

By Bjarne Bylov Jensen, Grontmij A/S

RAM SYSTEM – BEST PRACTICE

European Roads Need Your Assistance

Your task is: Maintain the road capital value in Europe as economically optimum as possible

A rough estimate: The capital value may exceed by far

€ 5,000,000,000,000

Your challenge is:

Roads are an important precondition for our welfare and not least our competitive power

How do we ensure that 500,000,000 million citizens can apply the road network safely - and not least without wasting time?

Ram system – Best Practice

Road maintenance in Denmark

Maintained by the Danish Road Directorate:

Motorway network: Approx. 1,200 km

Other nat. roads: Approx. 2,600 km

Maintained by 98 municipalities:

Municipal road network: Approx. 70,500 km

The *smallest* municipality maintains approx. 60 km road network

The *largest* municipality maintains approx. 2,000 km road network

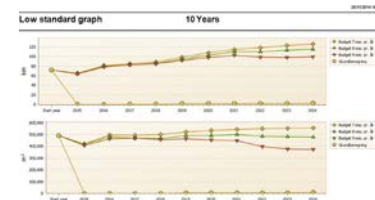


Ram system – Best Practice

Why RoSy PMS/RAMS is needed

Overview of:

- Municipal road network (basic data)
- Condition of road network
- Traffic load in road network
- Calculation of maintenance requirement
- Consequence calculation using various budget scenarios:
 - Backlog
 - Number of km low standard roads
 - Road capital
 - Average remaining service life
 - Concrete measures in the individual years
 - ... etc.



Product specification

Grundbegriff

Rd. No.	Road name	Change 0	2015	Quantity	Investment
100001	NOVUSBERGUE	0	0	32	32.000
100002	NOVUSBERGUE	0	32	616	7.000
100003	NOVUSBERGUE	0	616	890	1.000
100004	NOVUSBERGUE	0	890	1.000	1.000
100005	NOVUSBERGUE	0	1.000	1.000	1.000
100006	NOVUSBERGUE	0	1.000	1.000	1.000
100007	NOVUSBERGUE	0	1.000	1.000	1.000
100008	NOVUSBERGUE	0	1.000	1.000	1.000
100009	NOVUSBERGUE	0	1.000	1.000	1.000
100010	NOVUSBERGUE	0	1.000	1.000	1.000
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100012	NOVUSBERGUE	0	1.000	1.000	1.000
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Ram system – Best Practice

RoSy RAMS – Main modules

RoSy BASE

All relevant data about the road Network



RoSy PLAN

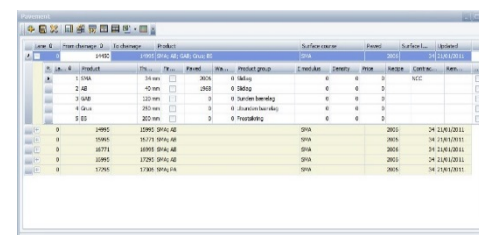
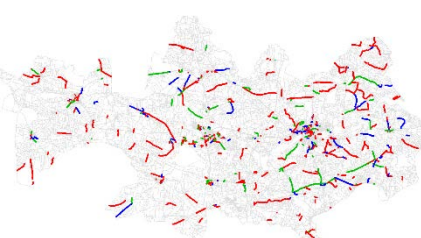
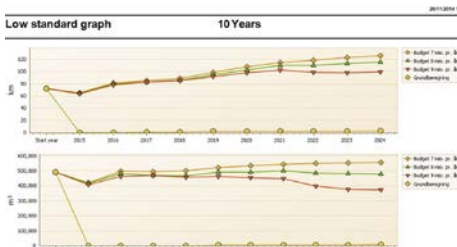
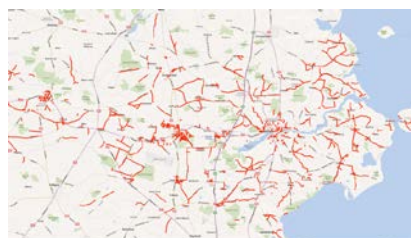
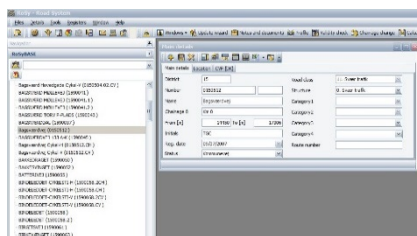
Kalkulation engine. Budget scenarios & consequences



