

International Symposium LCA & Construction

Methods for construction materials

Environmental evaluation of reinforcing bars sold on the French market

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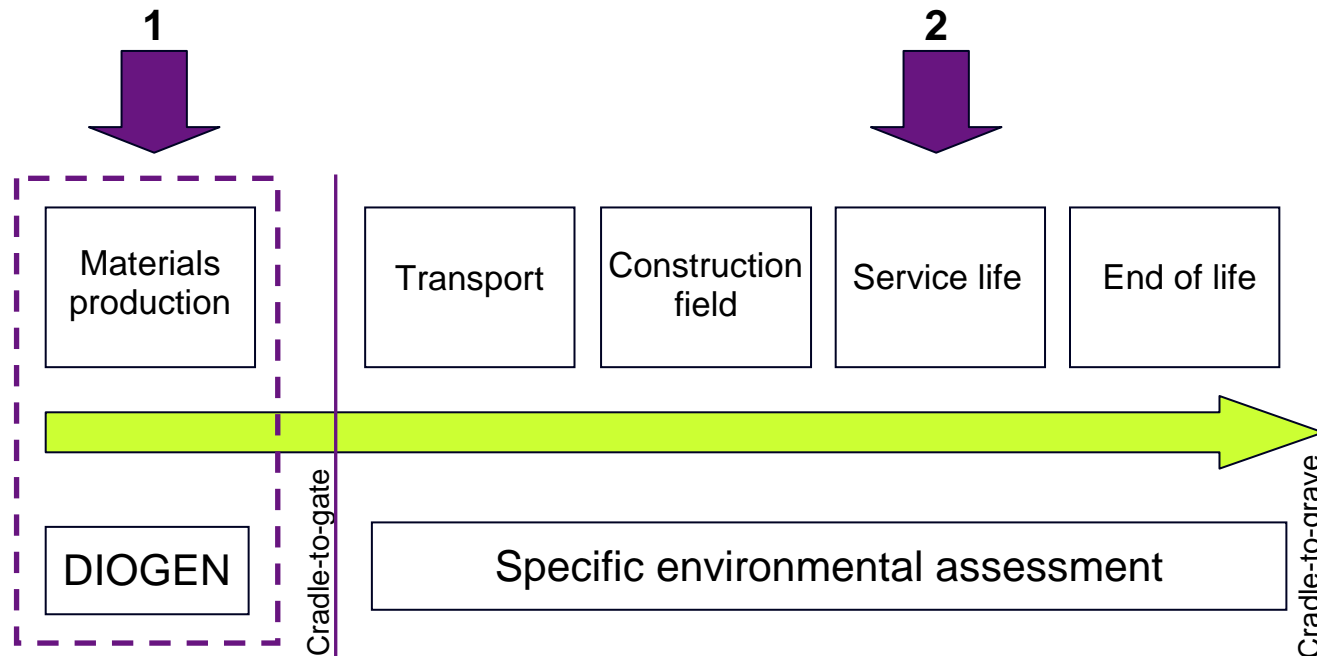
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Agenda

- *Context and objectives of the study*
- *Methodology applied*
- *Results and interpretation*



