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SOCIOECONOMIC ANALYSIS OF THE USE OF NICKEL SULPHATE IN THE MANUFACTURE OF BATHROOM FIXTURES AND FITTINGS

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INTRODUCTION

Society increasingly needs to balance the potential risks posed by exposure to chemicals against benefits provided by their use. This can be achieved by undertaking Socio Economic Analysis (SEA)

SEA seeks to quantify (ideally in monetary terms) the social, economic and human health costs and benefits of different chemical management scenarios. SEA answers the question '*Is society better or worse off by allowing a particular use of a chemical?*'

This poster describes an SEA for the use of $NiSO_4$ to manufacture bathroom fixtures and fittings using "nickel chromium" plating. This study was conducted to establish if sufficient information was available in the public domain to undertake an SEA for this use. $NiSO_4$ is not currently subject to Authorisation under EU REACH rules.

Most bathrooms in the EU have nickel-chromium plated fixtures and fittings. This is because they have:

- High resistance to corrosion
- High durability
- Low-cost/recycled substrate materials can be used to make them (e.g. brass / plastic)
- Have desirable aesthetic properties

Two scenarios were considered:

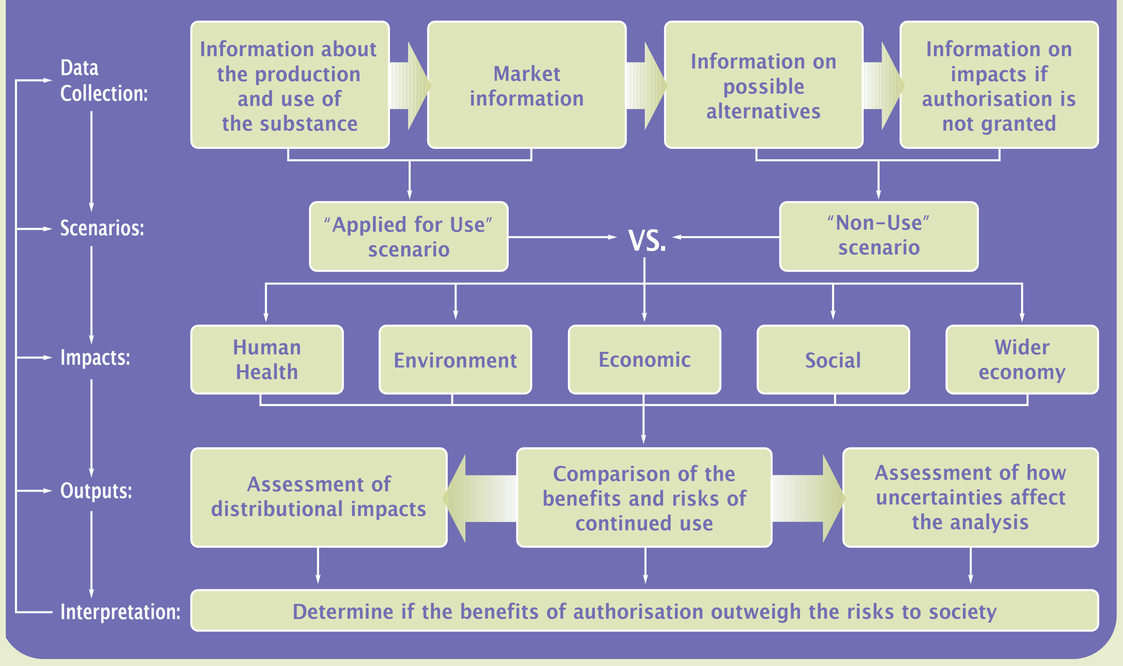
'Continued Use' Scenario

- Provides a baseline for the SEA
- Predicts change in use and risks over time

'Non-use' Scenario

- Fittings would continue to be manufactured using $NiSO_4$, but outside of the EU.
- Final products would be imported to the EU

THE SEA PROCESS



DATA USED FOR ASSESSMENT

- 366 tonnes of Ni are used per year for showerheads and taps (EC 2011 – Table 1).
- Value of EU-27 production of bathroom fixtures and fittings is €29 billion per year (EC 2011).
- An independent assessment of EU-27 production (Eurostat NACE code DK29.13) estimates a production value of €32.7bn (Table 2).
- Data on potential workplace and environmental exposure were obtained from $NiSO_4$ REACH documentation (Chemical Safety Report – CSR - Aurubis 2011) and questionnaire responses from individual companies.

