

3E Logistics – Electric Transport Routing

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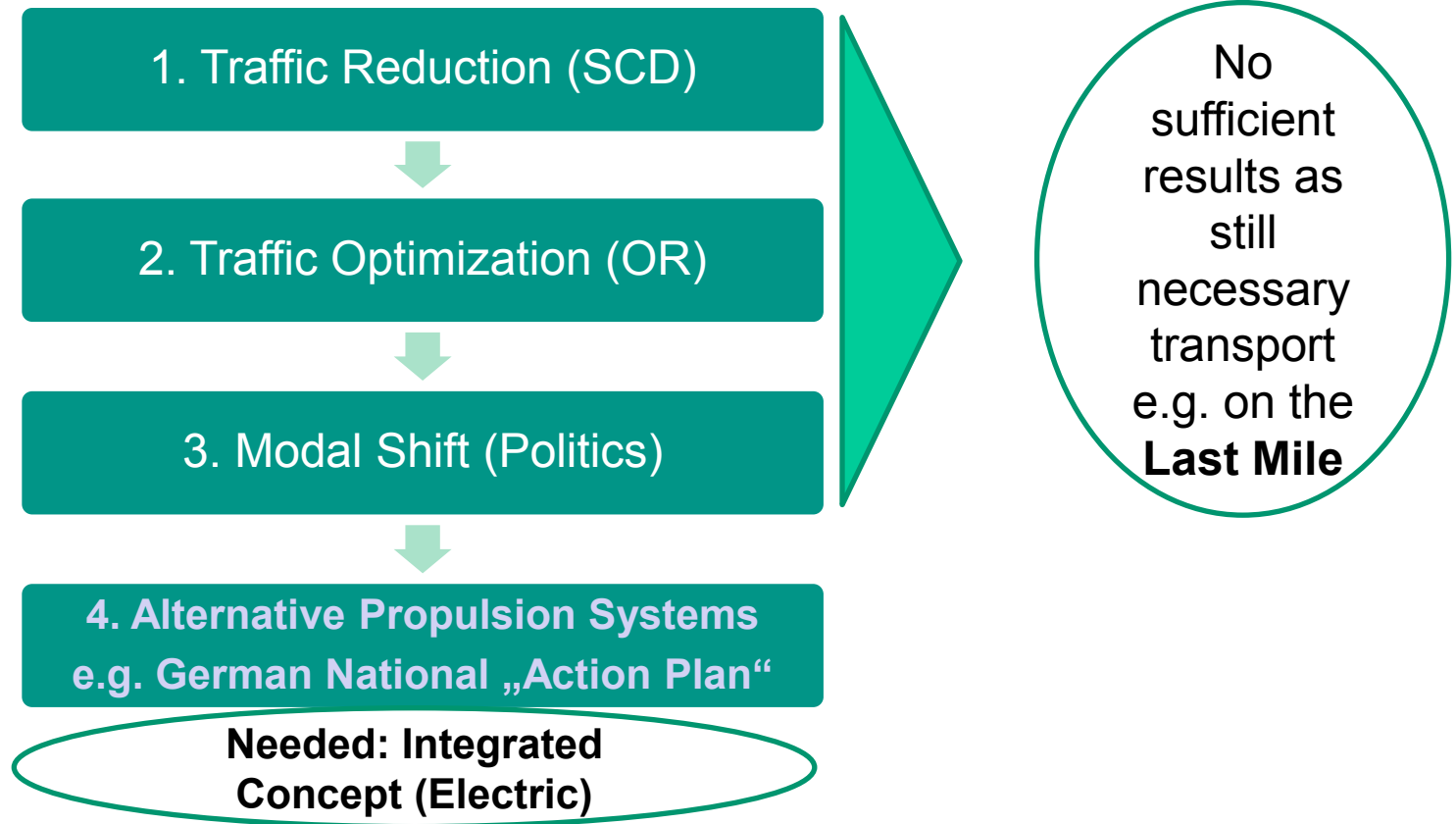
Hamburg, September, 2nd / 3rd 2010



1. Introduction
2. 3E Concept
3. Ecological Perspective
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5. Electric Process & Routing Perspective
6. Conclusion

