

Environmental impact evaluation in the Czech Republic

Vilém Pařil

Institute for Transport Economics,
Geography and Policy

Project Impact Assessment
Transport Planning
Public Sector Role
Commuting
Labour Markets

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Centre for Nonprofit Sector
Research

Project Impact Assessment
Public Sector Role
NGO Mapping
NGO Policy
NGO Effects
Labour Markets

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Sustainable development

- 1980 World Conservation Strategy
- Definition
 - development in which meeting the needs of today's generations does not threaten to meet the needs of future generations

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Environmental and Ecological Economics

Transportation, Regional Development

Public Finance, Project Impact Assessment



Principles

- revitalizing economic growth
- change in the quality of growth
- conservation of natural resources
- sustainable population level
- friendly technology orientation
- integration of economic and ecological aspects
- reform of international economic relations
- international cooperation

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Environmental Impact Assessment

- Environmental Impact Assessment
- 70s of the 20th century.
 - USA
 - CBA extension
- 1972 Stockholm
 - 1st United Nations International Conference on the Environment
- 1985 of EEC Directive 85/337 / EEC
 - Environmental impact assessment

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Basic EIA document

- likely effects of the intended action on the environment
- the unavoidable negative effects of the action
- possible alternative variants of the event
- the relationship between the short and long-term effects of the action
- the demands of action on irreplaceable resources



Legal framework

- ECE Directive 85/337 / EEC
- Act No. 244/1992 Coll.
 - on Environmental Impact Assessment of Development Concepts
- Act 100/2001 Coll.
 - on Environmental Impact Assessment and on Amendments to Certain Related Acts
- Decree 457/2001 Coll.
 - on professional competence and on the modification of some other issues related to the environmental impact assessment

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Phases of EIA

- Notification / announcement
- Detection procedure (category II)
 - Screening (to determine whether the EIA will be fully implemented or not)
 - Scoping (to define area of interest and scope of full implementation of EIA)
- Documentation
- Assessment
- Public discussion
- Administrative legal act



Methods

- the ad hoc method
- method of translating layers
- index method
- matrix method
- network method

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Landscape evaluation

- Line constructions
- Methodological procedure for evaluation of the territory
 - Definition of the area of interest
 - Selection of map data
 - Analysis of Territorial Components
 - Partial synthesis
 - Environmental
 - Urbanist
- The resulting synthesis
 - Split into 3 zones

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Analysis of Territorial Components

- geomorphology (map 1)
 - the main types of relief according to the height and the predominant slope
- geology (map 2)
 - mineral resources, seismic influences, landslides threatened by landslides
- water (map 3)
 - watercourses and water areas
- protection of water resources (map 4)
 - protection zones of water resources, CHOPAV, protection zones of natural medicinal waters, water courses



Analysis of Territorial Components

- elements of the ecological framework of the landscape (map 5)
 - nationally protected areas of ZCHÚ: NP, CHKO / NPR, PR, NPP, PP, significant landscape features
- Territorial system of ecological stability (map 6)
 - supra-regional TSES
- forest ecosystems (map 7)
 - Category by eco-stabilization function
- agricultural land (map 8)



Analysis of Territorial Components

- archaeological sites and historical buildings (map 9)
- settlement structure (map 10)
 - boundaries of residential urban areas
- transport (map 11)
 - transport infrastructure

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Partial synthesis - environmental

- ecological values of the ground
- integration of map information 3 - 8
- resulting in the determination of 3 zone types
 - partial synthetic map 1
 - Zone 1
 - Maximizing conservation of ecological functions
 - Zone 2
 - Possible localization of investments provided extraordinary measures are taken
 - Zone 3
 - Localization of line constructions is generally permissible



Partial synthesis - urbanist

- urban values of the area
- integration of map information 9 - 11
- resulting in the determination of 3 zone types
 - partial synthetic map 2
 - Zone 1
 - Maximazing protection
 - Zone 2
 - Possible compromises
 - Zone 3
 - Localization of line constructions is generally permissible



The resulting synthesis

- Zone 1
 - Max. protection of ecological stability
 - Strong urbanization
- Zone 2
 - Possible compromises
 - Possibility of localization, but necessary protection
- Zone 3
 - Localization of line constructions is generally permissible

Examples of geographical background

- <http://geoportal.gov.cz>
- <https://geoportal.npu.cz/web>
- <https://geoportal.npu.cz/webappbuilder/apps/93/>
- <http://mapy.nature.cz/>
- http://heis.vuv.cz/data/webmap/isapi.dll?map=mp_heis_voda&
- <http://www.lpis.cz/>
- http://geoportal.jsdi.cz/geoportal_RSDCR/default.aspx

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Case Study: Costs of environment

- What are relevant costs?
- How to measure them?

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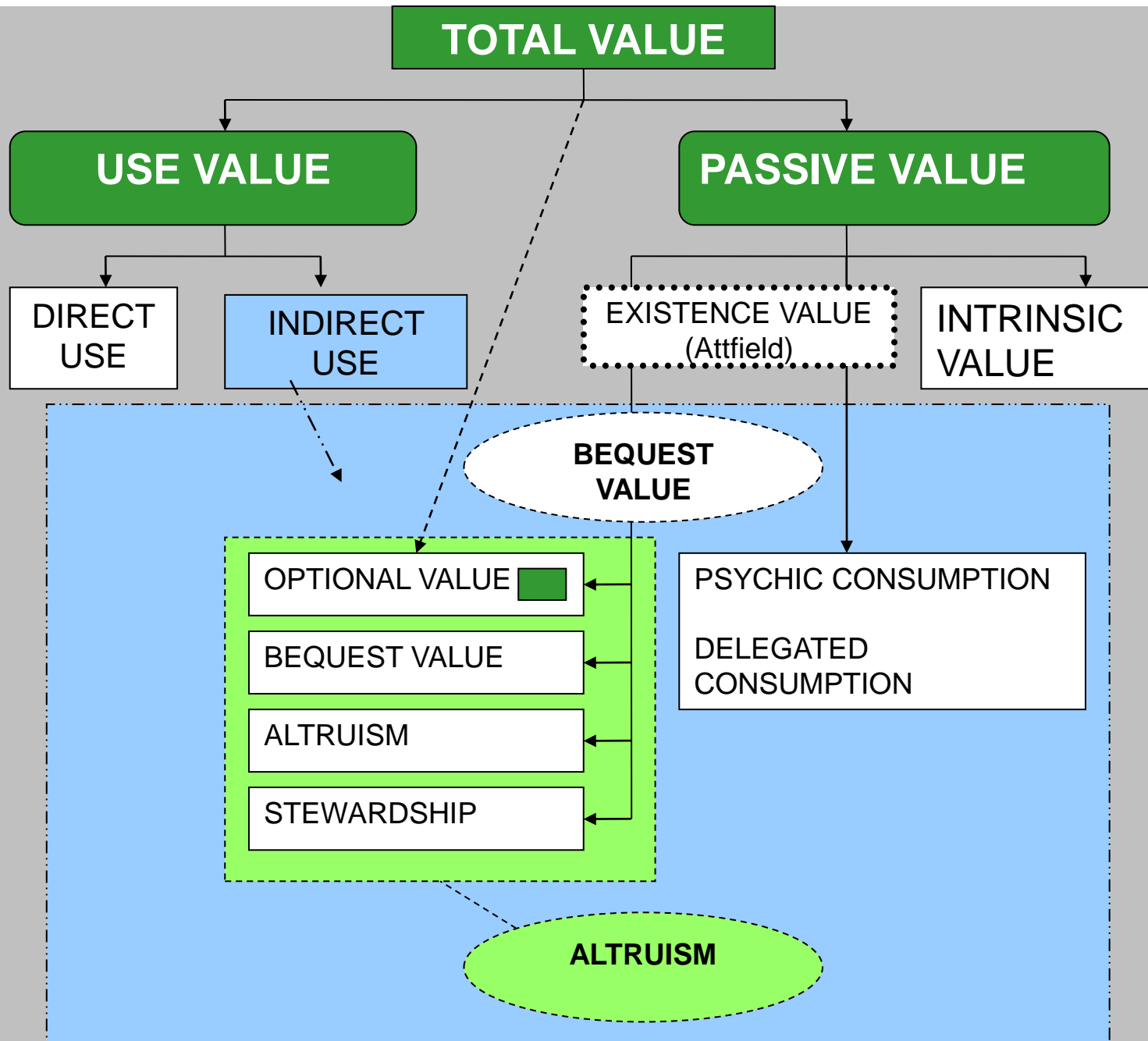
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Environmental Value