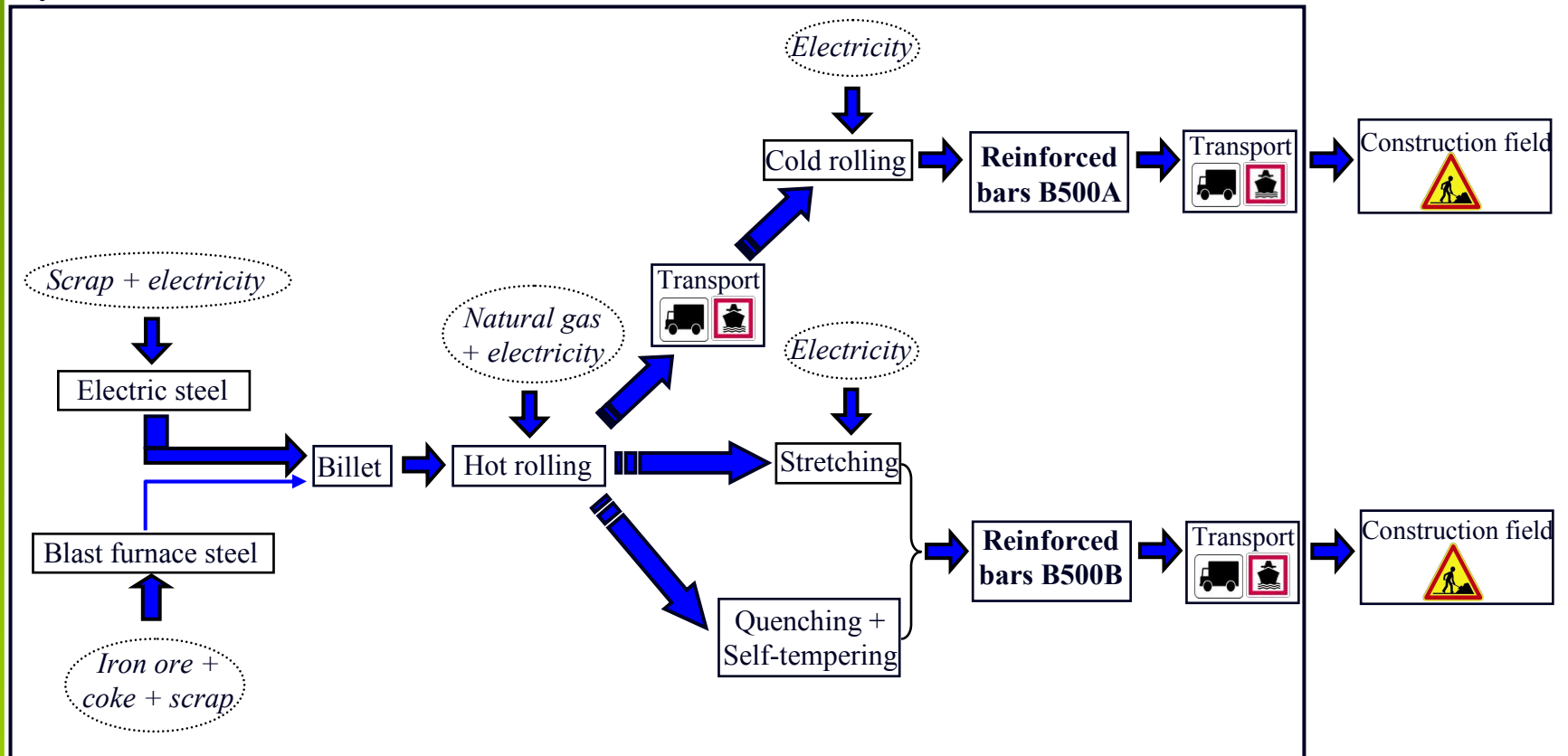
Context and objectives



- *System studied: 1 kg of reinforcing steel from B500 A and B500 B types certified by the NF mark.*
- *The difference between these two types is the production route which induces different material properties like ductility. Type A is used for small diameters and type B, for large diameters.*
- *This study evaluates the impact of materials used in France even if they are not produced in France*