1. Introduction

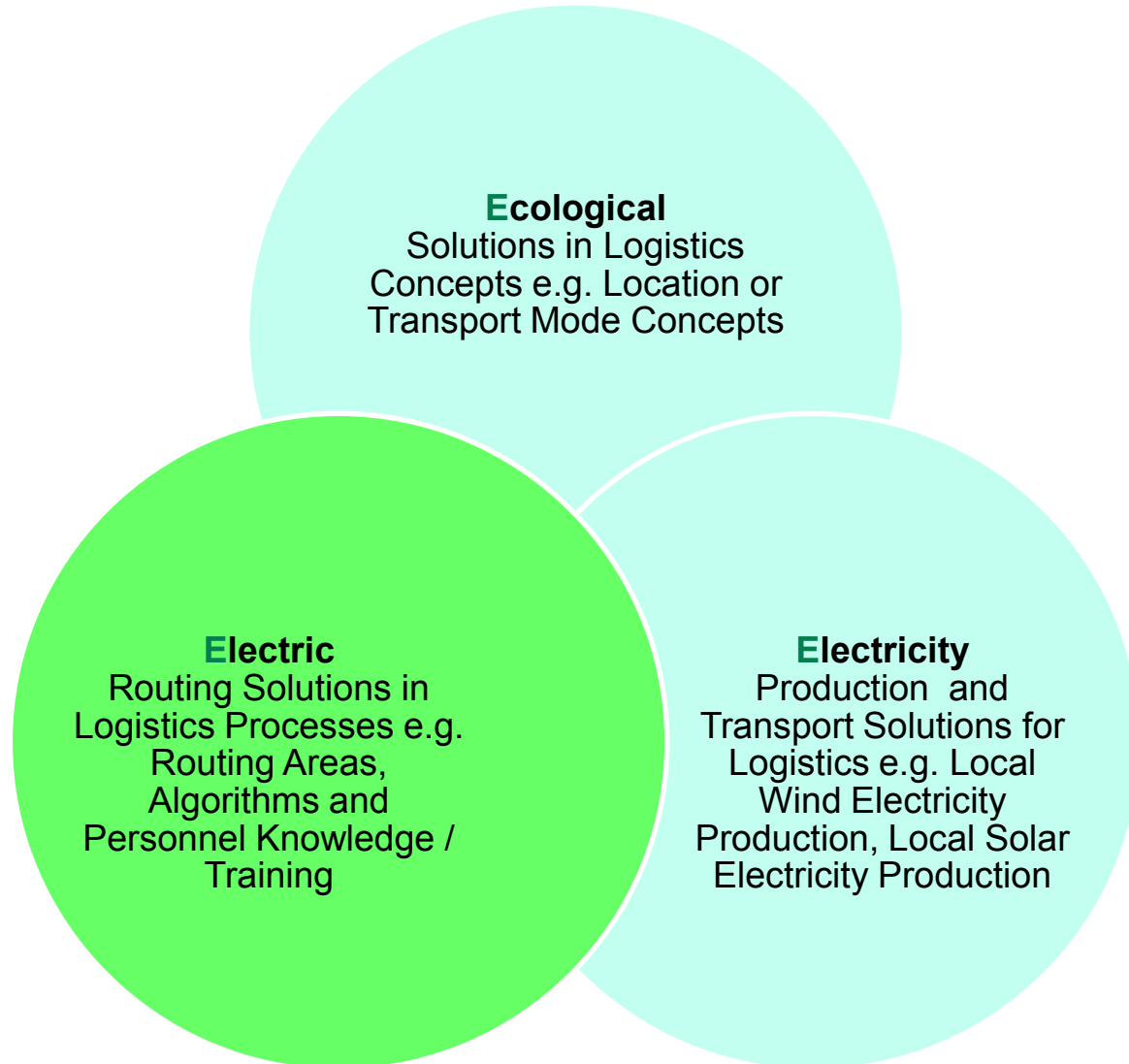
- **Green Logistics** as major trend in logistics management
- Operative implementation of green logistics mainly based on four approaches:



2. 3E Logistics Concept

Strategic concept requirement because of

- simple change of propulsion system will bring no green change
- integrated change management in different companies and industries needed
- broad qualification requirements from truck drivers to logistics managers



Literature review

- Distinctive but seldom integrated perspectives in Green Logistics literature

- Future research demand for integrated green logistics concepts (strategic, operative)