RoSy MAP

GIS-engine

RoSy data in a MAP



Product specification		2015					
Grundbergrøpning							
Rd. No.	Road name	Chainage S	Lane	From	To	Quantity	Investment
Pavement		70_SMA-LN					
1905023	NOVEMBERVEJ	S97 NØRDKØJVEJ	0	0	32	320 m³	33,6
1905023	NOVEMBERVEJ	S97 NØRDKØJVEJ	0	32	815	7.830 m³	751,6
1905034	VADSTRUPVEJ	S99 BAGSØVEJ	0	578	890	1.009 m³	100,9
1905034	VADSTRUPVEJ	S99 BAGSØVEJ	F	0	160	1.029 m³	102,9
1905047	VANDTÅRNSVEJ	S41 SØBORG HØVEDGADE	0	1.300	1.342	600 m³	71,4
1905047	VANDTÅRNSVEJ	S41 SØBORG HØVEDGADE	0	1.342	1.413	827 m³	86,8
1905047	VANDTÅRNSVEJ	S41 SØBORG HØVEDGADE	0	1.413	1.948	513,0 m³	513,0
1905047	VANDTÅRNSVEJ	S41 SØBORG HØVEDGADE	0	1.948	2.000	562 m³	58,0
Total amount						124.329 m³	12.340,0



Ram system – Best Practice

RoSy PLAN – overview and consequences

Condition of road network

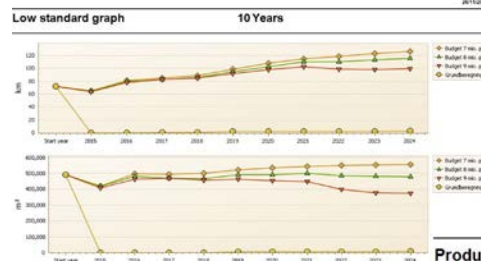
Consequence calculation using various budget scenarios – 10 year perspective

Optimum budget

Budget needed to keep status quo

Your overview

- Backlog
- Number of km low standard roads
- Road capital
- Average remaining service life
- Concrete measures in the individual years
- ... etc.



Product specification							
Grundberegning		2015					
Rd. No	Road name	Chainage @	Lane	From	To	Quantity	Investment
Pavement		70_SMA-LN					
1590623	NOVEMBERVEJ	597	NOVEMBERVEJ	0	0	320 m²	33.600
1590623	NOVEMBERVEJ	597	NOVEMBERVEJ	0	32	815	751.680
1590634	VADSTRUPVEJ	39	BAKSTØVVEJ	0	578	690	1.009.500
1590634	VADSTRUPVEJ	39	BAKSTØVVEJ	f	0	160	1.029.300
1590947	VANDTARNVEJ	841	SØBORG	0	1.300	1.342	660 m²
1590947	VANDTARNVEJ	841	SØBORG	0	1.342	1.413	827 m²
1590947	VANDTARNVEJ	841	SØBORG	0	1.413	1.948	5.593 m²
1590947	VANDTARNVEJ	841	SØBORG	0	1.948	2.000	562 m²
Total product						136.329 m²	13.340.989

Ram system – Best Practice

Optimal budget

Investment allocation per product group

10 Years

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* 1.000

Grundberegning



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
1 Pavement	43,398	10,409	9,326	10,565	6,844	7,176	6,919	3,351	7,514	7,143	112,645
3 Prior repair	2,991	188	186	132	103	131	53	28	168	157	4,137
4 Repair	694	144	130	89	60	334	249	81	398	79	2,258
5 Gutter					17	16					33
6 Kerb	2,324	359	130	37	8	167		99	203	93	3,420
7 Footpath	2,360		59	19	18				16	57	2,529
9 Conc. costs	2,553	668	555	715	557	488	568	313	758	513	7,688
1. In budget.	54,320	11,768	10,386	11,557	7,607	8,312	7,789	3,872	9,057	8,042	132,710
10 Safety repair	3	1	3	5	7	8	8	13	17	17	82
11 Shoulder	57	3	28	2	55	153	312		57	3	670
12 Ditch						2	17				19
2. Not in budget.	60	4	31	7	62	163	337	13	74	20	771
	54,380	11,772	10,417	11,564	7,669	8,475	8,126	3,885	9,131	8,062	133,481