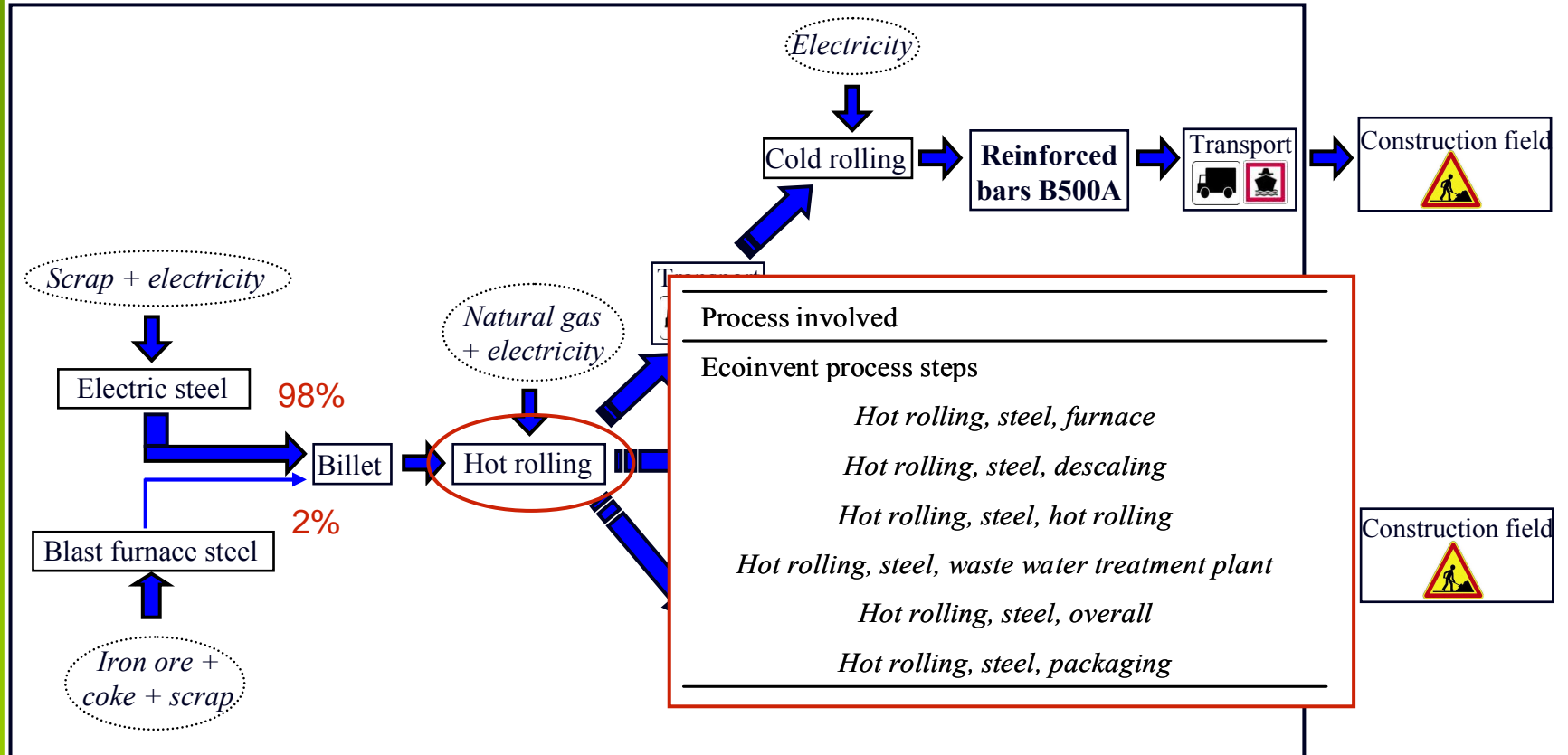
Reinforcing bars fabrication process

System boundaries



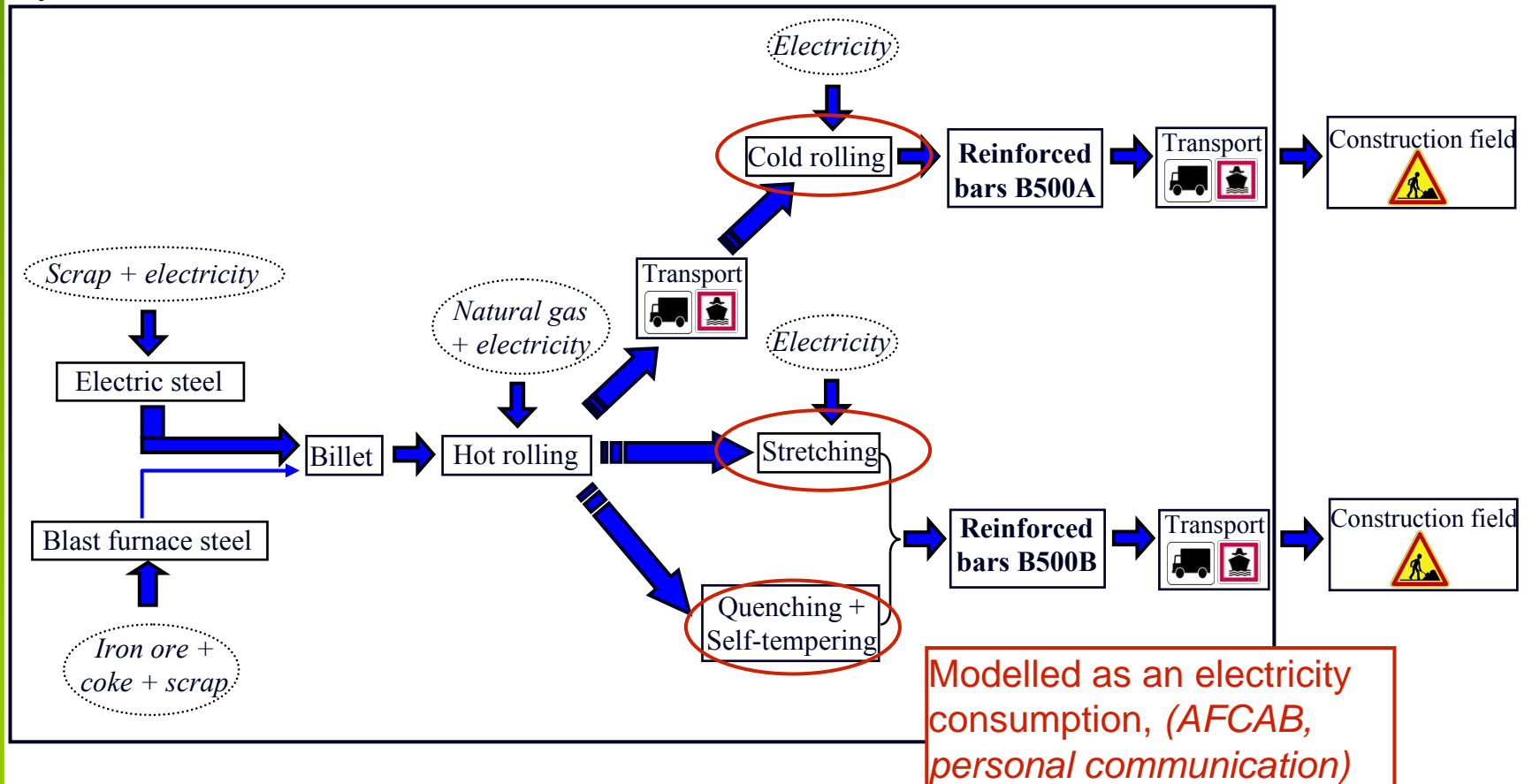
Reinforcing bars fabrication process

System boundaries