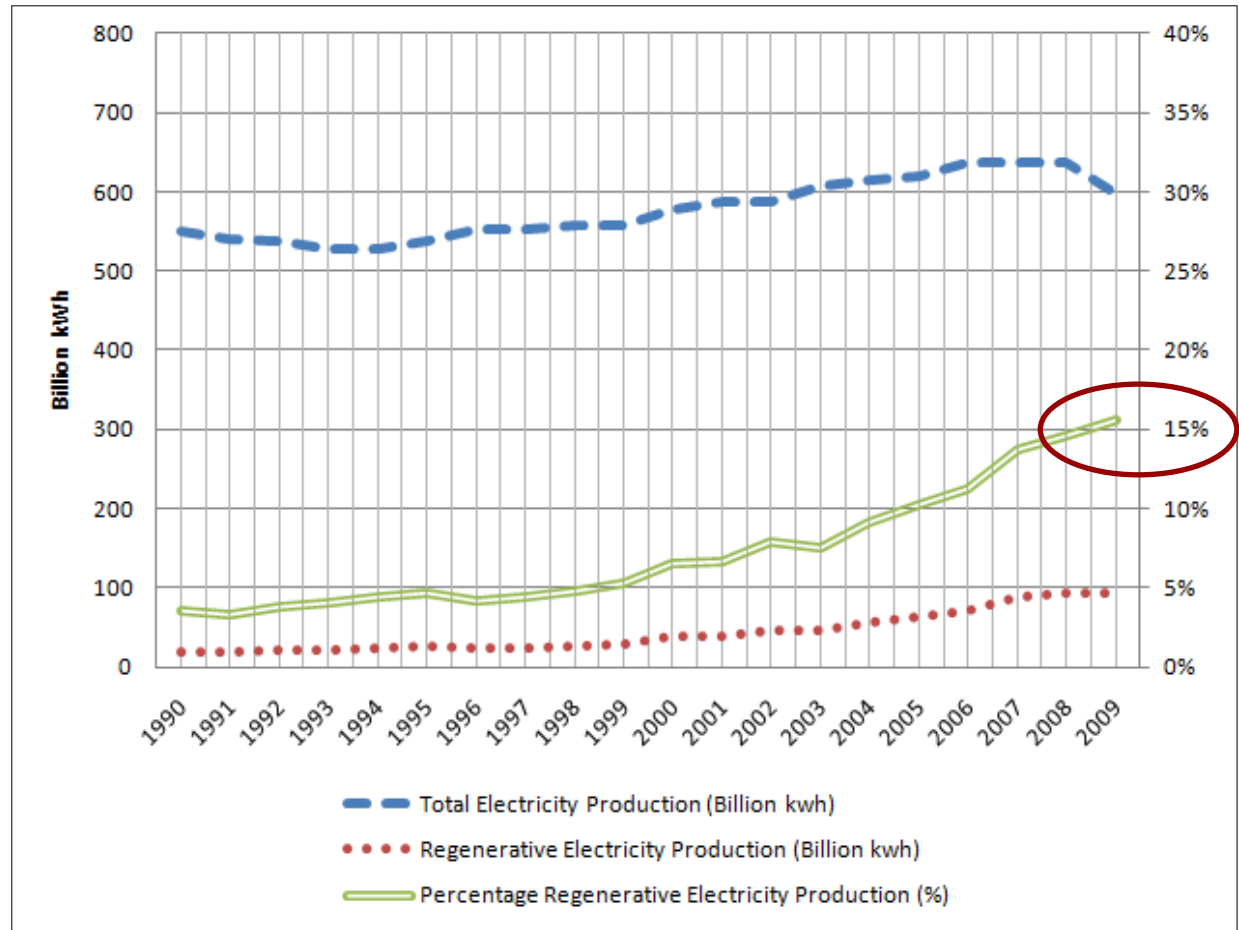
Author(s)	Operational Perspective	Customer Quality Perspective	Green Perspective	Logistics Perspective
Anderson et al. (2009)		X	X	
Krause et al. (2009)	X		X	
Al-Mansi et al. (2008)	X			X
Archel et al. (2008)			X	
Carter et al. (2008)			X	
Darnall et al. (2008)			X	X
Kohler (2008)	X	X		X
Middendorf (2008)			X	X
Seuring et al. (2008)	X		X	
Straube et al. (2008)		X	X	X
Vieira et al. (2008)			X	X
Koplin et al. (2007)		X	X	
Hamprecht (2005)		X		X
Steven (2004)			X	X
Bowen et al. (2001)			X	X
Rodrigue et al. (2001)				X
Hussain (1999)		X	X	
Walton et al. (1998)			X	X
Fleischmann et al. (1997)				X
Tate (1996)		X		X
Wu et al. (1995)			X	X