Table 1. Tonnage of nickel used for manufacture of bathroom taps and showerheads in the European Union in 2008 (EC 2011)

	Production in EU-27	Volume of nickel/ chrome used (tonnes)	Estimate of nickel used (tonnes)
Bathroom taps	131,662,400	263	258
Showerheads	54,859,000	110	108
Total	186,521,400	373	366

Table 2. Market and value data for manufacture of taps and valves (2008)

	Number of enterprises	Production Value (millions of Euro)	Total purchases (millions of Euro)	Number of persons employed
EU – 27	2,671	32,745	23,583	154,740
Selected MSs				
Germany	455	12,899	9,020	69,296
Spain	129	814	654	4,153
France	324	2,992	2,210	13,959
Italy	897	8,688	6,303	30,293
Poland	139	442	359	6,172
United Kingdom	233	1,978	1,491	13,815

VALUATION OF IMPACTS (Difference between use and non-use scenario))

Analysis of impacts considers human health, environmental, economic and social impacts as well as the wider economy (e.g. Trade balance and GDP). Key challenges are establishing the main socio-economic benefits of continued use, linking risk assessment outputs to impacts on human health and the environment, and monetising impacts.

Economic costs:

- Net loss of production value in the EU of €350-388 billion Net Present Value (NPV) over 20 years. This would be offset by production outside the EU.

Health benefits:

- OELs and DNELs for $NiSO_4$ are not exceeded in the workplace. Therefore, impacts on workers or the public should be negligible.
- An alternative economic assessment suggests total avoided damage to health of €16-98 million NPV over 20 years, summarised below and in Table 3.
  - Inhalation carcinogenicity based on risk factor of $2.5x10^{-4}$ per 1 ug m^{-3} lifetime exposure to atmospheric nickel (CEPN) combined with estimates of lifetime workplace exposure, incidence rates, numbers of workers and the cost of fatal cancer. However, if nickel salts are assumed to have a practical threshold for carcinogenicity (as proposed by SCOEL) the lower bound for this estimate would in fact be close to zero.
  - Allergic contact dermatitis based on an incidence rate of 42 – 49 cases per 100,000 workers, each leading a loss of €3,537 per worker covering medical costs, production losses and welfare loss.
  - public health impacts from emissions to air and water based on EEA unit damage costs of €3.9/kg Ni and annual emissions of 64 kg.

Table 3. Summary of annual damage estimates

	Best estimate	Worst case
Inhalation carcinogenicity for workers	€1.2 million	€7 million
Non-carcinogenic effects amongst workers	€0	€0
Allergic contact dermatitis amongst workers	€0	€150,000
Reproductive and developmental toxicity amongst workers	€0	€0
Reproductive and developmental toxicity amongst workers	€0	€500
Total annual damage	**€1.2 million**	**€7.2 million**
NPV over 20 year period	**€16 million**	**€98 million**

Environment benefits and costs:

- Approximately 100-150 waterbodies in the EU-27 may improve (to some extent) under the non-use scenario (Table 4). However, this conclusion is tentative and requires site-specific data to confirm.
- This benefit should be balanced against the impacts of an increase in CO_2, NO_x and SO_x emissions from transportation (partial estimate of €12 million over 20 years through effects in Europe only) due to imports.

Table 4. Potential aquatic impact of nickel plating under various scenarios

Exposure Scenario	Emission[c]	Dilution capacity	High bioavailability[a]		Medium bioavailability[b]	
			RCR	Estimated PAF	RCR	Estimated PAF
Freshwater 1	14.6 kg yr^{-1} (median)	10	**1.1**	~2%	0.70	-
Freshwater 2		100	0.8	-	0.55	-
Marine 1		100	0.1	-	0.1	-
Freshwater 3	247 kg yr^{-1} (90P)	10	**4.9**	~20%	**3.2**	~10%
Freshwater 4		100	**1.2**	-	0.81	-
Marine 2		100	0.3	-	0.30	-

RCR: Risk Characterisation Ratio
PAF: Potentially Affected Fraction, estimated from Species Sensitivity Distribution (SSD) for aquatic ecotoxicity
a: based on the ecoregion scenarios used in the CSR: Lake Monate/Italy for freshwater
b: based on the ecoregion scenarios used in the CSR: River Rhine/Netherlands for freshwater
c: All scenarios assume the presence of municipal waste water treatment works operating to a removal efficiency of 40%, as per the CSR (i.e. 60 % of nickel is assumed to pass through the treatment works, with 40% partitioning to sludge).

Social costs: Up to 150,000 EU jobs could be at risk.

Wider economic costs: Up to 0.22-0.24% of EU GDP may be lost.

CONCLUSIONS

- The costs associated with non-use are dominated by the loss in EU production. Potential health benefits are small (well below 0.1%) and improvements in water bodies are uncertain. These benefits are also partially offset by the health and environmental impacts transport emissions linked to additional imports.
- Given the scale of economic and social benefits relative to the risks of continued use of a well-controlled substance, it seems clear that the benefits of Authorisation outweigh the risks to human health and the environment, within the hypothetical context of $NiSO_4$ being subject to Authorisation.
- This conclusion was reached on the basis of an initial analysis of alternatives.

References:

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