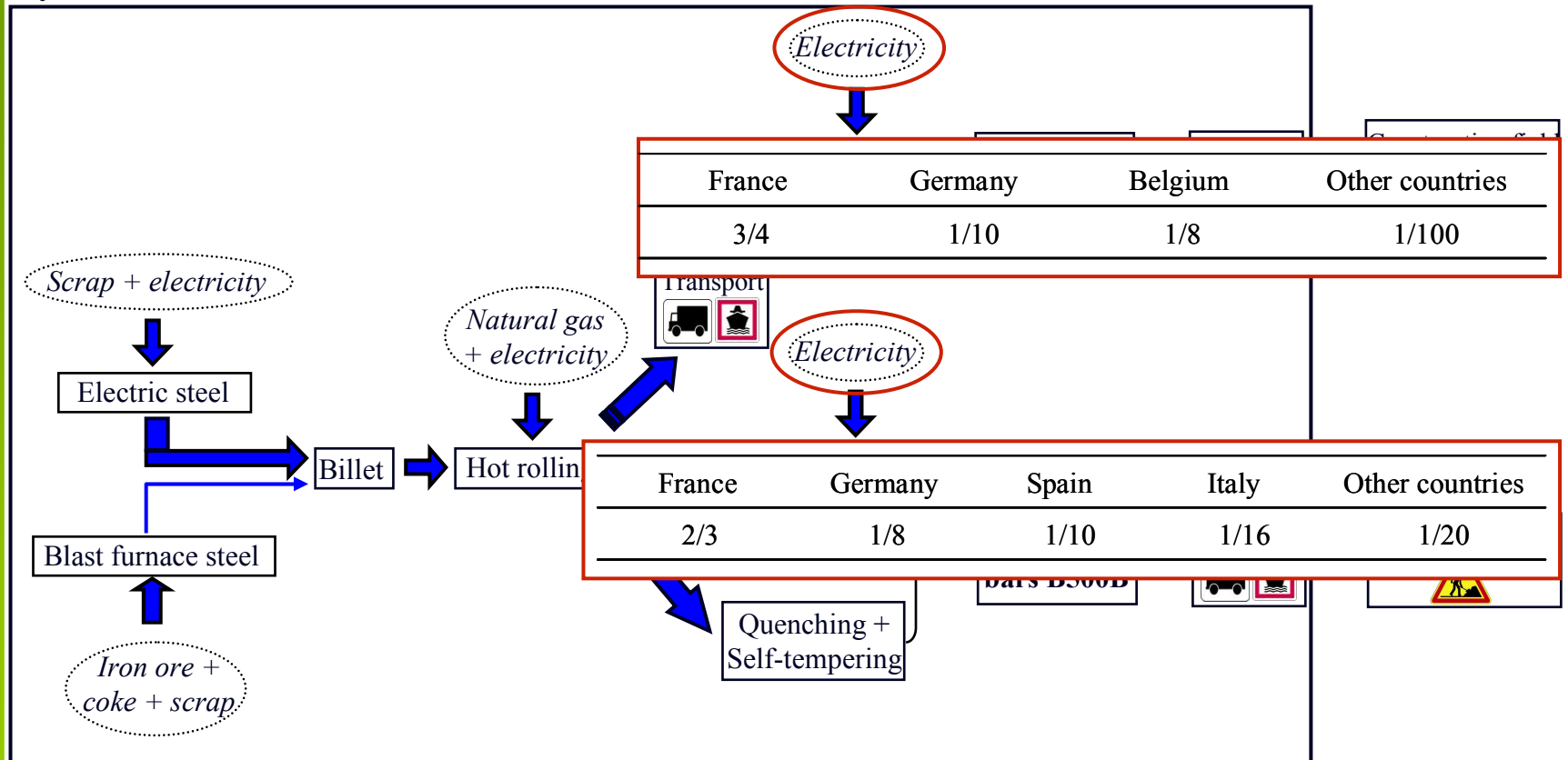
Reinforcing bars fabrication process

System boundaries



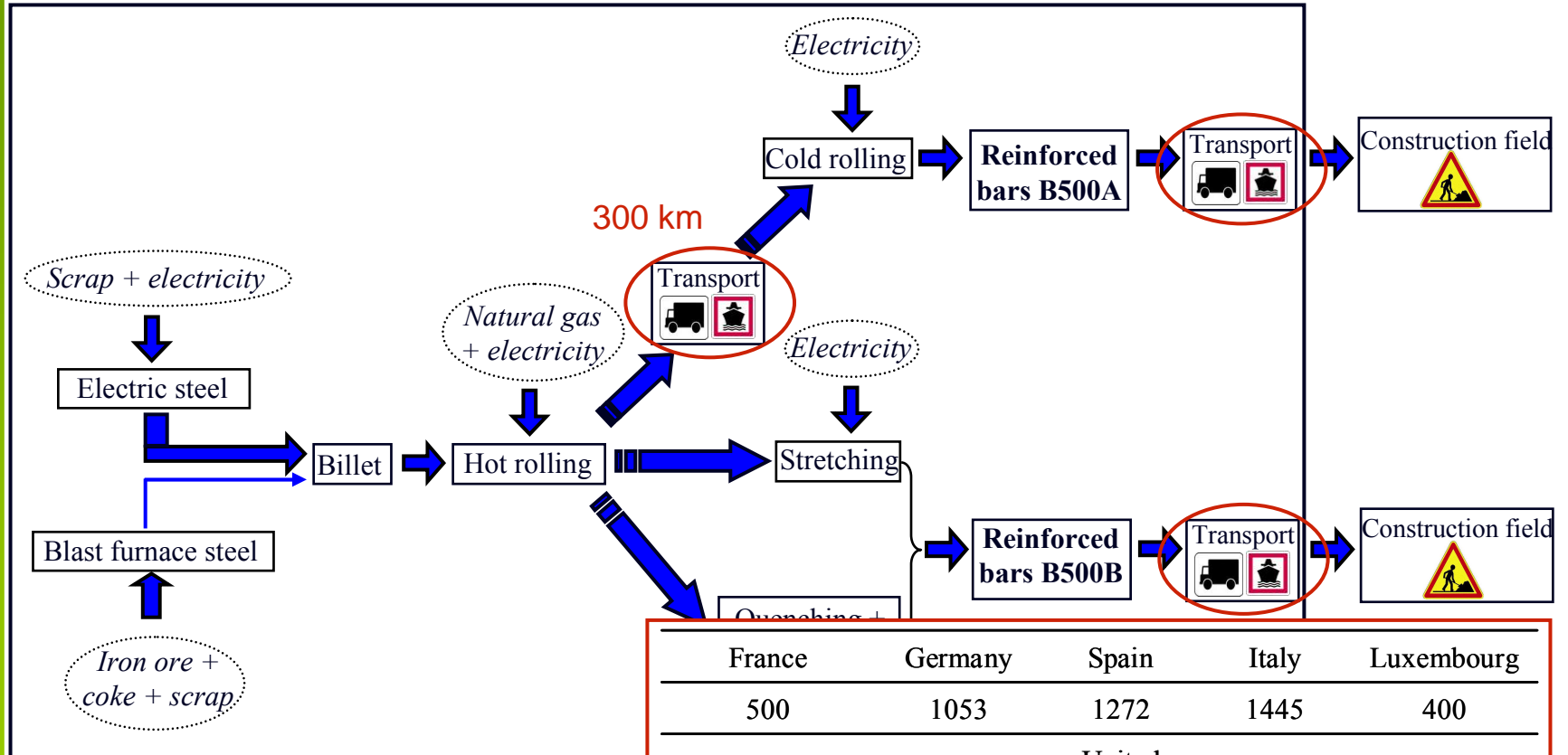
Reinforcing bars fabrication process

System boundaries



Reinforcing bars fabrication process

System boundaries



France	Germany	Spain	Italy	Luxembourg
500	1053	1272	1445	400
Switzerland	Belgium	United Kingdom	Turkey	Netherlands
585	309	451	3870*	517