- Components



Environmental Approches

- Market Approaches
- Neoclassical Environmental Economics
- Institutional Ecological Economics
- Public Choice Approach

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Assessment Methods

- Cost Minimalization Analysis, CMA
 - (minimalizing the cost)
- Cost Effectiveness Analysis, CEA
 - (maximizing the output)
- Cost Utility Analysis, CUA (public health)
- Cost Benefit Analysis, CBA (method used to assess transport infrastructure project in EU)



Monetisation / Valuation Methods

- Shadow Price Method, SPM
- Analogue Market Method, AMM
- Travel Cost Method, TCM
 - Zonal Travel Cost Model, ZTCM
 - Individual Travel Cost Model, ITCM
 - Single Site Model, SSM
 - Random Utility Model, RUM
- Hedonic Pricing Method, HPM
- Replacement Costs Method, RCM
- Averting Behaviour Method, ABM
- Benefit Transfer Technique, BTT
- Preference Analysis, PA
- Contingent Valuation Methods, CVM
 - willingness to pay method
 - accepting compensation method
- Expert Methods
 - Ecosystem Services
 - wastewater treatment plant
 - wetland

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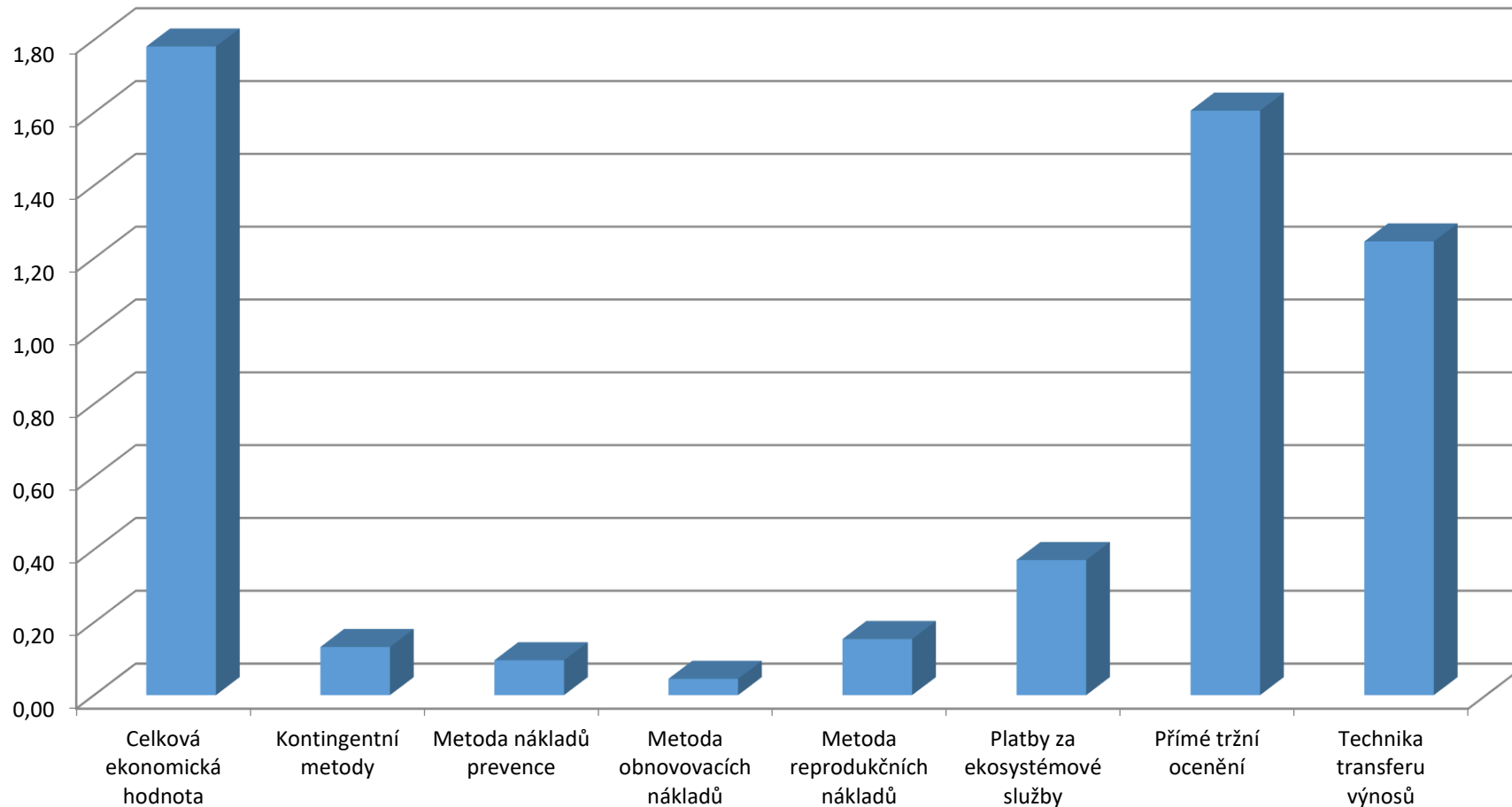
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Value of soil ecosystem services



- according to assessment methods used

The Case of Czech Republic Road Infrastructure Costs on Water

- Road Infrastructure
 - Expressways – national level
 - IInd class roads – regional level

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Legal Background

- Infrastructure legal Framework
 - Road infrastructure law
 - Road operations law
- Environmental legal Framework – law on:
 - Environment
 - Soil
 - Forest
 - Landscape and Biodiversity
 - Water
 - Air / Climate change
 - Noise
- Urban planning legal Framework
 - Both planning and construction/building law

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Process Background

- Intention / Concept
- Strategic Plan
- Urban Planning
 - spatial development policy (national level)
 - principles of territorial development (regional level)
 - Urban plan (local level)
- Feasibility Study
- Financial Sources
- Construction Approvements (regarding all related laws from other fields)
- Operation Costs/Revenues
- Reuseability / Demolition etc.

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Environmental impacts of transport

Stuy / Field of Study	Water / Soil	Safety	Time Savings	Noise	Air quality	Global Change	Biodiversity	Landscape
Abroad								
OECD (1998)		x	x	x	x	x		
DETR (1998)		x	x	x	x	x		
Forkenbrock (1998, 2001)		x		x	x	x		
PETS (Nash et al., 2000)		x	x	x	x	x	x	
Thaler (2003)		x		x	x	x	x	
OECD (2003)		x		x	x	x	x	
RECORDIT (Black et al., 2003)		x	x	x	x	x		
UNITE (Bickel et al., 2003)		x		x	x	x		
Lindberg (2003)		x	x					
ExternE (Bickel, Friedrich, 2005)	x			x	x	x	x	
GRACE (Lindberg, 2006)		x	x	x	x			
HEATCO (Bickel et al., 2006)	x	x		x	x	x		
IMPACT (Maibach et al., 2008)	x	x	x	x	x	x	x	
TREN (2010)			x	x	x	x		
TEN-T (TEN-T EA, 2011)		x		x	x	x	x	x
TAG (DefT, 2014)	x	x		x	x	x	x	x
Korzhenevych et al. (2014)		X	x	x	x	x		
Czech								
Dopravní sektorové strategie (MD, 2013)		x	x	x	x		x	
Adamec et al. (2002, 2005, 2006)	x	x	x	x	x		x	x
COŽP (2008)	x	x	x	x	x	x	x	
Total	6	18	12	19	19	16	10	3