4. Electricity Perspective

Regenerative energy gap

- Increasing share of „green“ electricity production

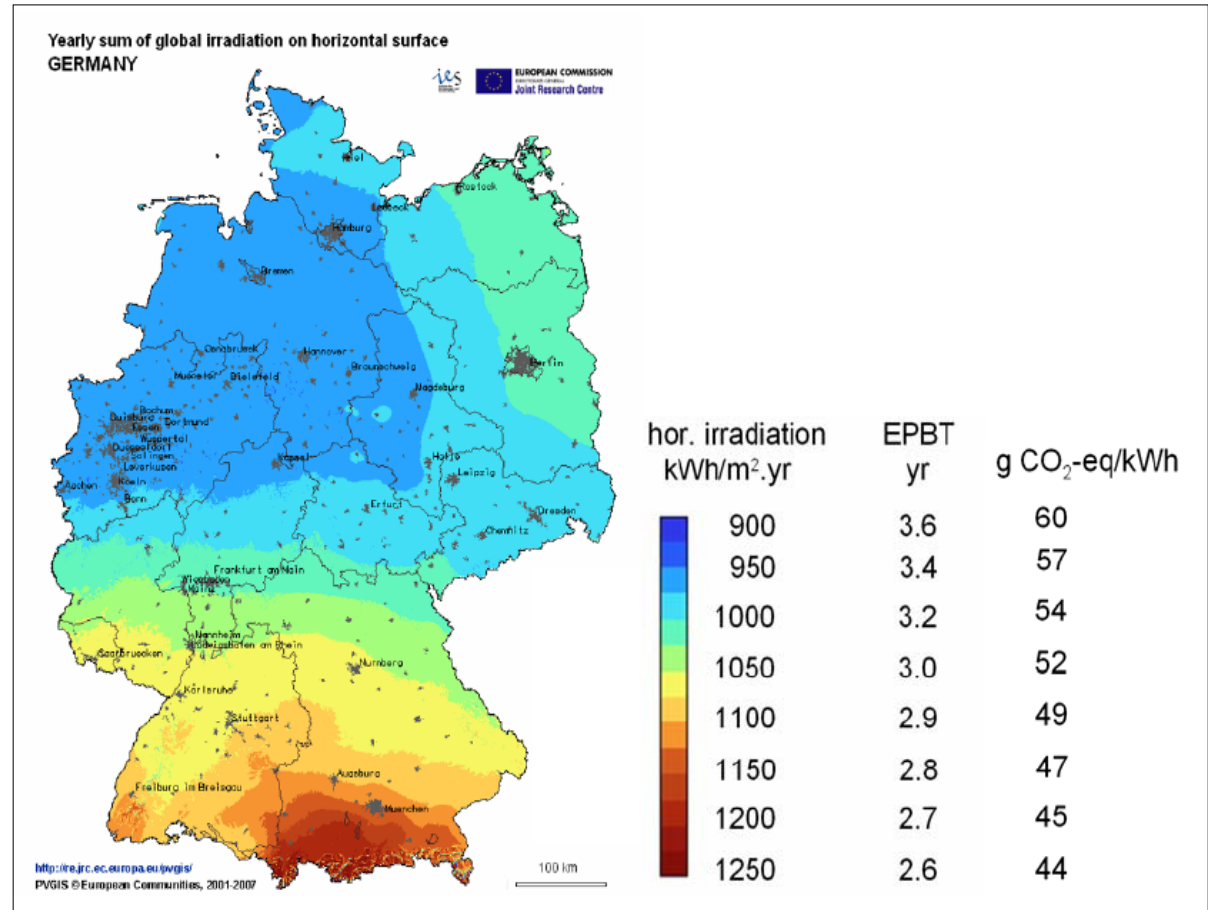
- But still low absolute share of about 15% of all electricity is produced „green“ – therefore electric vehicles are not per se green



4. Electricity Perspective

Regenerative energy problem

- Even regenerative energy is causing CO₂ emissions („Scope 3“)
- There are *measurement* and *placement* problems: solar electricity may not be climate friendly e.g. in Hamburg