* 2800 km by boat and 1070 km by truck

Inventory and sensitivity analysis

Reinforcing bars B500 B

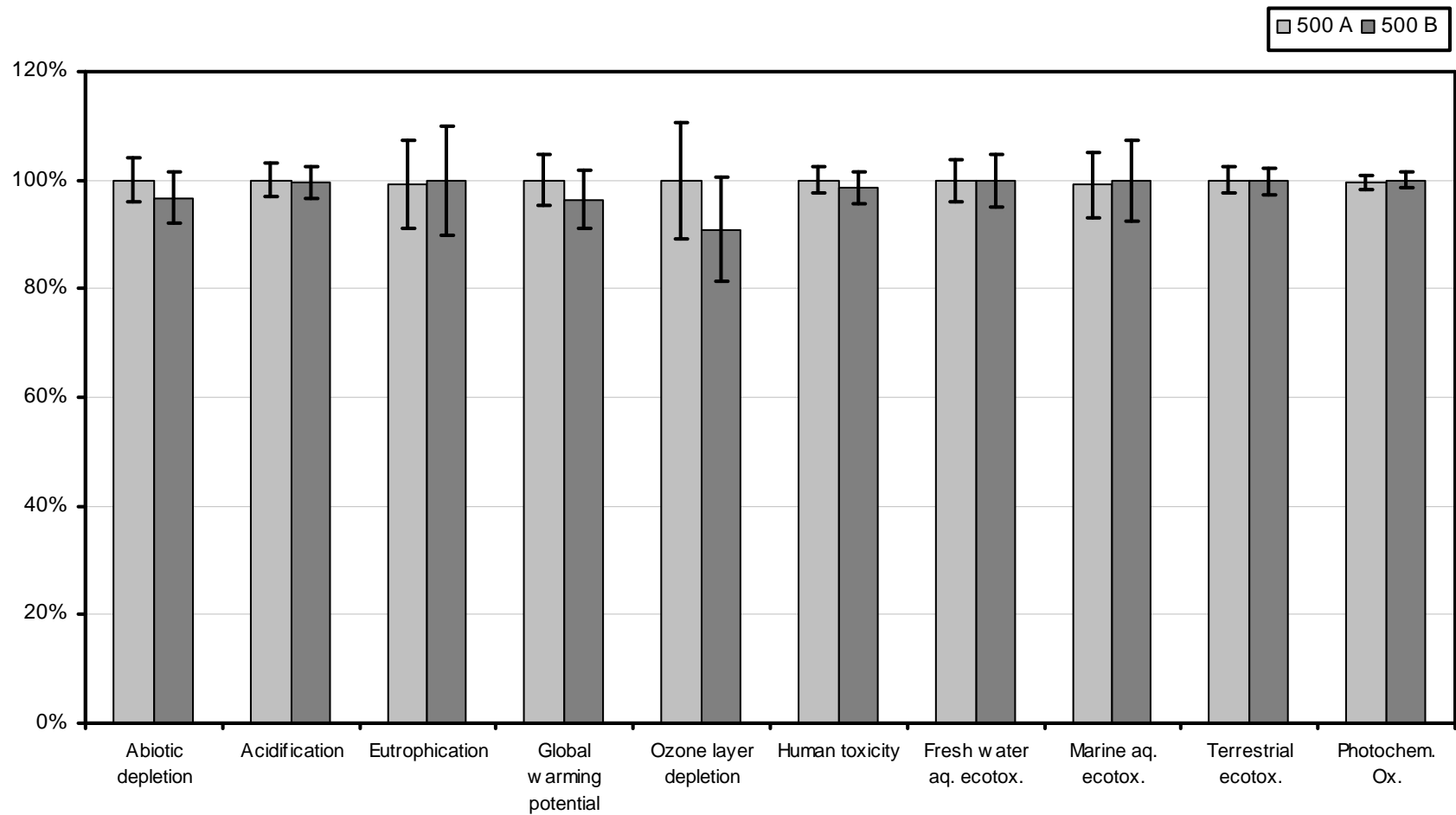
Reinforced bars type B500 B					
Parameters		Origin of data	Mean	Minimum	Maximum
Steel process nature					
	electric steel (%)	Ecoinvent process : " <i>steel, electric, un- and low-alloyed, at plant/RER</i> "	98	95	100
	blast furnace steel (%)	Ecoinvent process : " <i>steel, converter, unalloyed, at plant/RER</i> "	2	5	0
Electricity mix (%)		Ecoinvent process : " <i>electricity, medium voltage, at grid</i> "	Reference mix (table 4)	French electricity	German electricity
Treatment type					
	hot rolling (1kg)	Ecoinvent process changed (table 5): " <i>hot rolling, steel, RER</i> "	---	---	---
	stretching (%)	Industry data : (1/2) of " <i>cold rolling, steel, RER</i> " energy	50	0	100
	quenching + self tempering (%)	Industry data	50	100	0
Transport distance (km)					
	to the construction field (table 7)	Ecoinvent process - " <i>transport, lorry > 32t, EURO 4 / RER</i> "	686	0	1445

