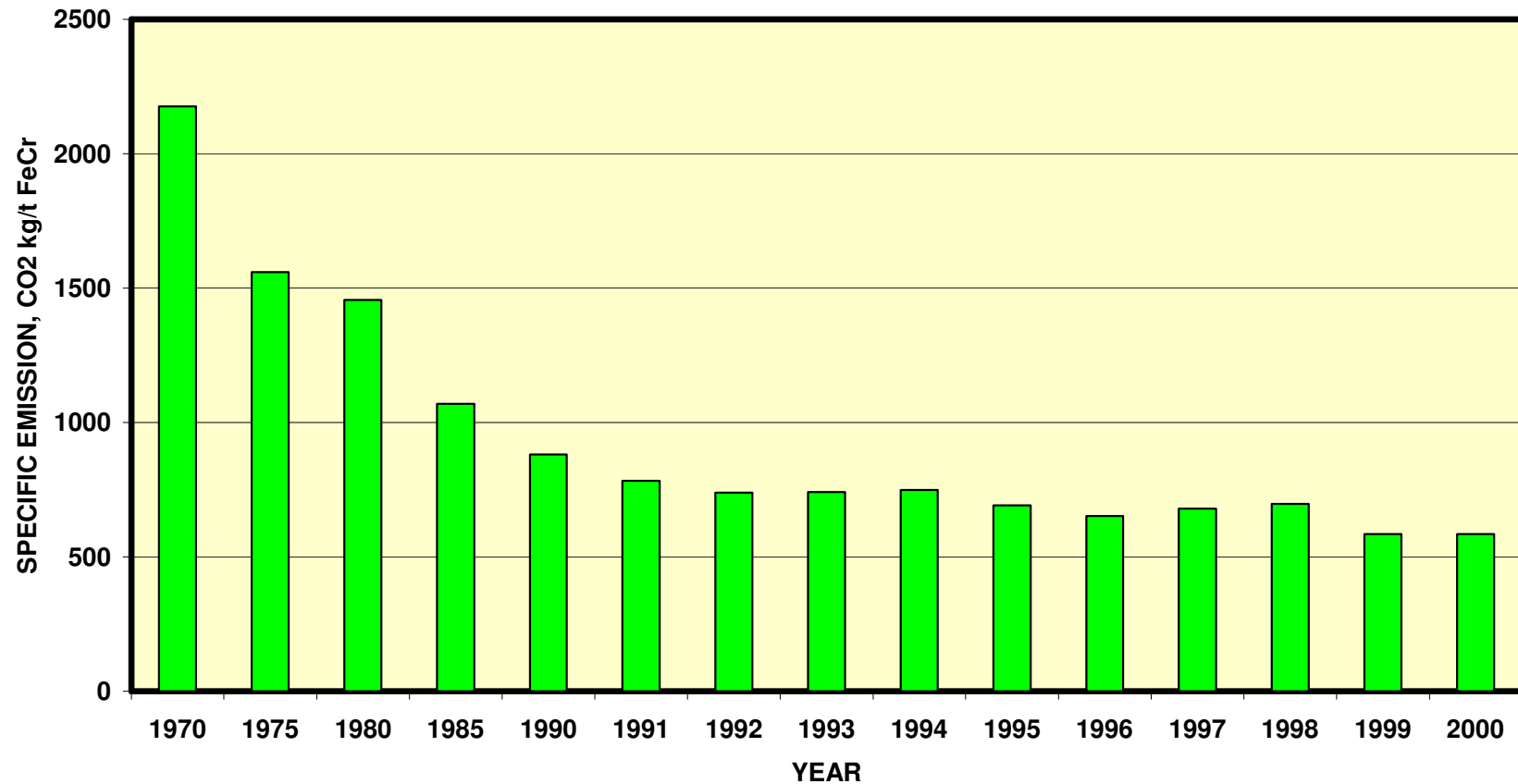


# The ecological balance of Tornio FeCr -plant



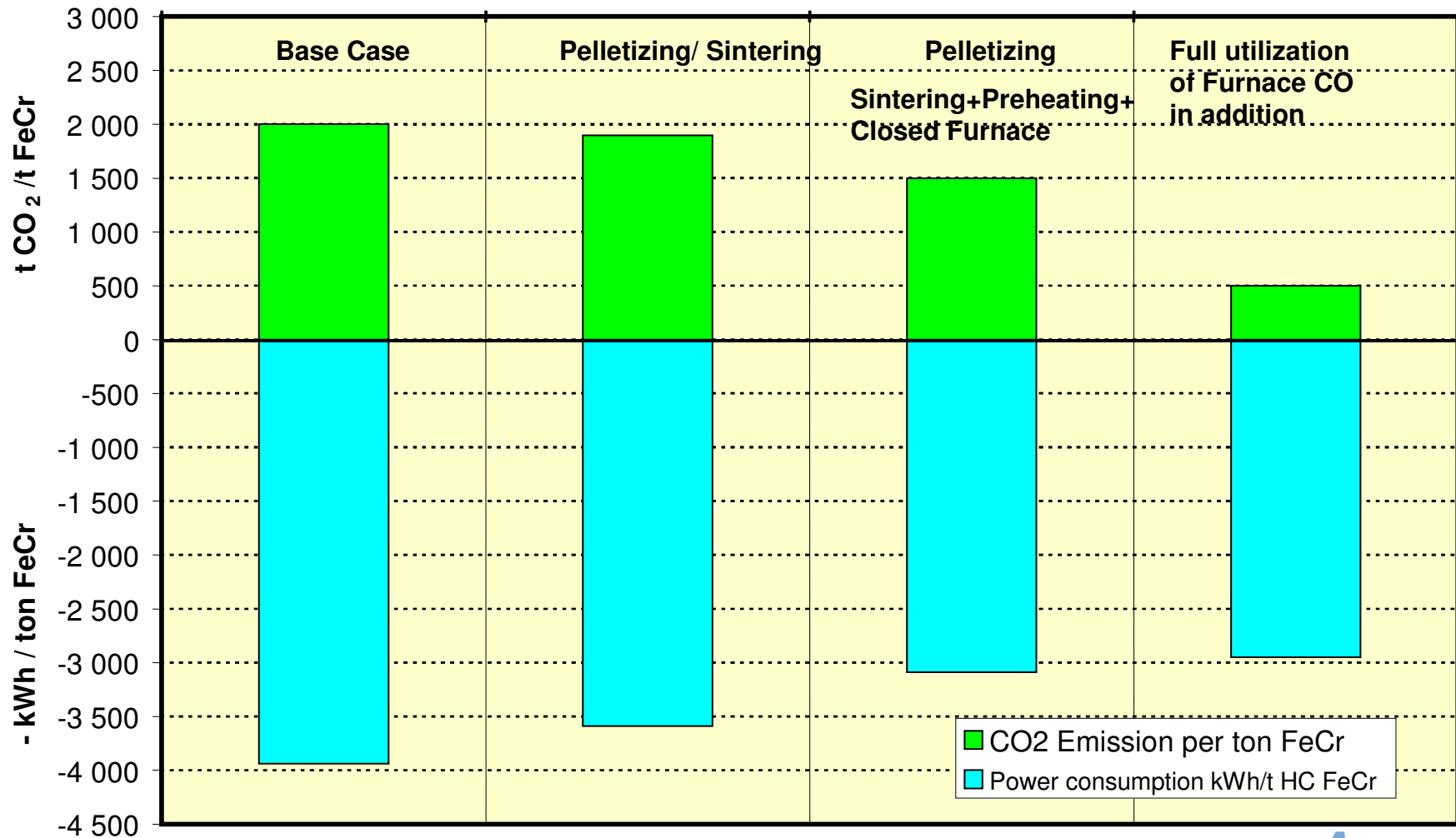
# Specific CO<sub>2</sub> emissions at Outokumpu Tornio FeCr Plant, kg CO<sub>2</sub>/t FeCr