Ram system – Best Practice

Budget – DKK **7** million per year

Investment allocation per product group

10 Years

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* 1.000

Budget 7 mio. pr. år



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
1 Pavement	4,916	6,250	4,685	6,423	6,446	6,618	6,350	6,837	6,010	6,227	60,762
3 Prior repair	749	37	158	220	92	60	22		250	178	1,766
4 Repair	1,033	154	229	54	112	84	406	57	360	81	2,570
6 Kerb	57	286	816		39				48	178	1,424
7 Footpath	38		929						54		1,021
9 Conc. costs	207	269	172	298	304	235	220	100	281	328	2,414
1. In budget.	7,000	6,996	6,989	6,995	6,993	6,997	6,998	6,994	7,003	6,992	69,957
10 Safety repair	9	10	14	21	29	39	46	65	70	82	385
11 Shoulder	57	3	28	2	55	153	312		57	3	670
12 Ditch						2	17				19
2. Not in budget.	66	13	42	23	84	194	375	65	127	85	1,074
	7,066	7,009	7,031	7,018	7,077	7,191	7,373	7,059	7,130	7,077	71,031

Ram system – Best Practice

Budget – DKK^⑨million per year

Investment allocation per product group

10 Years

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* 1.000

Budget 9 mio. pr. år



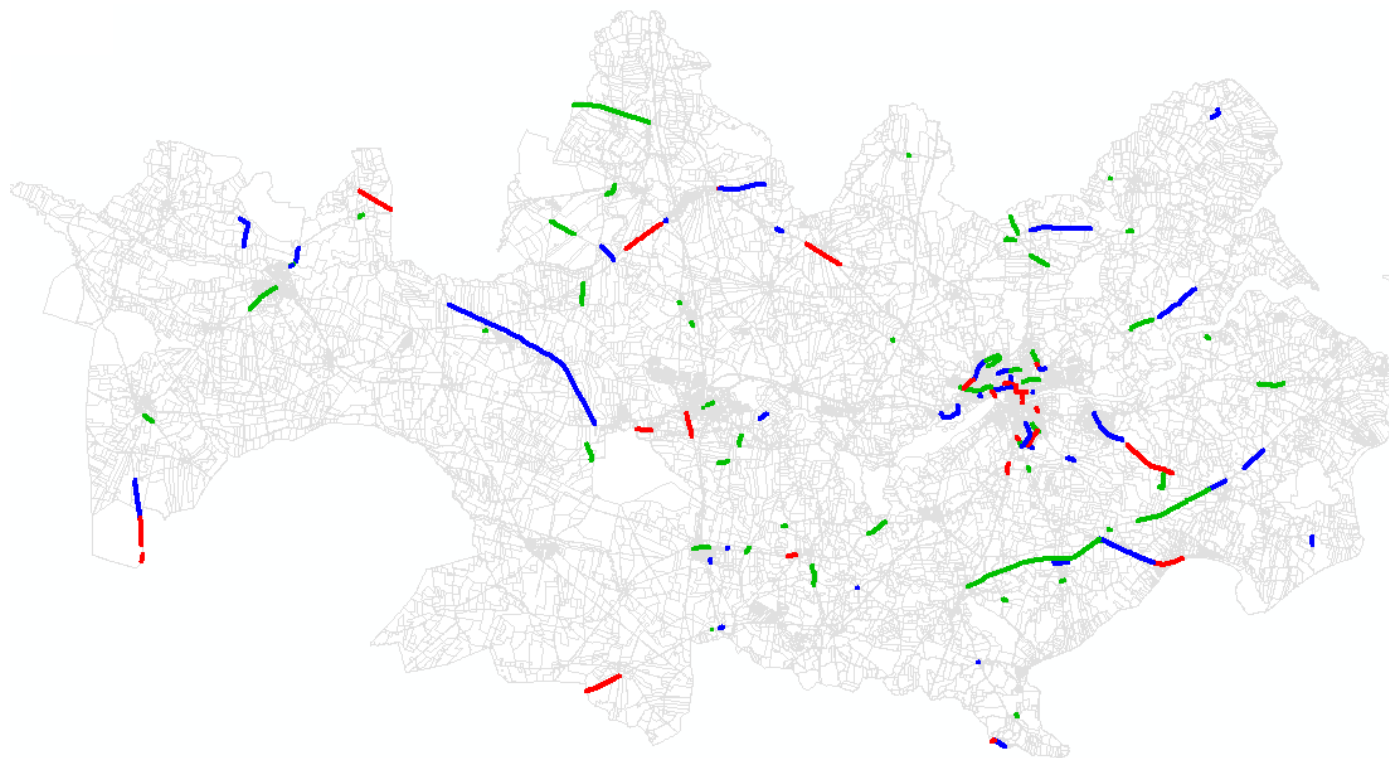
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
1 Pavement	6,627	8,150	4,659	8,459	8,380	8,410	7,472	8,062	7,273	8,074	75,566
3 Prior repair	966	95	106	166	109	97	485	302	727	186	3,239
4 Repair	1,029	130	154	32	90	150	206	139	372	64	2,366
6 Kerb	57	286	1,707		39		257	82	99	184	2,711
7 Footpath	38		2,187				159	5	1	5	2,395
9 Conc. costs	281	335	178	337	380	336	413	394	510	477	3,641
1. In budget.	8,998	8,996	8,991	8,994	8,998	8,993	8,992	8,984	8,982	8,990	89,918
10 Safety repair	9	10	14	21	28	36	33	44	53	60	308
11 Shoulder	57	3	28	2	55	153	312		57	3	670
12 Ditch						2	17				19
2. Not in budget.	66	13	42	23	83	191	362	44	110	63	997
	9,064	9,009	9,033	9,017	9,081	9,184	9,354	9,028	9,092	9,053	90,915