5. Electric Processes & Routing



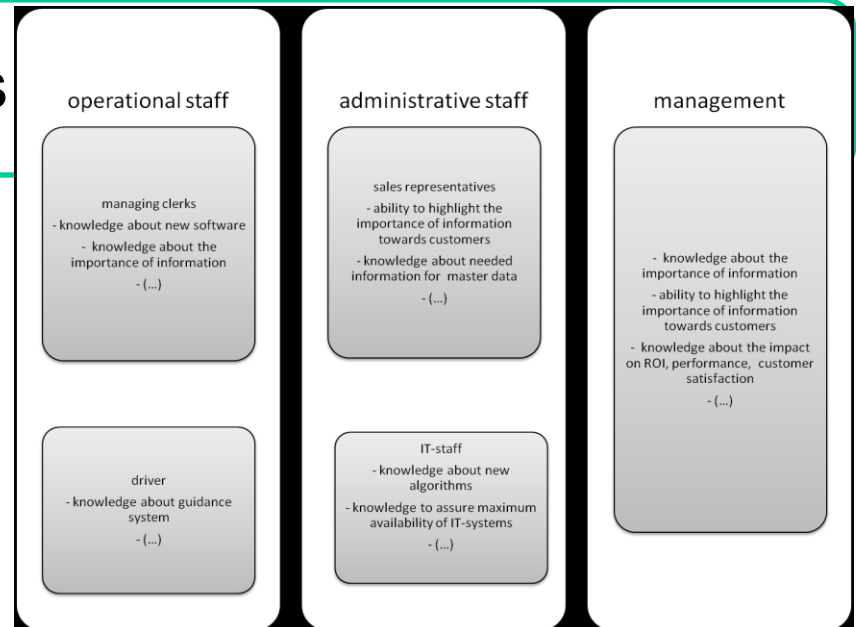
- Redesign of routing areas
- Integrated investment decision concept