- Disposable studies

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Infra-structure Costs

- Example of
- highway infrastructure costs on water protection areas

D/R	In operation		Plan		Total		%	
	Length (km)	Area (ha)	Length (km)	Area (ha)	Length (km)	Area (ha)	CHOPAV	OP VZ
D1	59,703	7 151	7,121	811	66,824	7 962	19,04	80,96
D0	2,551	277	0,110	6	2,661	283	0,00	100,00
D2	16,669	1 472	0,000	0	16,669	1 472	98,96	1,04
D3-Z	4,556	475	45,758	4 372	50,314	4 848	46,72	53,28
D3-V	4,556	475	46,508	4 250	51,064	4 726	43,75	56,25
D4	8,641	313	1,078	450	9,719	763	0,00	100,00
D5	14,290	1 470	0,000	0	14,290	1 470	0,00	100,00
D6	37,599	2 686	11,609	1 846	49,208	4 532	73,03	26,97
D7	0,000	0	16,621	1 774	18,571	1 774	96,56	3,44
D8	24,445	2 449	5,116	499	29,561	2 949	72,03	27,97
D10	58,728	4 995	0,000	0	58,728	4 995	73,80	26,20
D11	6,136	487	36,150	4 383	42,286	4 870	41,80	58,20
D35-J	38,966	4 097	66,965	7 366	105,931	11 463	84,26	15,74
D35-S	38,966	4 097	79,239	8 653	118,205	12 750	82,88	17,12
D35-sS	29,176	2 656	65,621	7 618	94,797	10 274	78,68	21,32
D43	0,000	0	24,378	2 628	24,378	2 628	0,00	100,00
D46	0,821	1 098	0,000	0	0,821	1 098	9,86	90,14
D48	0,000	0	0,500	0	0,500	0	0,00	100,00
D49	0,000	0	29,013	3 171	29,013	3 171	48,95	51,05
D52-Z	0,000	0	3,356	140	3,356	140	0,00	100,00
D52-V	0,000	0	9,554	759	9,554	759	100,00	0,00
D55	5,007	528	23,811	2 705	28,818	3 233	50,03	49,97
D56	0,000	0	0,000	0	0,000	0	0,00	0,00
D63	0,000	0	0,000	0	0,000	0	0,00	0,00

Infra-structure Costs

- Example of road infrastructure costs on water protection areas
- Millions CZK/year

D/R	In operation				Plan				Total			
	UVOV 1	UVOV 2	UVOV 3	UVOV 4	UVOV 1	UVOV 2	UVOV 3	UVOV 4	UVOV 1	UVOV 2	UVO V ₃	UVO V ₄
D1	197	319	1 450	5 216	22	45	164	592	219	364	1 614	5 807
R1	8	50	56	202	0	1	1	4	8	51	57	206
D2	41	69	298	1 074	0	0	0	0	41	69	298	1 074
D3-Z	13	29	96	347	120	174	886	3 189	133	202	983	3 536
D3-V	13	29	96	347	117	168	861	3 100	130	197	958	3 447
R4	9	27	63	228	12	55	91	328	21	82	155	556
D5	40	62	298	1 072	0	0	0	0	40	62	298	1 072
R6	74	153	545	1 959	51	96	374	1 346	125	249	919	3 305
R7	0	0	0	0	49	74	359	1 294	49	74	359	1 294
D8	67	92	496	1 786	14	19	101	364	81	110	598	2 151
R10	137	213	1 013	3 643	0	0	0	0	137	213	1 013	3 643
D11	13	33	99	355	121	206	888	3 197	134	239	987	3 552
R35-J	113	171	830	2 988	203	306	1 493	5 372	315	477	2 323	8 360
R35-S	113	171	830	2 988	238	368	1 754	6 311	351	539	2 584	9 299
R35-sS	73	113	538	1 937	210	328	1 544	5 556	283	441	2 082	7 493
R43	0	0	0	0	72	170	533	1 916	72	170	533	1 916
R46	30	45	223	801	0	0	0	0	30	45	223	801
R48	0	0	0	0	0	0	0	0	0	0	0	0
R49	0	0	0	0	87	106	643	2 313	87	106	643	2 313
R52-Z	0	0	0	0	4	5	28	102	4	5	28	102
R52-V	0	0	0	0	21	45	154	554	21	45	154	554
R55	15	26	107	385	74	116	548	1 973	89	143	655	2 358
R56	0	0	0	0	0	0	0	0	0	0	0	0
R63	0	0	0	0	0	0	0	0	0	0	0	0
Sum min.	717	1 230	5 282	19 006	826	1 366	6 087	21 901	1 550	2 619	11 420	41 091
Sum max.	757	1 289	5 574	20 057	865	1 434	6 372	22 929	1 639	2 762	12 072	43 437



Infrastructure Costs

Road	Celkem		z plochy (%):	
	Length (km)	Area (ha)	CHOPAV	OP VZ
II/152	6,239	125,714	0,00%	100,00%
II/352	4,644	80,671	11,49%	88,51%
II/353	62,582	1 717,725	57,85%	42,15%
II/373	2,359	35,464	0,00%	100,00%
II/374	2,510	121,824	0,00%	100,00%
II/380	0,094	0,657	0,00%	100,00%
II/384	12,625	390,875	0,00%	100,00%
II/385	54,902	1 483,417	3,23%	96,77%
II/405	2,559	52,153	0,00%	100,00%
II/406	0,000	0,000	0,00%	0,00%
II/417	0,636	17,908	0,00%	100,00%
II/430	0,000	0,000	0,00%	0,00%
II/523	13,785	298,971	0,00%	100,00%
II/602	31,685	852,918	0,00%	100,00%
II/640	1,355	22,981	0,00%	100,00%
II/642	0,000	0,000	0,00%	0,00%
Total	195,975	5 201,277	∅	∅
Average	12,248	325,080	20,20%	79,80%

- Example of
- IInd class road infrastructure costs on water protection areas

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Infrastructure Costs

Road	Value			
	UVOV ₁	UVOV ₂	UVOV ₃	UVOV ₄
II/152	3,459	4,229	25,482	91,687
II/352	2,220	3,958	16,352	58,836
II/353	47,265	62,290	348,180	1 252,795
II/373	0,976	1,210	7,189	25,865
II/374	3,352	6,366	24,693	88,850
II/380	0,018	0,022	0,133	0,479
II/384	10,755	44,804	79,230	285,078
II/385	40,818	56,387	300,686	1 081,906
II/405	1,435	2,186	10,571	38,037
II/406	0,000	0,000	0,000	0,000
II/417	0,493	1,051	3,630	13,061
II/430	0,000	0,000	0,000	0,000
II/523	8,227	16,072	60,601	218,050
II/602	23,469	36,459	172,885	622,062
II/640	0,632	2,656	4,658	16,761
II/642	0,000	0,000	0,000	0,000
Total	143,119	237,690	1 054,291	3 793,466
Average	8,945	14,856	65,893	237,092

- Example of
- IInd class road infrastructure costs on water protection areas
- Millions CZK/year