Ram system – Best Practice

Pavement 2015-2017 – with low budget

Pavement:

- 2015
- 2016
- 2017

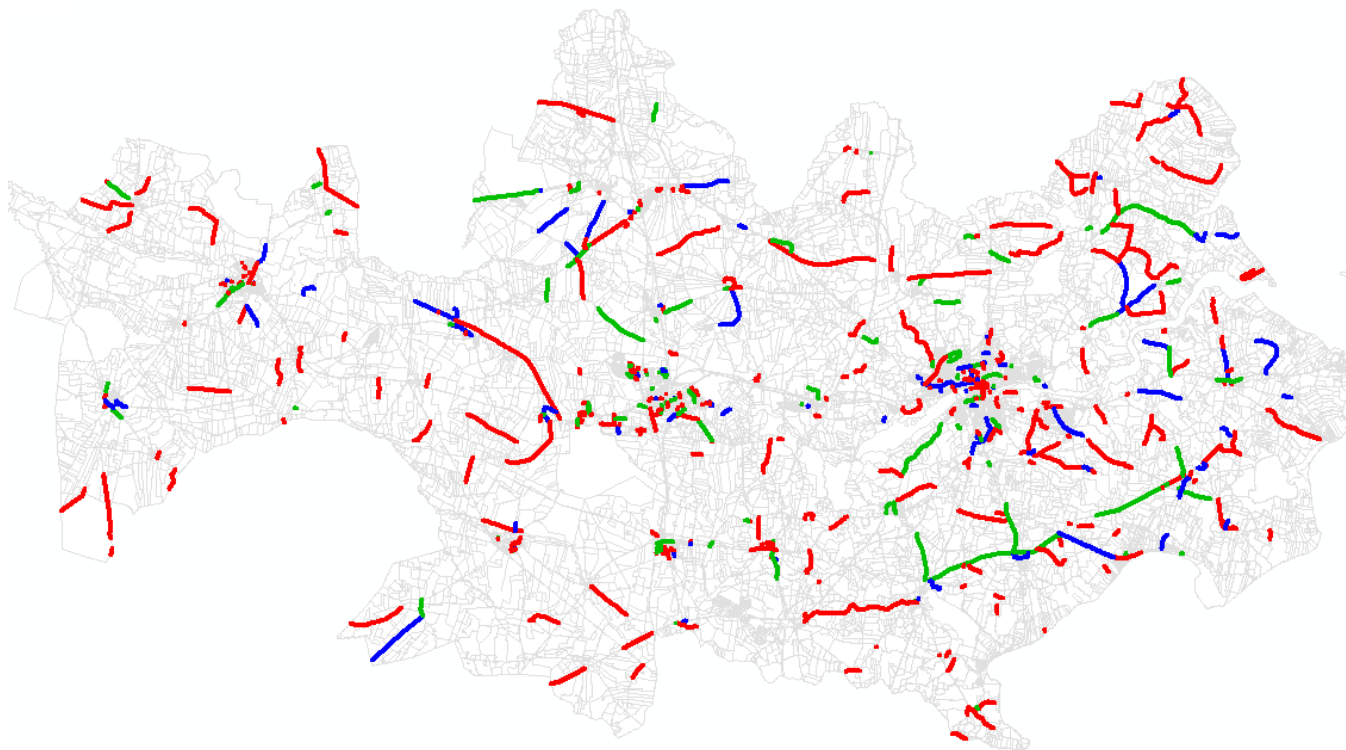


Ram system – Best Practice

Pavement 2015-2017 – optimum budget

Pavement:

- 2015
- 2016
- 2017



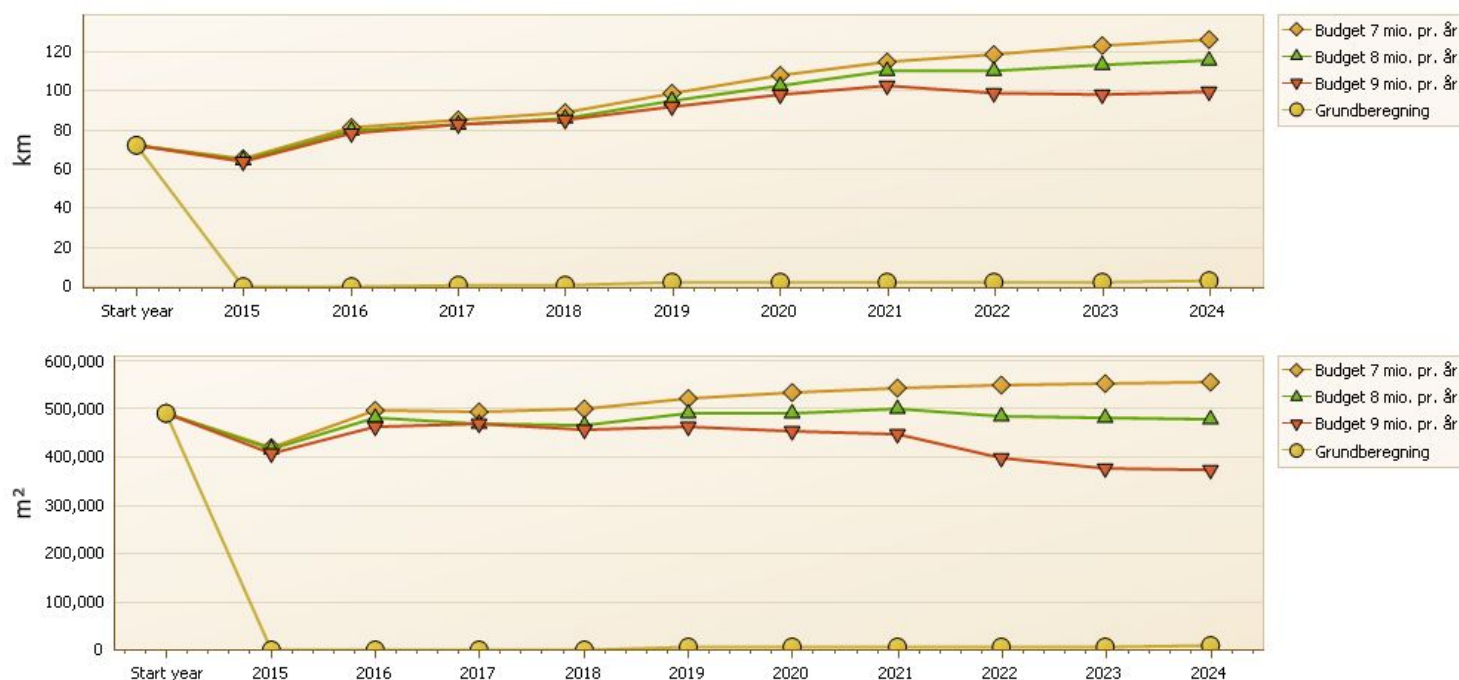
Ram system – Best Practice

Low standard roads – various budgets

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Low standard graph

10 Years



Ram system – Best Practice

Low standard roads – development in km

Budget DKK 7m/year

Low standard

10 Years

Budget 7 mio. pr. år

Kilometers per priority/road class

Priority	Class	Start year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	0. Cykelsti langs vej	12.6	12.6	19.0	21.8	23.3	28.9	36.1	42.1	44.9	47.6	50.2
	1. Trafikvej	22.2	19.1	19.6	15.4	13.8	8.8	6.0	3.7	2.6	2.5	2.5
	10. Sekundær stier i eget område	2.3	2.3	2.6	2.6	2.8	2.8	3.5	4.4	5.6	5.6	6.4
	11. Svær trafik	7.6	4.2	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2. Fordelingsvej	5.5	5.3	10.4	11.5	10.8	13.0	12.1	11.2	10.5	7.1	5.4
	3. Lokalveje	21.5	21.5	28.6	32.5	36.4	39.0	41.2	44.6	46.1	50.0	50.8
	4. P. plads/Torv	0.1	0.1	0.2	0.3	0.3	0.3	0.5	0.5	0.6	0.6	0.6
	9. Primær stier i eget område	0.0	0.0	0.0	0.2	1.5	5.4	7.9	8.3	8.5	9.3	10.3
1	Total	71.8	65.1	81.4	84.8	89.0	98.3	107.4	114.7	118.7	122.6	126.2