- Software and algorithm changes
- Technical equipment changes



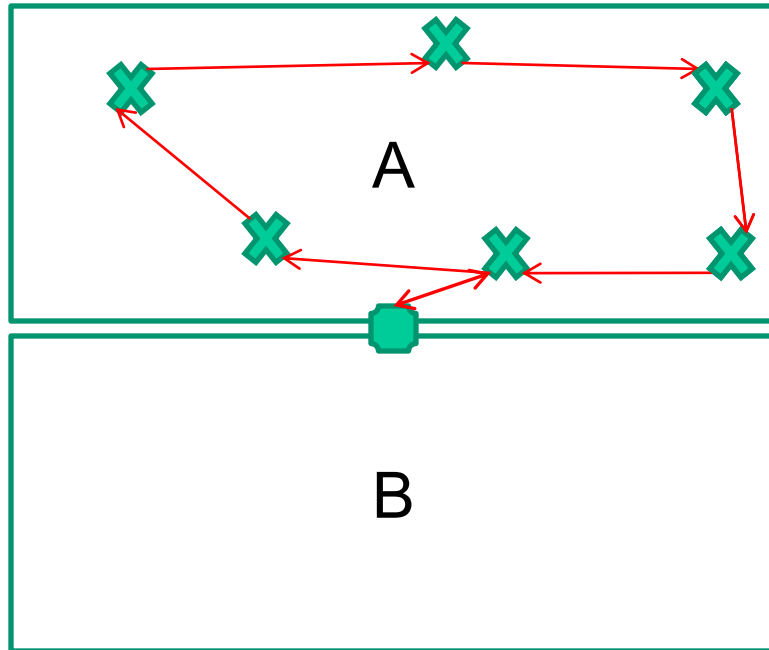
- Knowledge gaps



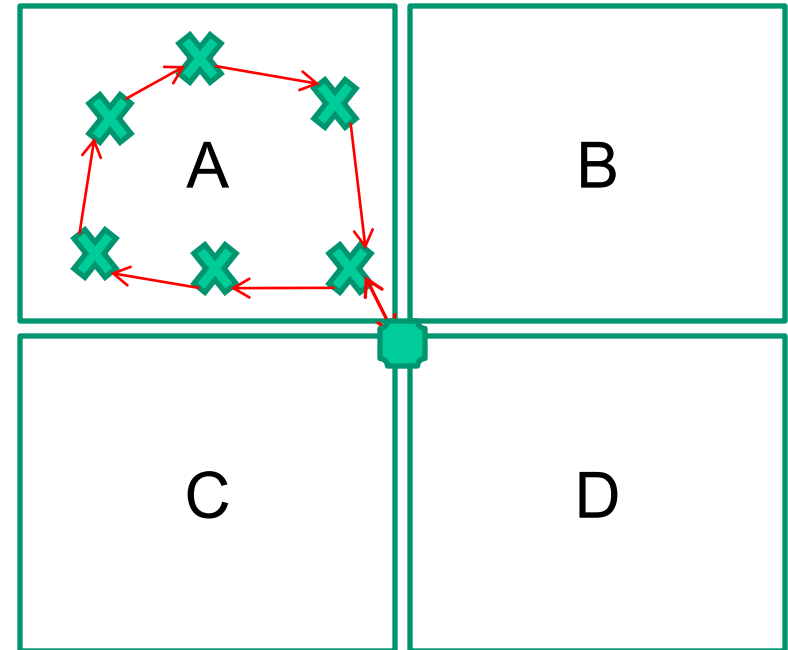
5. Routing Problems: Example I

Last-mile logistics with electric-driven vehicles:

Before



Afterwards (E-Mobility)



5. Routing Problems: Example II

Increasing problem through „driver planning“

driver-planned route

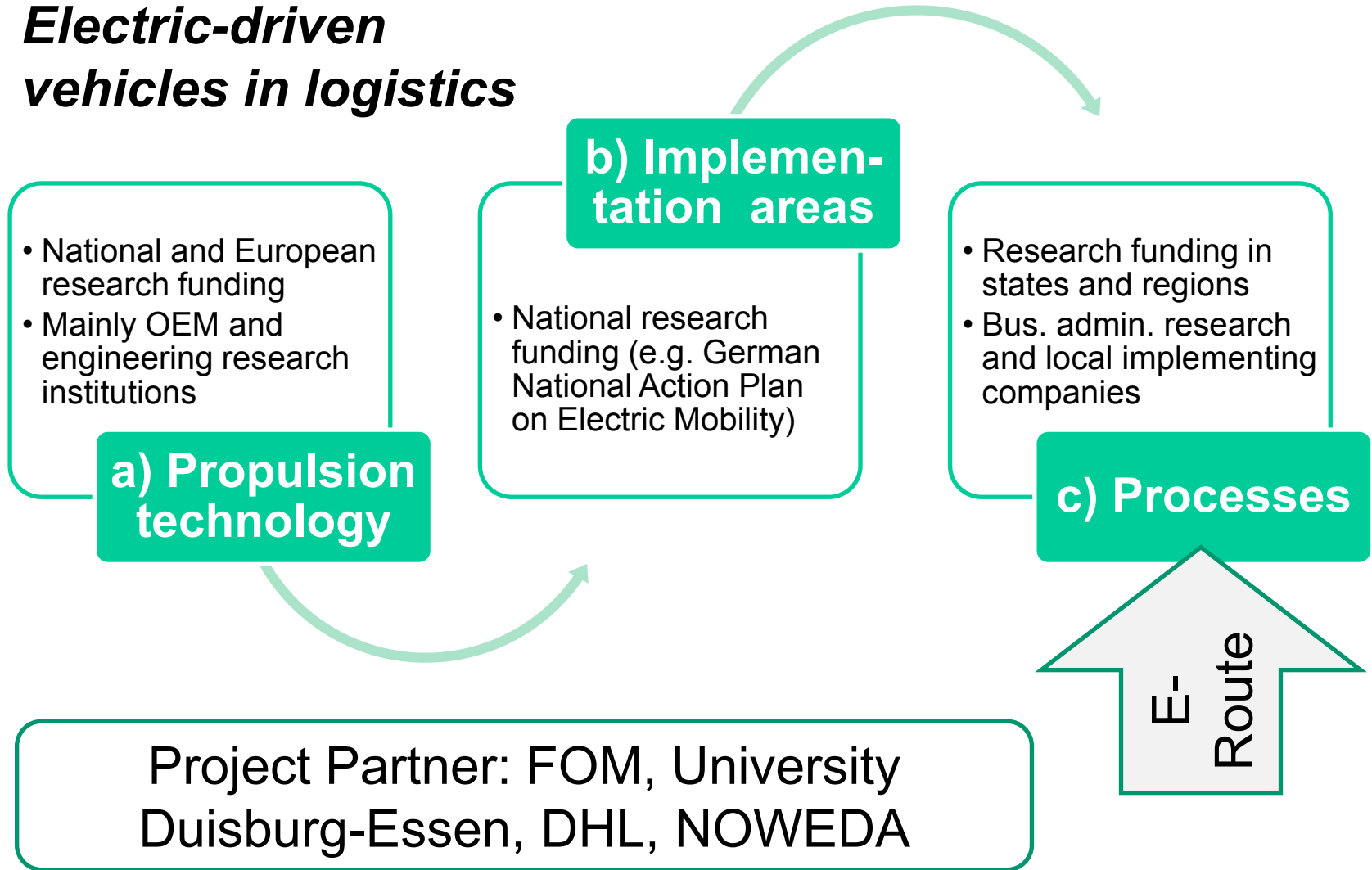
Stop no.	Street	ZIP	City	km
1	KRUPPSTRASSE	47475	KAMP-LINTFORT	23,2
2	INNENWALL	47495	RHEINBERG	29,5
3	NORDRING	47495	RHEINBERG	31,5
4	RHEINFELD	47495	RHEINBERG	31,8
5	DAMMWEG	47495	RHEINBERG	39,6
6	INDUSTRIESTRASSE	47495	RHEINBERG	44,3
7	SAALHOFFER STR.	47495	RHEINBERG	51,7
8	ALPENER STRASSE	47495	RHEINBERG	53
9	KARLSTR.	47495	RHEINBERG	62,4
10	WESELER STR.	46519	ALPEN	66,5
11	LINDENAU	47661	ISSUM	75,8
12	KULLENWEG	47661	ISSUM	76,7
13	VORSTER HEIDWEG	47661	ISSUM	82,8
14	HERMESWEG	47665	SONSBECK	92,5
15	ALPENERSTR.	47665	SONSBECK	98,7
16	HOCHSTR.	47665	SONSBECK	100,7
17	RAIFFEISENSTR.	47665	SONSBECK	101,6
18	HOCHSTR.	47665	SONSBECK	103
19	DASSENDALER WEG	47665	SONSBECK	103,9
20	BRUCHWEG	46509	XANTEN	113,5
21	AUF DER ALTEN BURG	46509	XANTEN	123,3
22	HAAGSCHER WEG	46509	XANTEN	129,2
23	RHEINSTR.	47546	KALKAR	151,6
24	ESCHENWEG	47546	KALKAR	166
25	DEPOT	47229	Duisburg	226,9