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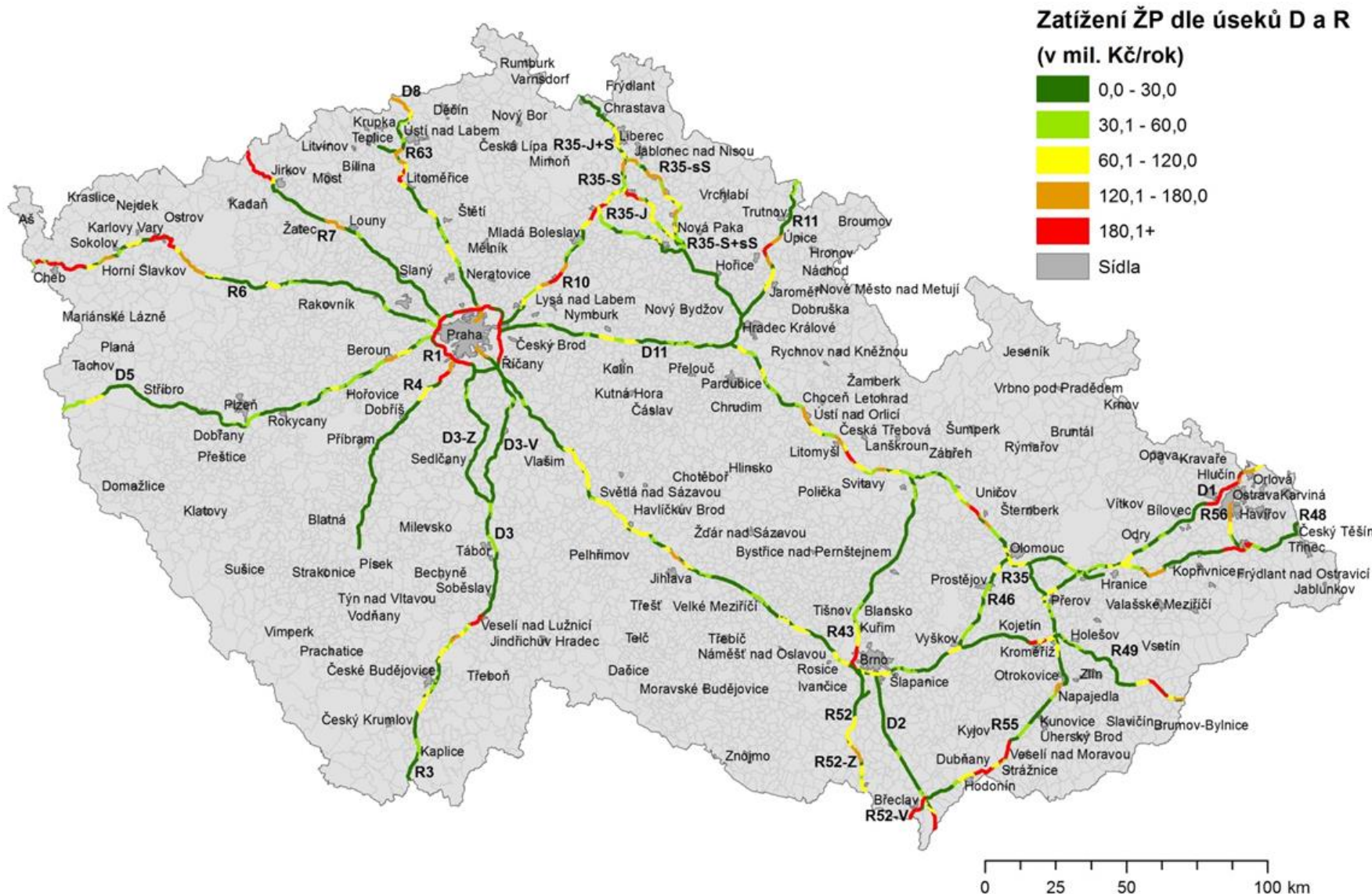
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Road Environmental Costs



- Absolute
- In millions CZK a year

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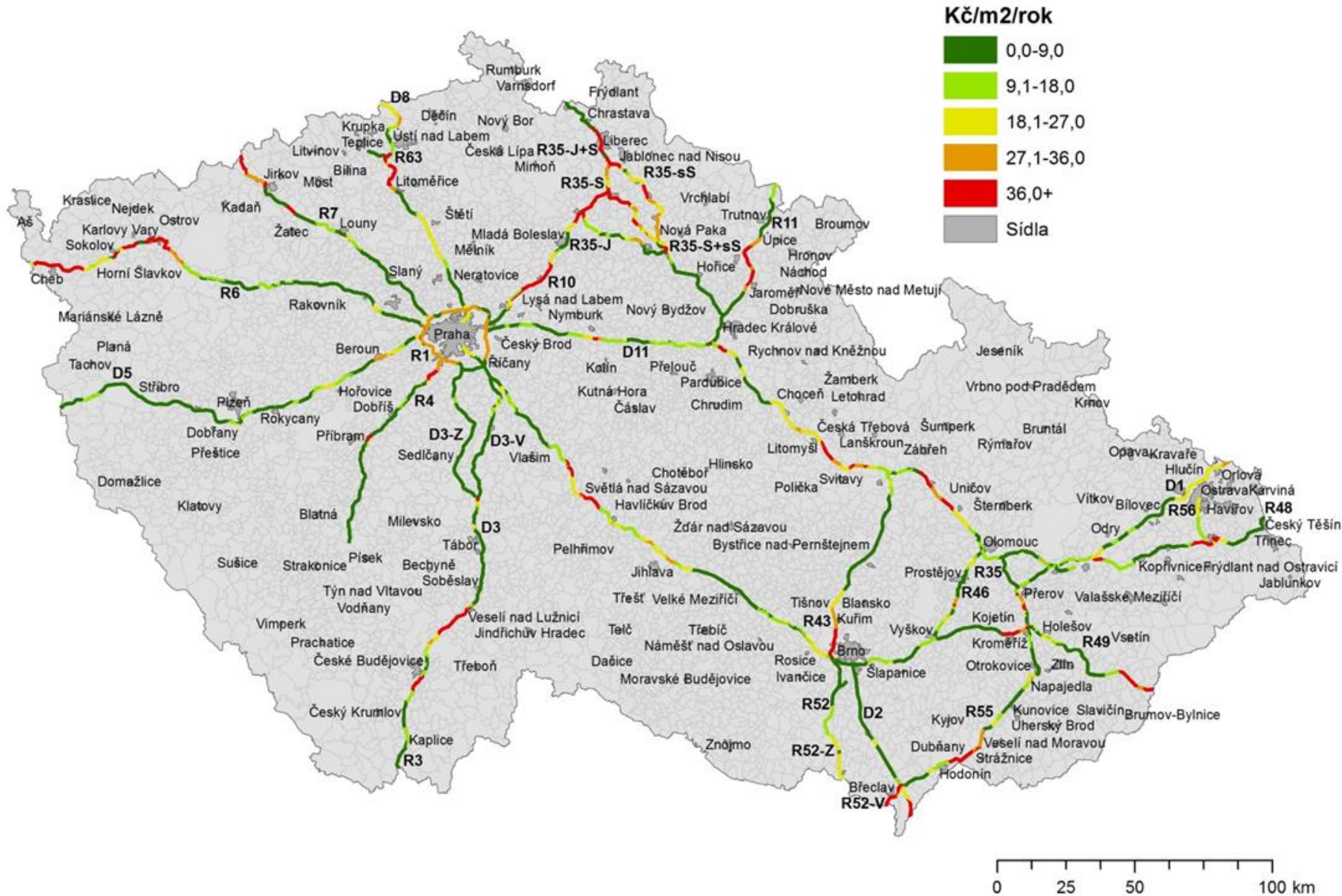
Comparison of the Variants

- Highway solutions

D/R	H _{ÚZ}	H _{Celk}	H _{Min}	H _{Max}	H _{ZPF}	H _{PPFL}	H _{VP} L	H _{ÚVOV}	H _{RZ} H	H _{RZ} O	H _{OB}	Opposite	Eco-friendly
D3-Z	11	10	10	8	7	8	10	7	12	12	13	4	7
D3-V	10	9	9	9	8	9	9	9	11	11	12	7	4
D35-J	4	4	4	2	4	4	4	2	4	4	4	0	9
D35-S	1	1	1	1	2	1	2	1	2	2	2	10	0
D35-sS	2	2	2	3	3	3	1	3	3	3	3	1	2
D52-Z	22	20	19	22	20	20	18	21	21	20	22	9	2
D52-V	23	22	20	21	22	21	21	18	23	23	23	2	9