FERROCHROMIUM PRODUCTION  
- CO<sub>2</sub> EMISSION -



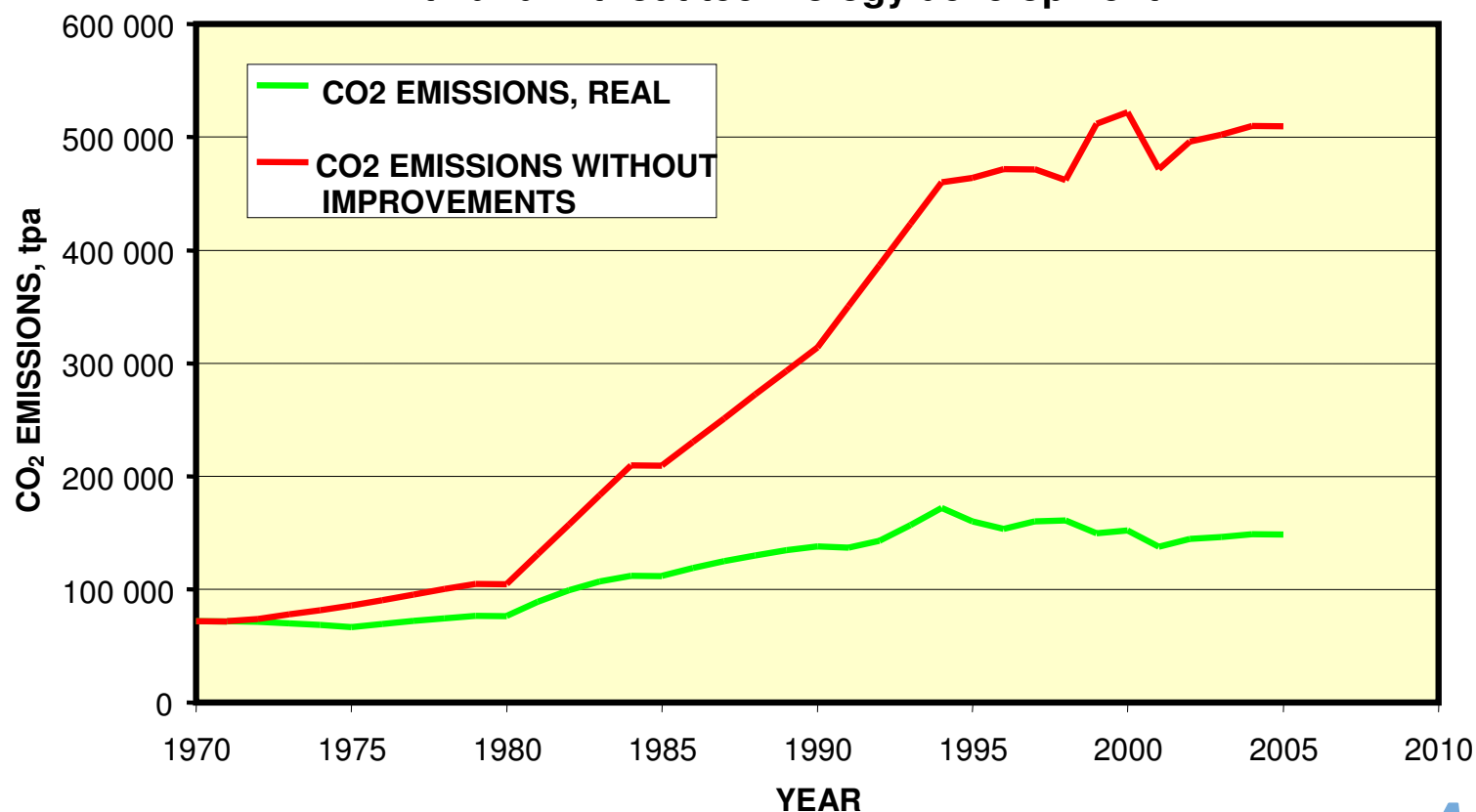


# Effect of Technology development on CO<sub>2</sub> emission and power consumption in FeCr production

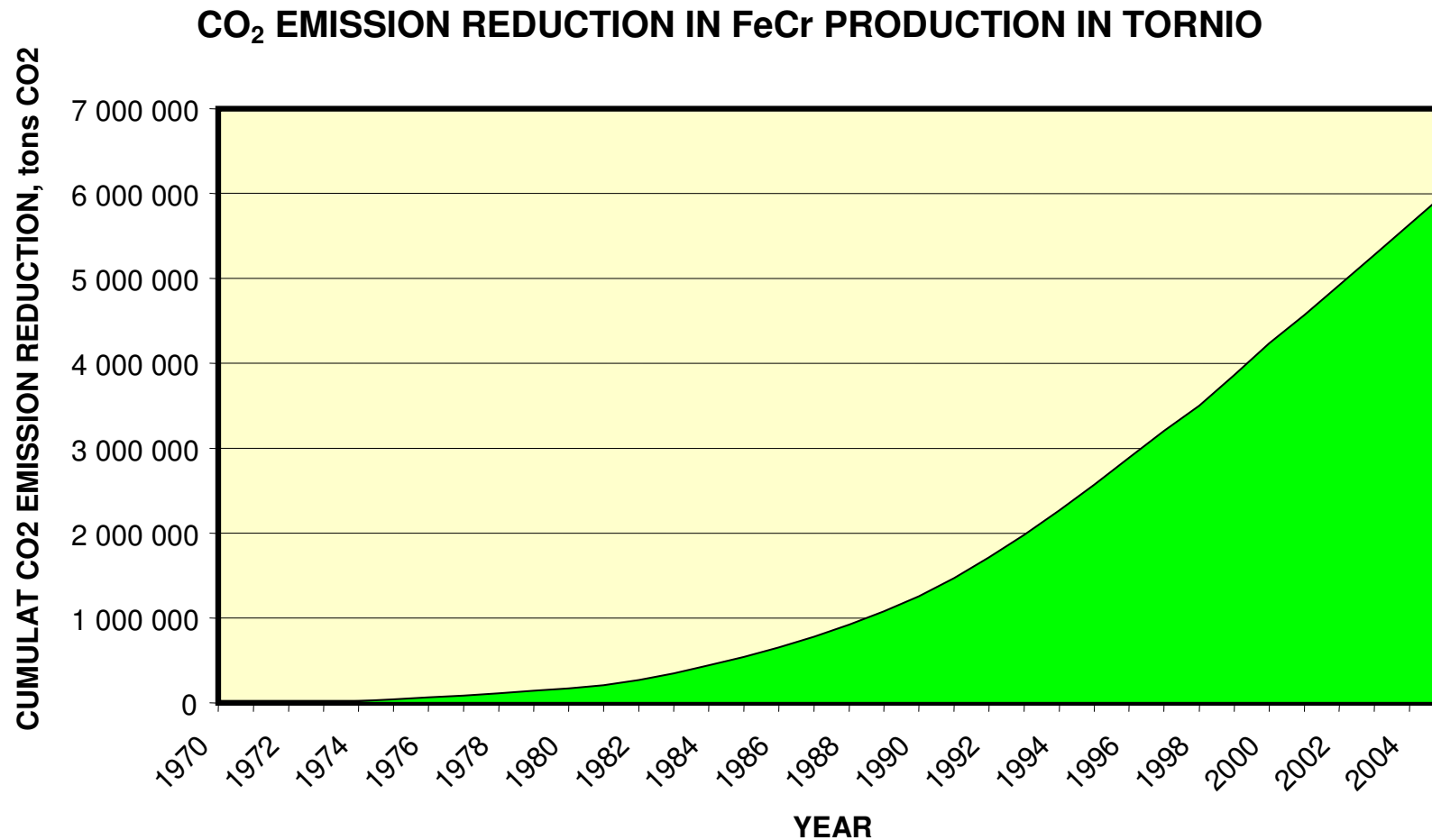


# Without technology development the CO<sub>2</sub> emission level at Outokumpu Tornio FeCr plant would be more than 3-fold compared to the present actual figures

CO<sub>2</sub> emissions at Outokumpu Tornio FeCr plant with and without technology development



# Effect of technology development on cumulative CO<sub>2</sub> emission reduction at Outokumpu Tornio FeCr plant



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# How to govern the eco-efficiency of the activities in an industrial park?

- There is no umbrella organization to govern the activities of individual companies in the park
- The overall supervision is carried out by the environmental authorities
- They have the final decision making power in environmental permissions and they also monitor the emissions from various sources in the park