Ram system – Best Practice

Low standard roads – development in km

Budget DKK 9m/year

Low standard

10 Years

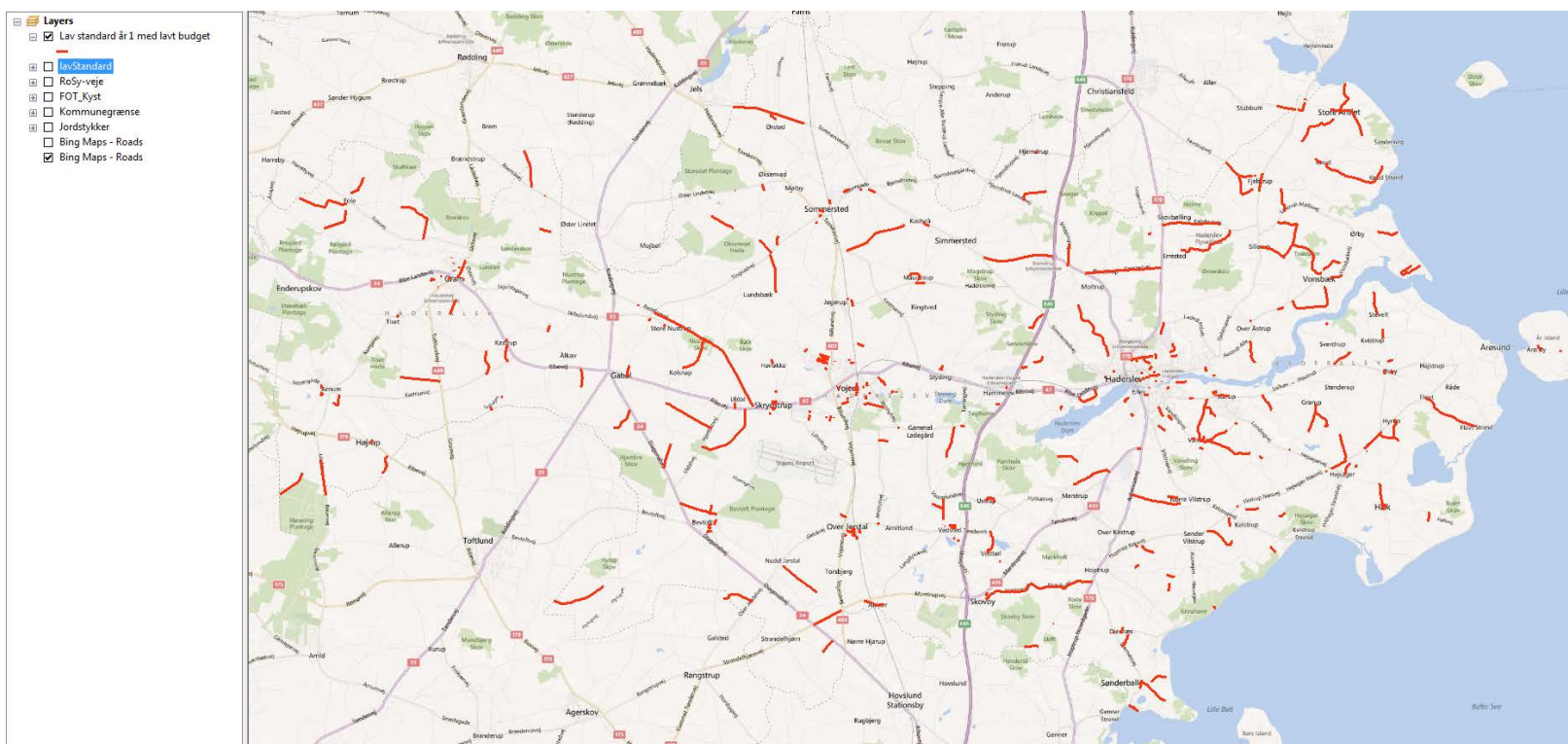
Budget 9 mio. pr. år

Kilometers per priority/road class

Priority	Class	Start year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	0. Cykelsti langs vej	12.6	12.6	19.0	21.8	23.3	28.9	36.1	42.1	44.9	47.6	50.2
	1. Trafikvej	22.2	17.5	16.5	13.2	9.2	5.4	2.7	2.6	2.6	2.5	2.5
	10. Sekundær stier i eg	2.3	2.3	2.6	2.6	2.8	2.8	3.5	4.4	5.6	5.6	6.0