Inventory and sensitivity analysis

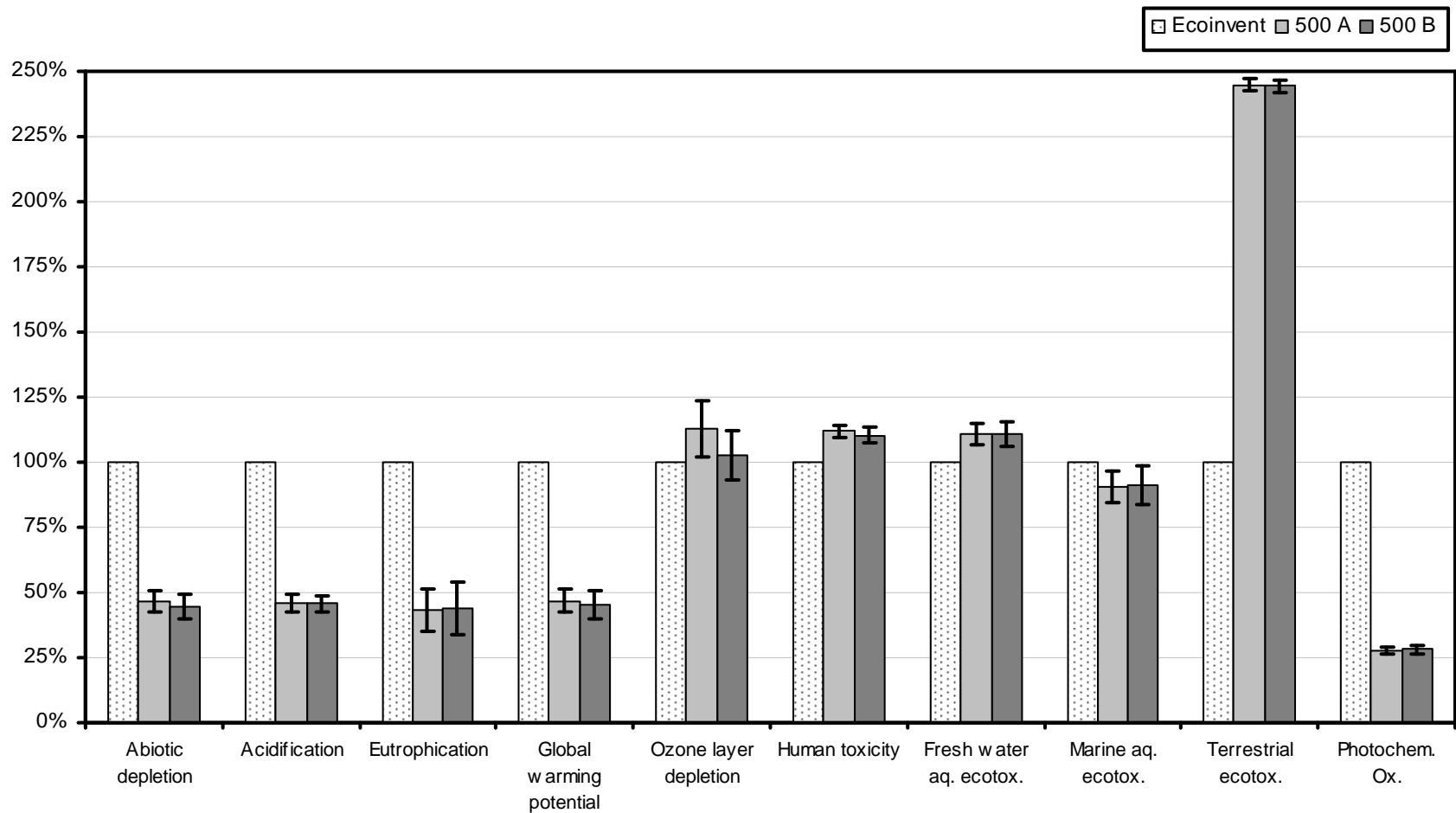
Reinforcing bars B500 A

Reinforced bars type B500 A					
Parameters		Origin of data	Mean	Minimum	Maximum
Steel process nature					
	electric steel (%)	Ecoinvent process : <i>"steel, electric, un-and low-alloyed, at plant/RER"</i>	98	95	100
	blast furnace steel (%)	Ecoinvent process : <i>"steel, converter, unalloyed, at plant/RER"</i>	2	5	0
Electricity mix (%)		Ecoinvent process : <i>"electricity, medium voltage, at grid"</i>	Reference mix (table 3)	French electricity	German electricity
Treatment type					
	hot rolling (1kg)	Ecoinvent process changed (table 5) : <i>"hot rolling, steel, RER"</i>	---	---	---
	cold rolling energy (kWh/t)	Industry data (table 6)	---	---	---
Transport distance (km)					
	to the cold rolling plant	Ecoinvent process - <i>"transport, lorry > 32t, EURO 4 / RER"</i>	300	0	1000
	to the construction field (table 7)	Ecoinvent process - <i>"transport, lorry > 32t, EURO 4 / RER"</i>	686	0	1445