Road Environmental Costs



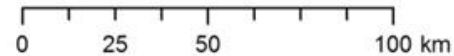
- Relative
- In CZK/meter /year

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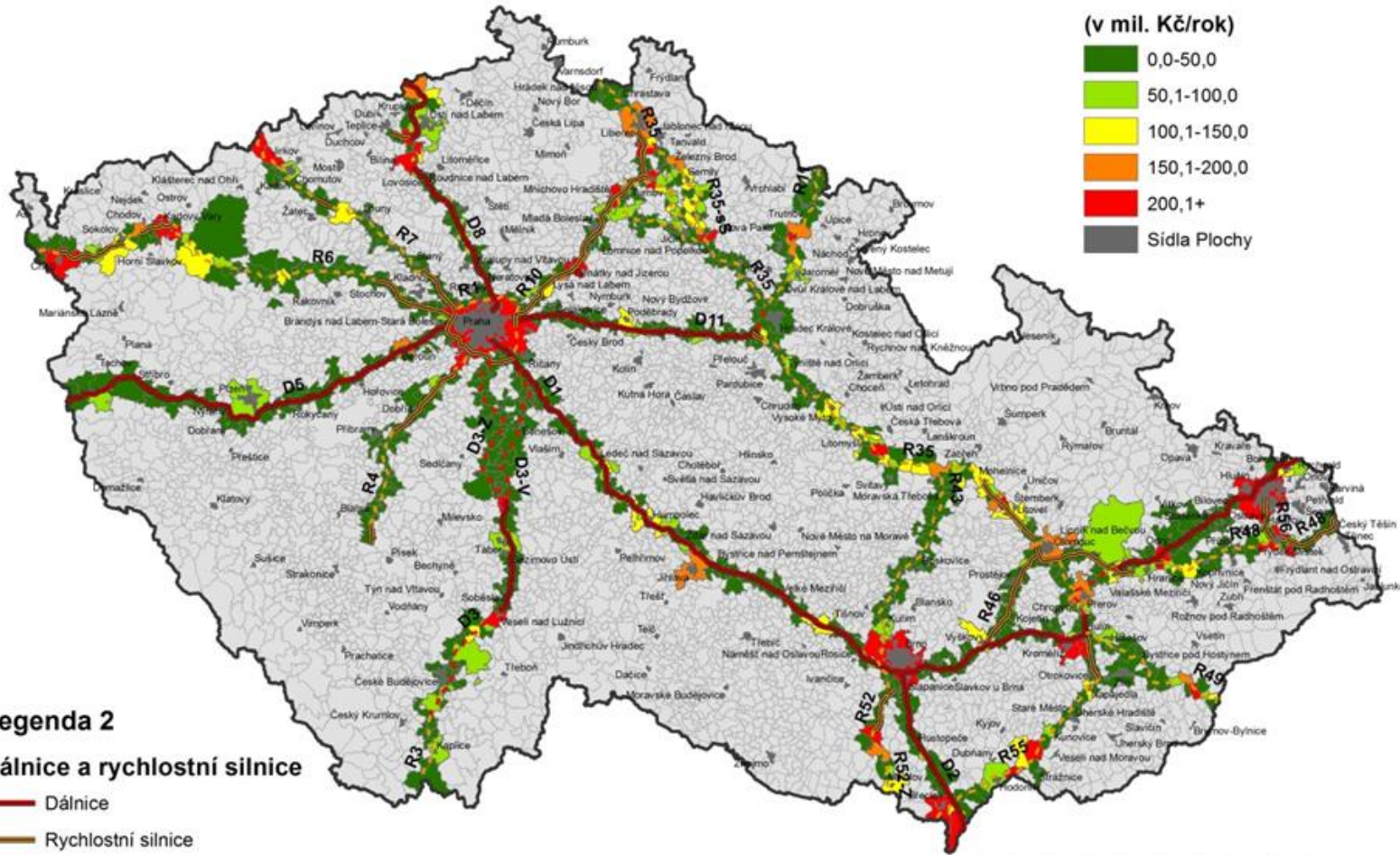
Road Environmental Costs on Municipalities

Legenda 1

**Ekonomické zatížení obcí
(v mil. Kč/rok)**

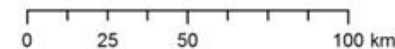


- Municipal view
- Millions CZK



Legenda 2

Dálnice a rychlostní silnice



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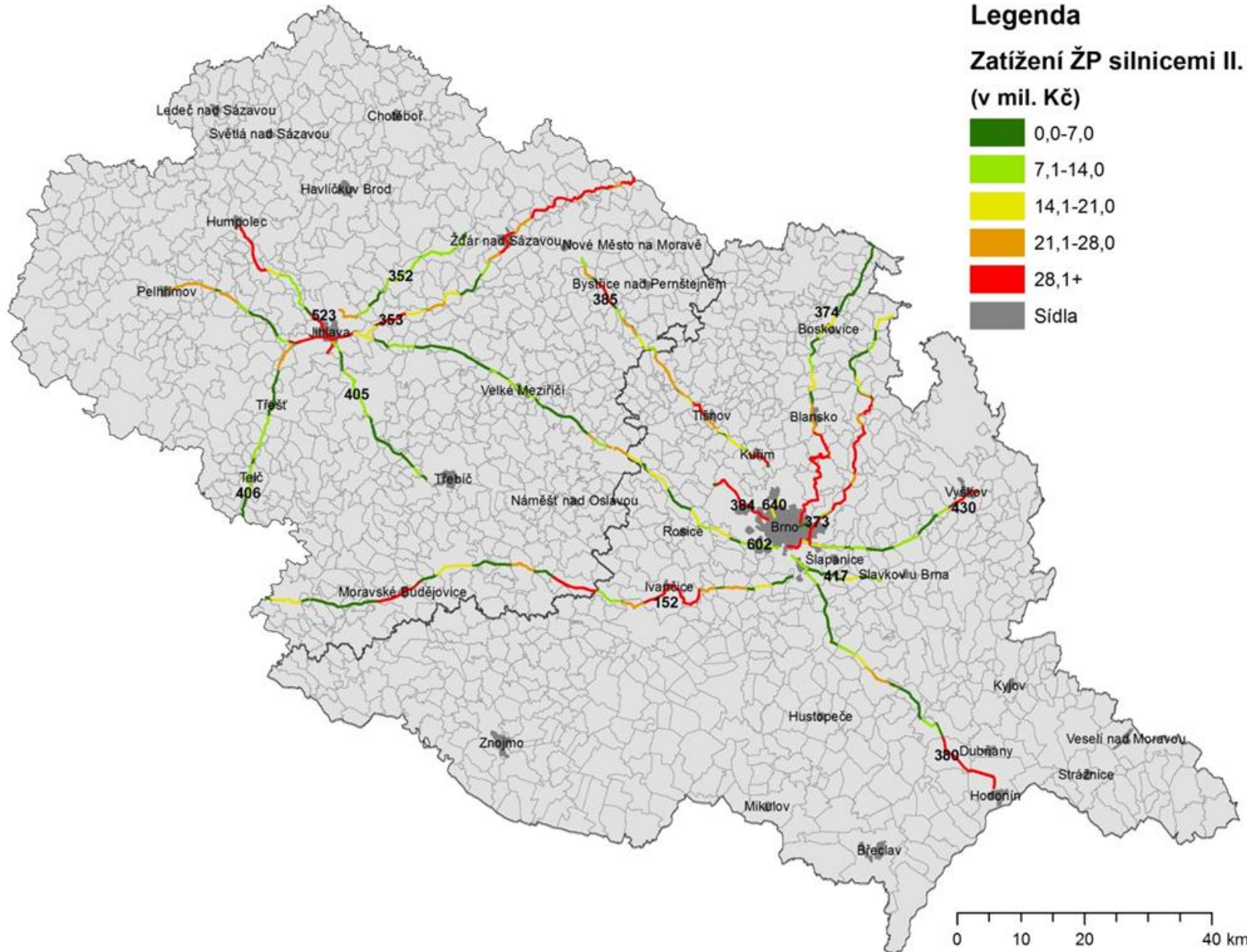
Road Environmental Costs

Legenda

Zatížení ŽP silnicemi II. třídy
(v mil. Kč)