software-planned route

optimised stop no.2	Street	ZIP	City	optimised km
1	INDUSTRIESTRASSE	47495	RHEINBERG	25,7
2	DAMMWEG	47495	RHEINBERG	30,3
3	INNENWALL	47495	RHEINBERG	35,9
4	NORDRING	47495	RHEINBERG	37,9
5	RHEINFELD	47495	RHEINBERG	38,2
6	SAALHOFFER STR.	47495	RHEINBERG	42,8
7	ALPENER STRASSE	47495	RHEINBERG	44,1
8	WESELER STR.	46519	ALPEN	50,1
9	KARLSTR.	47495	RHEINBERG	54,2
10	BRUCHWEG	46509	XANTEN	63,1
11	AUF DER ALTEN BURG	46509	XANTEN	72,9
12	HAAGSCHER WEG	46509	XANTEN	78,8
13	RHEINSTR.	47546	KALKAR	101,2
14	ESCHENWEG	47546	KALKAR	115,6
15	DASSENDALER WEG	47665	SONSBECK	136,2
16	HOCHSTR.	47665	SONSBECK	137,1
17	HOCHSTR.	47665	SONSBECK	137,7
18	RAIFFEISENSTR.	47665	SONSBECK	138,6
19	ALPENERSTR.	47665	SONSBECK	140
20	HERMESWEG	47665	SONSBECK	146,2
21	LINDENAU	47661	ISSUM	151,6
22	KULLENWEG	47661	ISSUM	152,5
23	VORSTER HEIDWEG	47661	ISSUM	158,6
24	KRUPPSTRASSE	47475	KAMP-LINTFORT	160,5
25	DEPOT	47229	Duisburg	192,5

6. Outlook: Project „E-Route“

Electric-driven vehicles in logistics



Strategy

- Integrated concept for green logistics with electric vehicles needed (e.g. including electricity production)
- National and international standards needed

Operations

- Several changes in routing and processes (e.g. stops, accident and ADR training etc.) needed
- Future research task with business practice

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**Thank you for your
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Hamburg, 2./3. September 2010