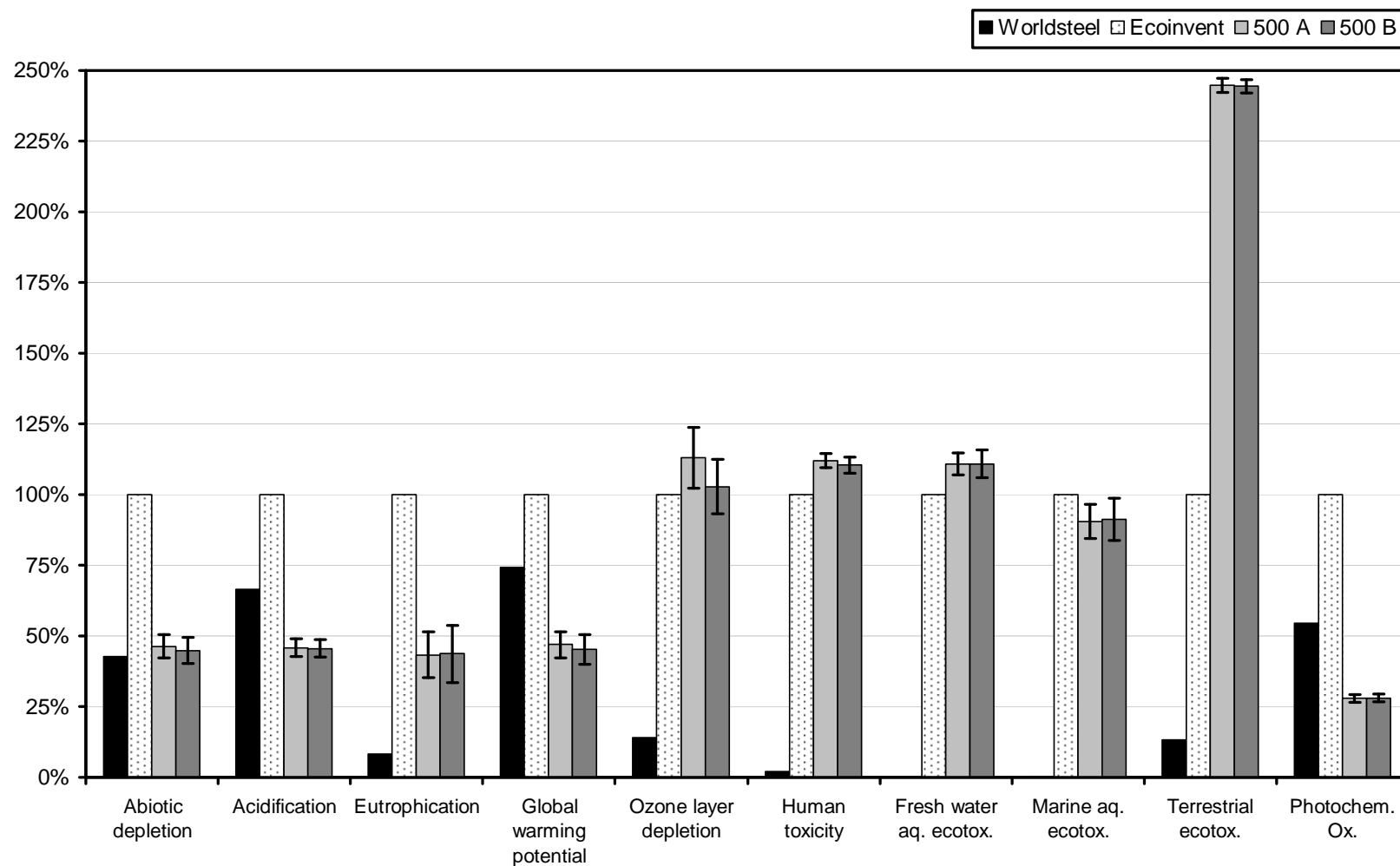
Results for B500A & B500B



Study results and available database



Study results and available database



Conclusion

- It is relevant to provide specific data for each steel product. (Reinforcing steel is a highly recycled product).

Even if steel is a material that seems to be sold on the global market, specific processes are used to produce one type of steel product for one specific market.

- The results and comparisons highlight the significant variations in environmental performance, resulting from modelling parameters as: detailed identification processes, relative proportion of production routes, energy mix adaptation...