- Regional
- Millions CZK



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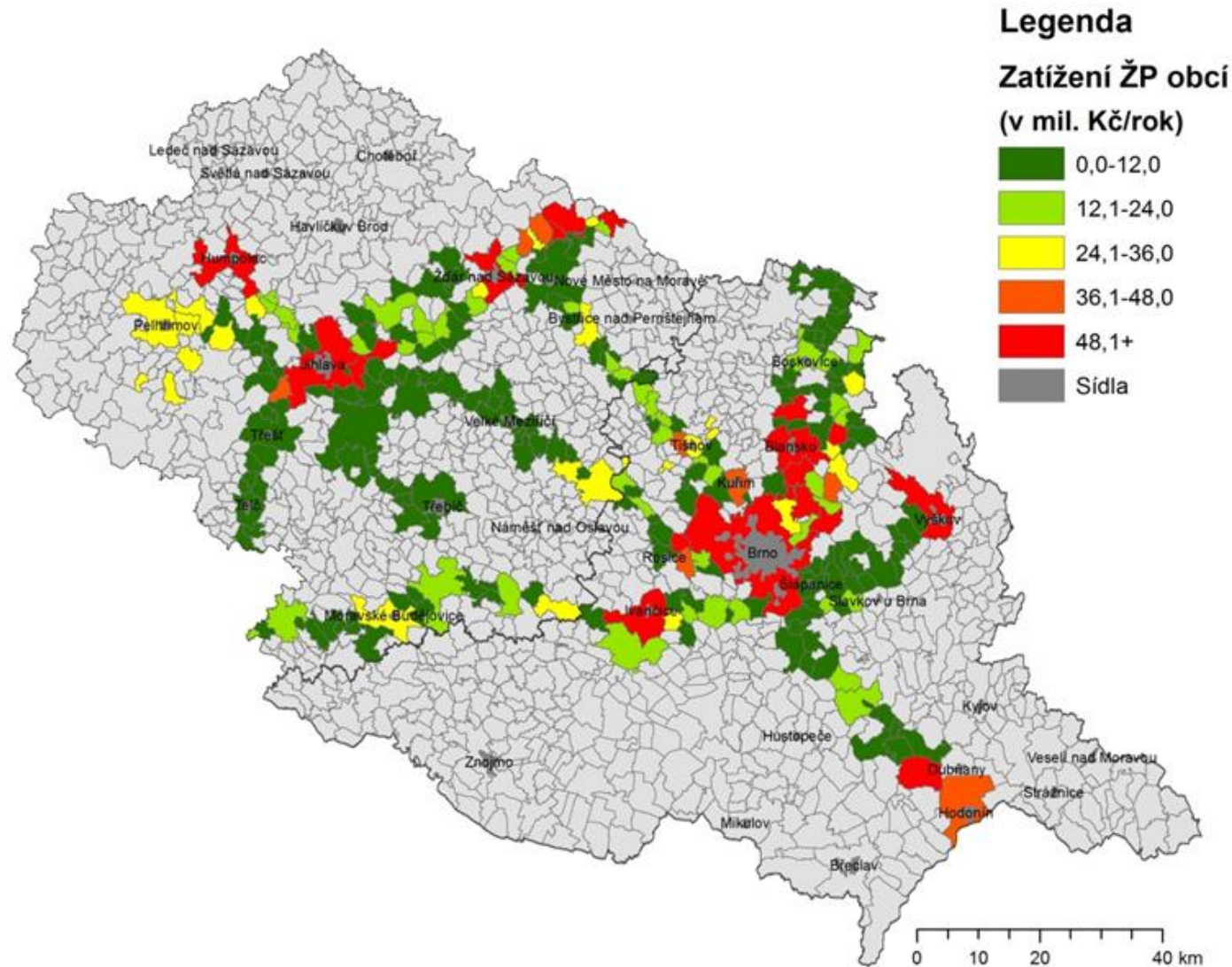
Environmental and Ecological Economics

Transportation, Regional Development

Public Finance, Project Impact Assessment



Road Environmental Costs



- Regional
- Municipal view

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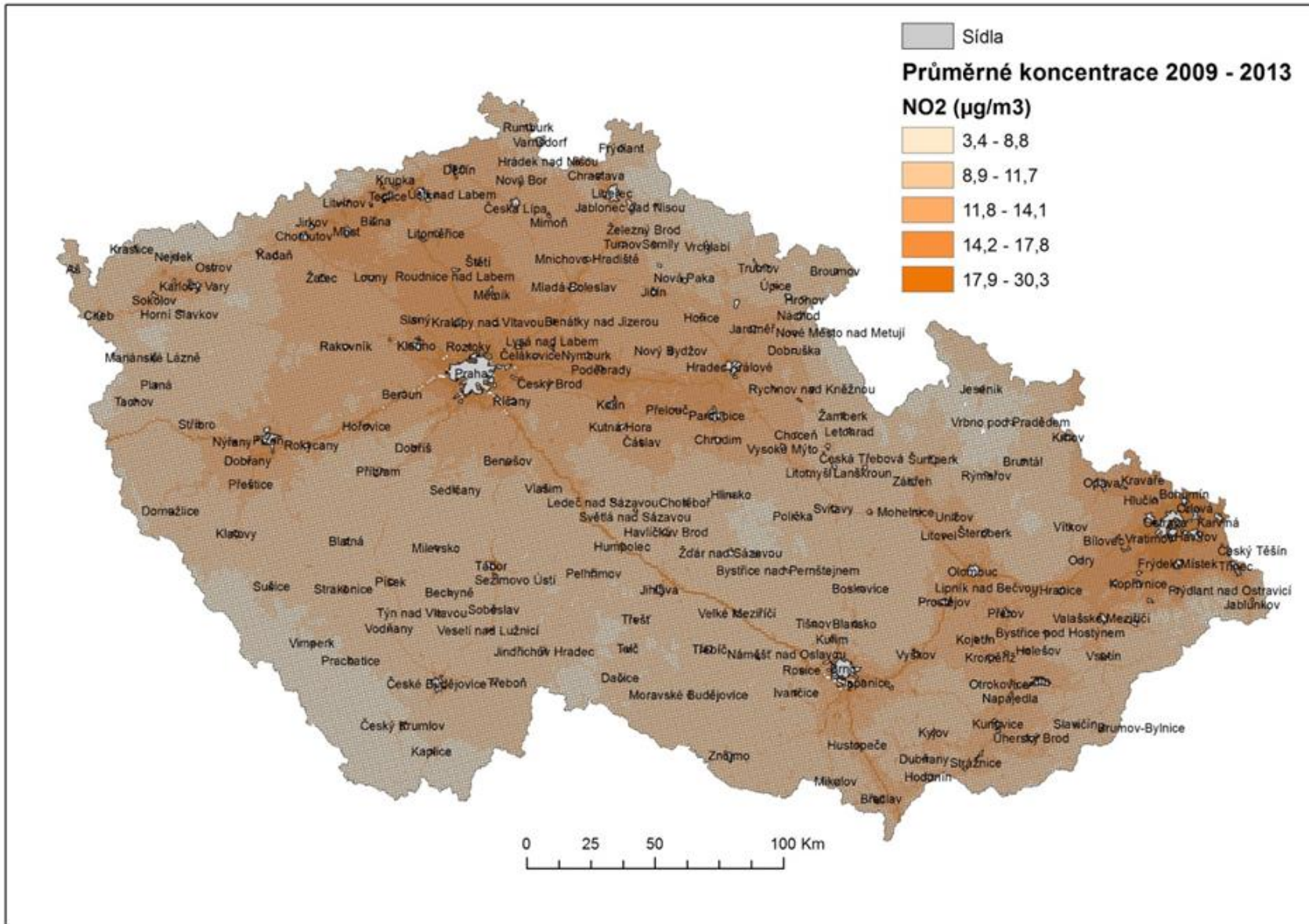
Transportation, Regional Development