	11. Svær trafik	7.6	4.2	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2. Fordelingsvej	5.5	5.3	9.9	11.5	11.1	10.7	7.4	4.2	0.9	0.5	0.0
	3. Lokalveje	21.5	21.5	28.7	32.5	36.4	38.1	39.6	40.3	36.1	32.0	30.6
	4. P. plads/Torv	0.1	0.1	0.2	0.3	0.3	0.3	0.5	0.5	0.3	0.3	0.3
	9. Primær stier i eget t	0.0	0.0	0.0	0.2	1.5	5.4	7.9	8.3	8.5	9.3	9.4
1 Total		71.8	63.5	77.8	82.5	84.7	91.7	97.7	102.3	98.8	97.8	99.1

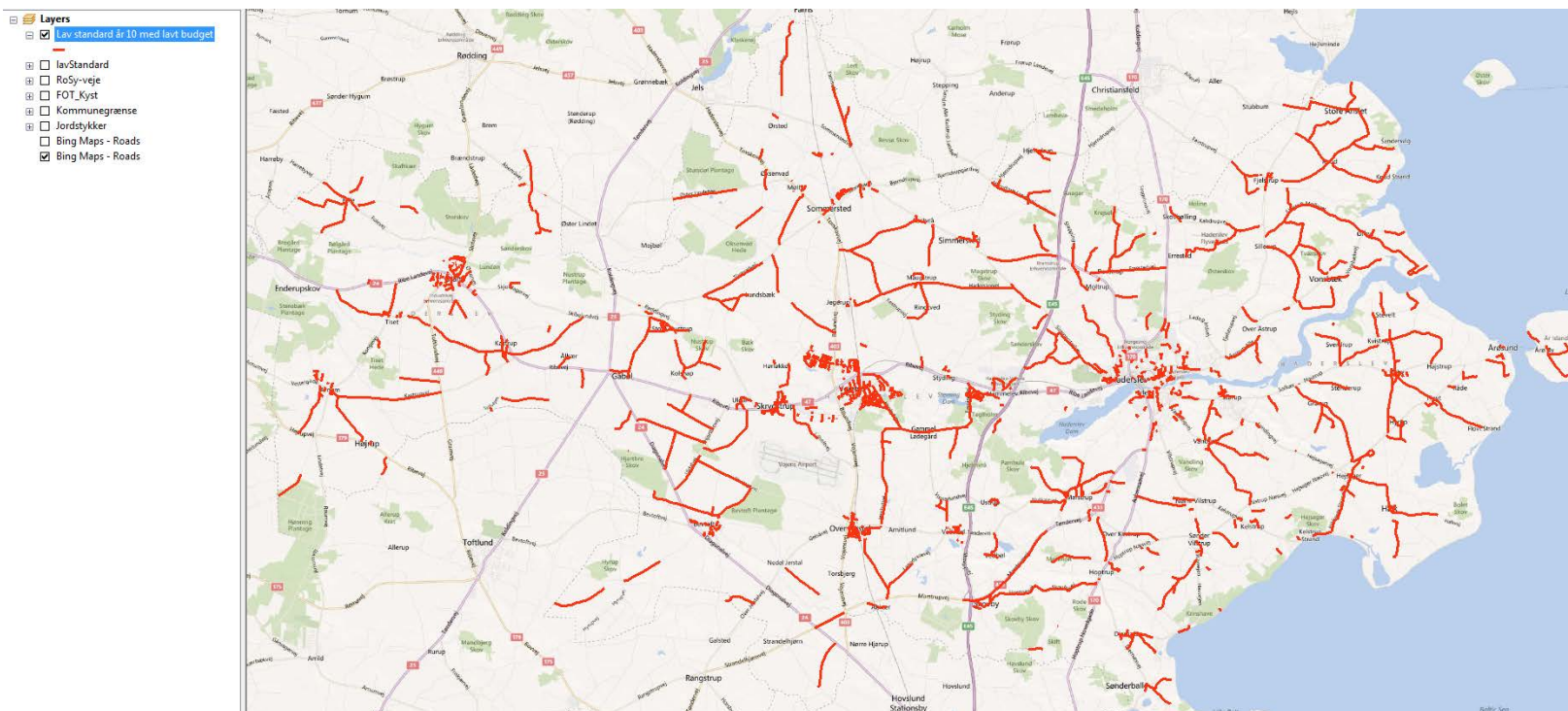
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Low standard roads – year one



Ram system – Best Practice

Low standard roads – year 10 (budget too low)

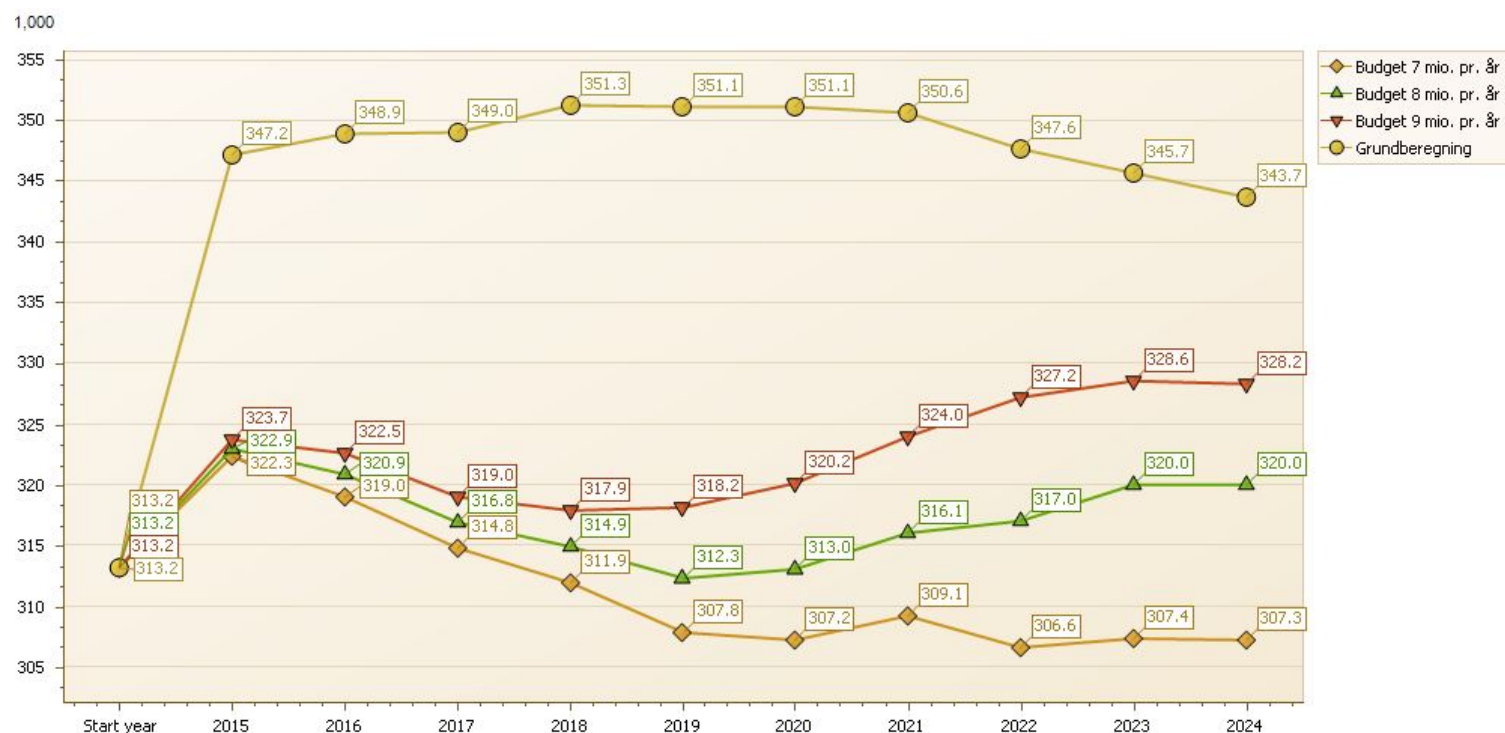


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Road capital value – with various budgets

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Capital value



Ram system – Best Practice

Why RoSy PMS/RAMS is needed

Overview of:

- Municipal road network (basic data)
- Condition of road network
- Traffic load in road network
- Calculation of maintenance requirement
- Consequence calculation using various budget scenarios:
 - Backlog
 - Number of km low standard roads
 - Road capital
 - Average remaining service life
 - Concrete measures in the individual years
 - ... etc.



Ram system – Best Practice

Thank you for your attention!

Bjarne Bylov Jensen
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