Public Finance, Project Impact Assessment



Air Quality

- Example of nitrogen oxid



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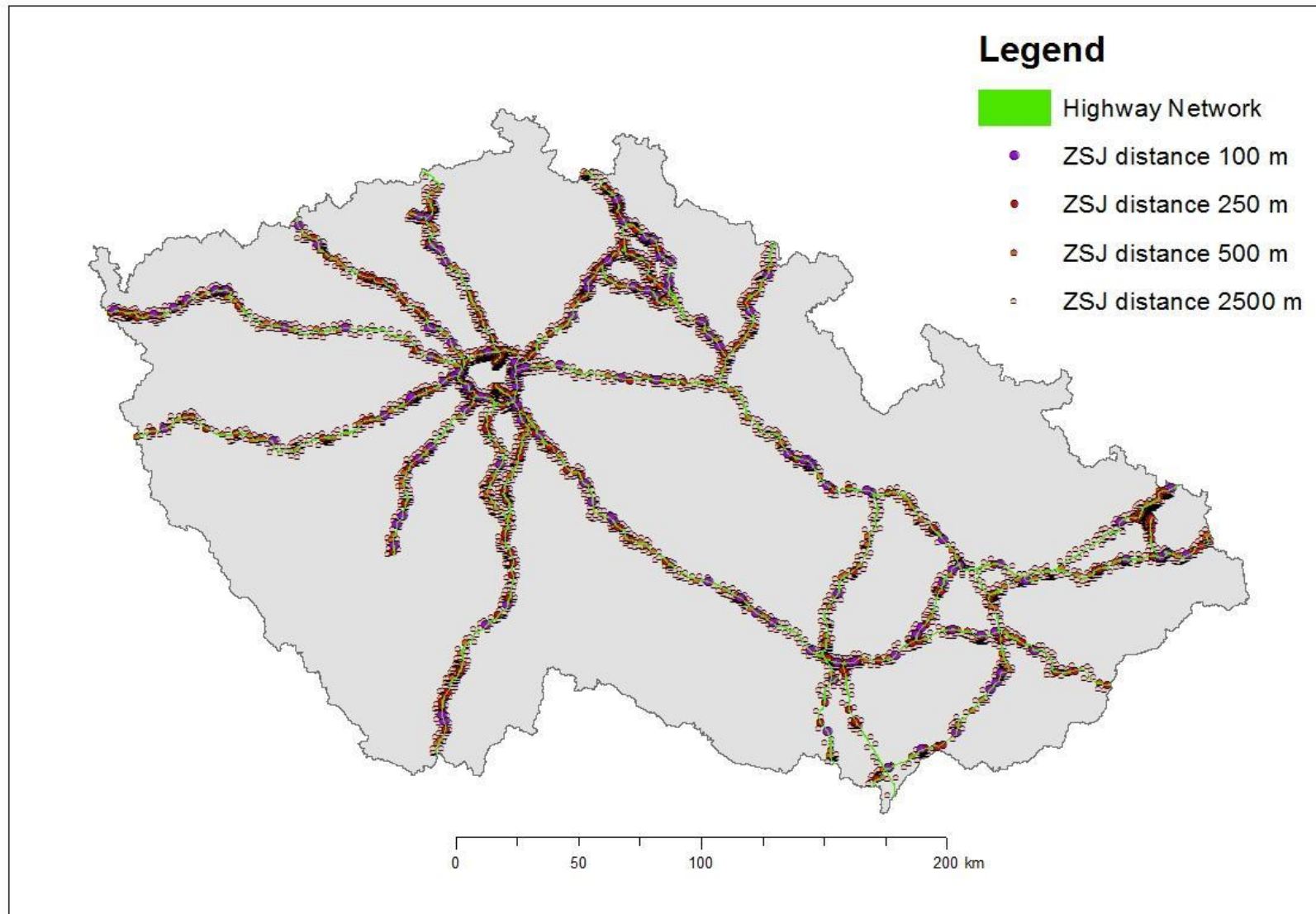
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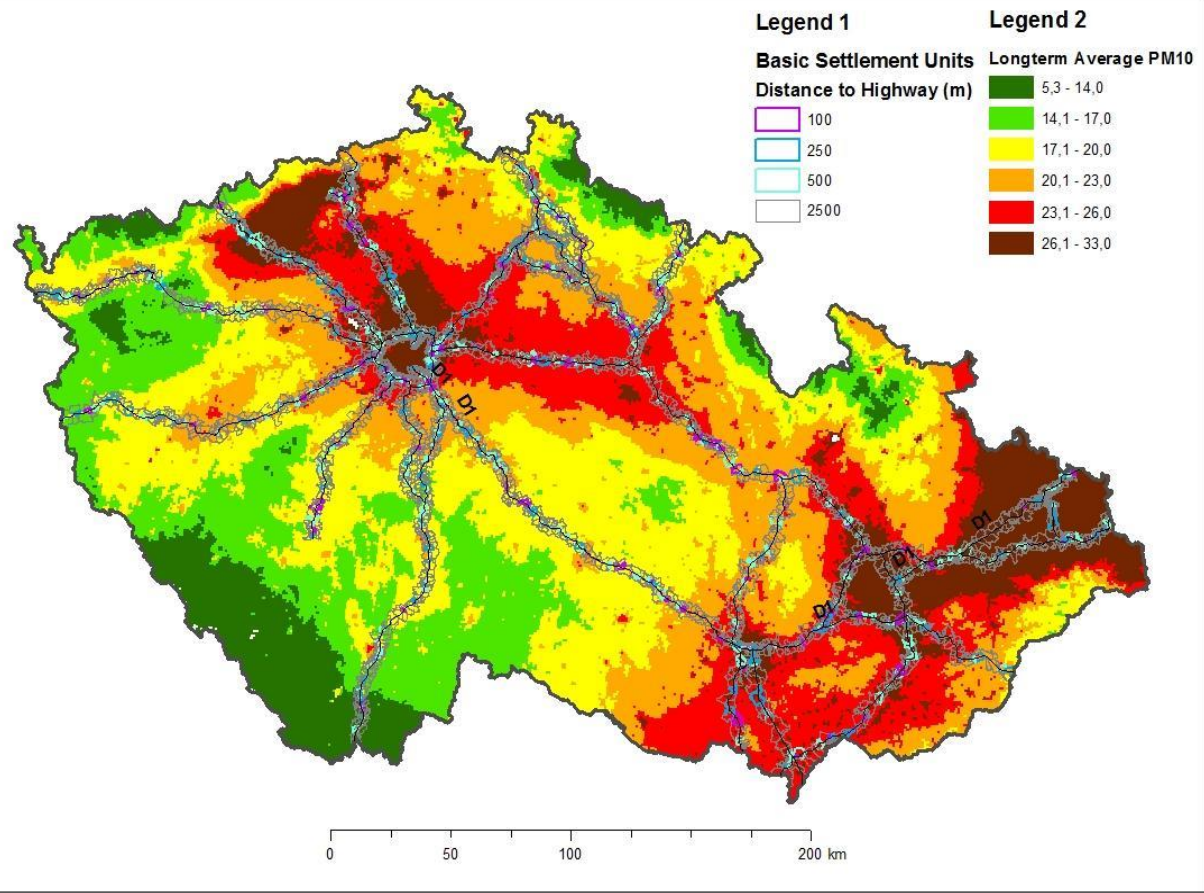
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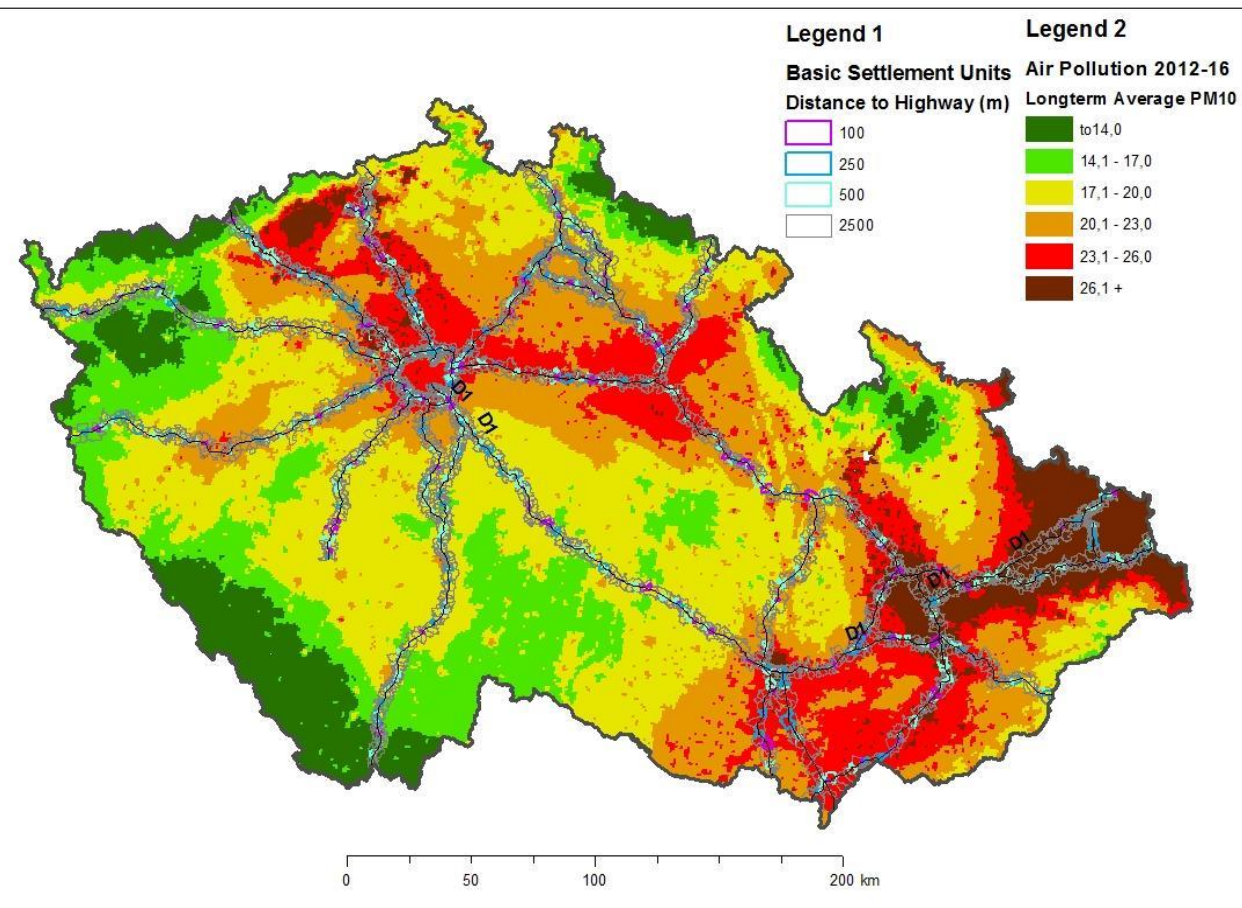


Air Quality

- Example of nitrogen oxid
- 2007 - 2011

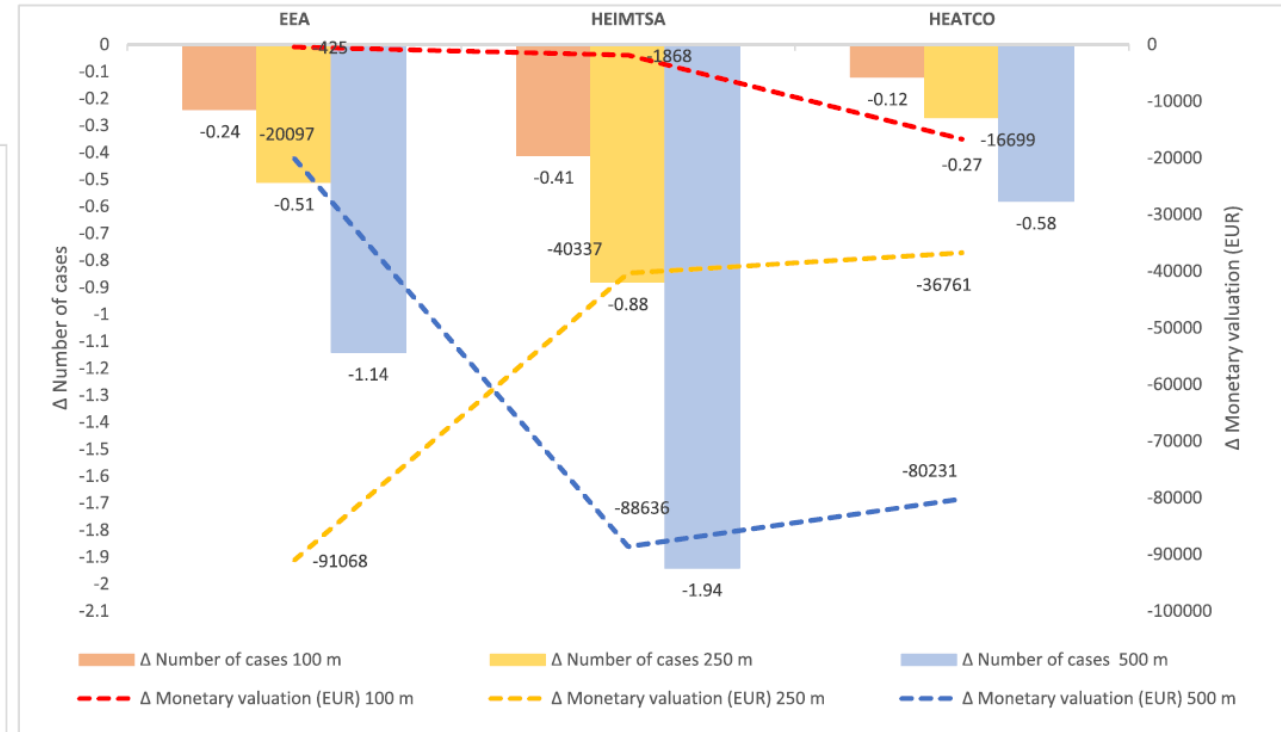
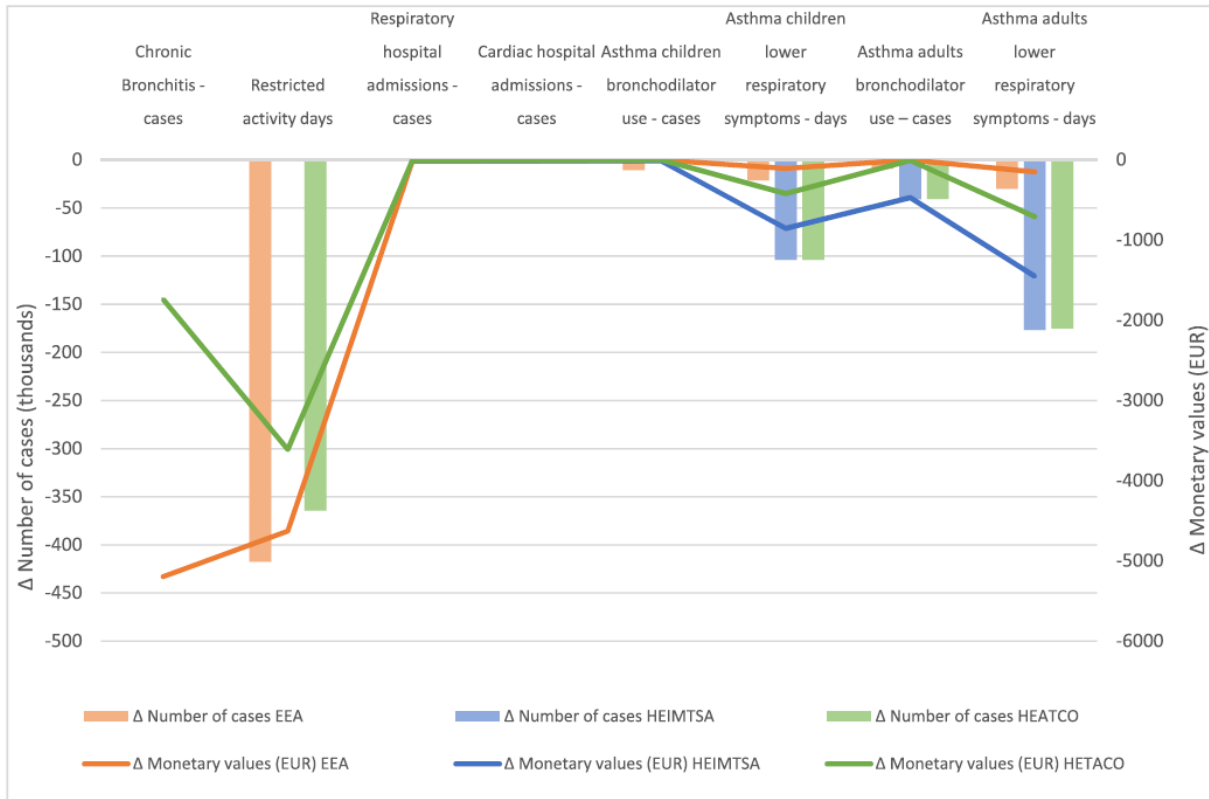
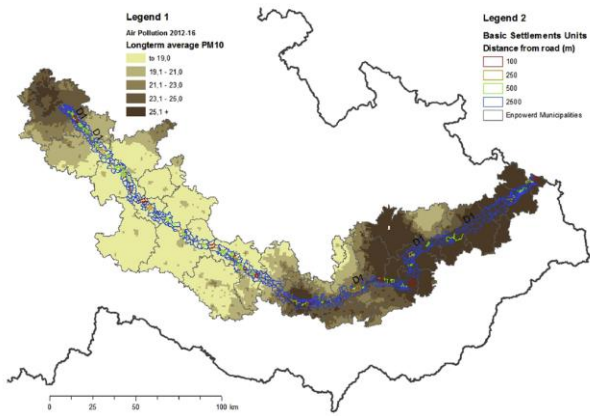


- Example of nitrogen oxid
- 2012 - 2016



Air Quality

- Example of PM10
- 2012 – 2016



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Thank you for your attention

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