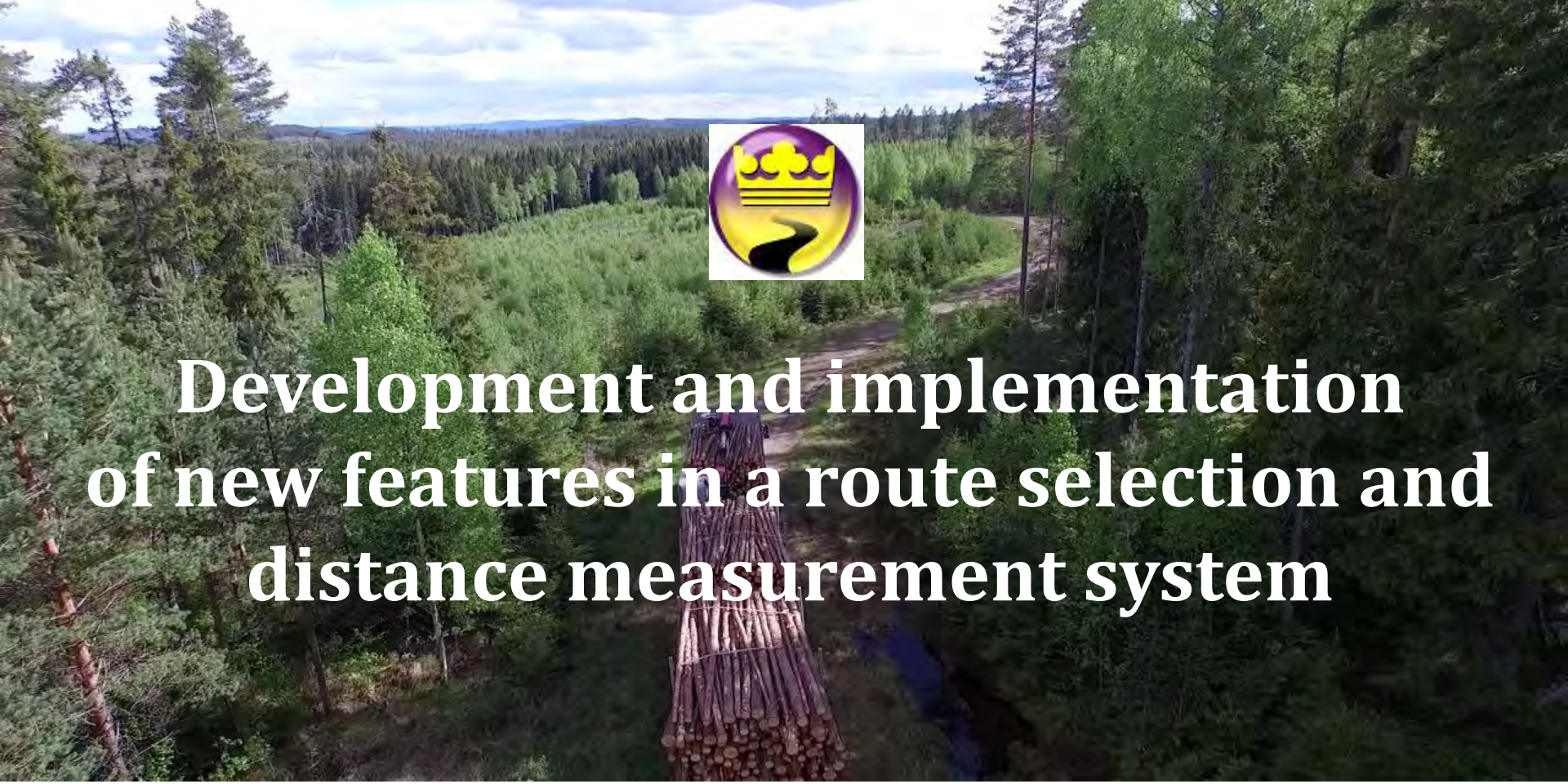


Development and implementation of new features in a route selection and distance measurement system

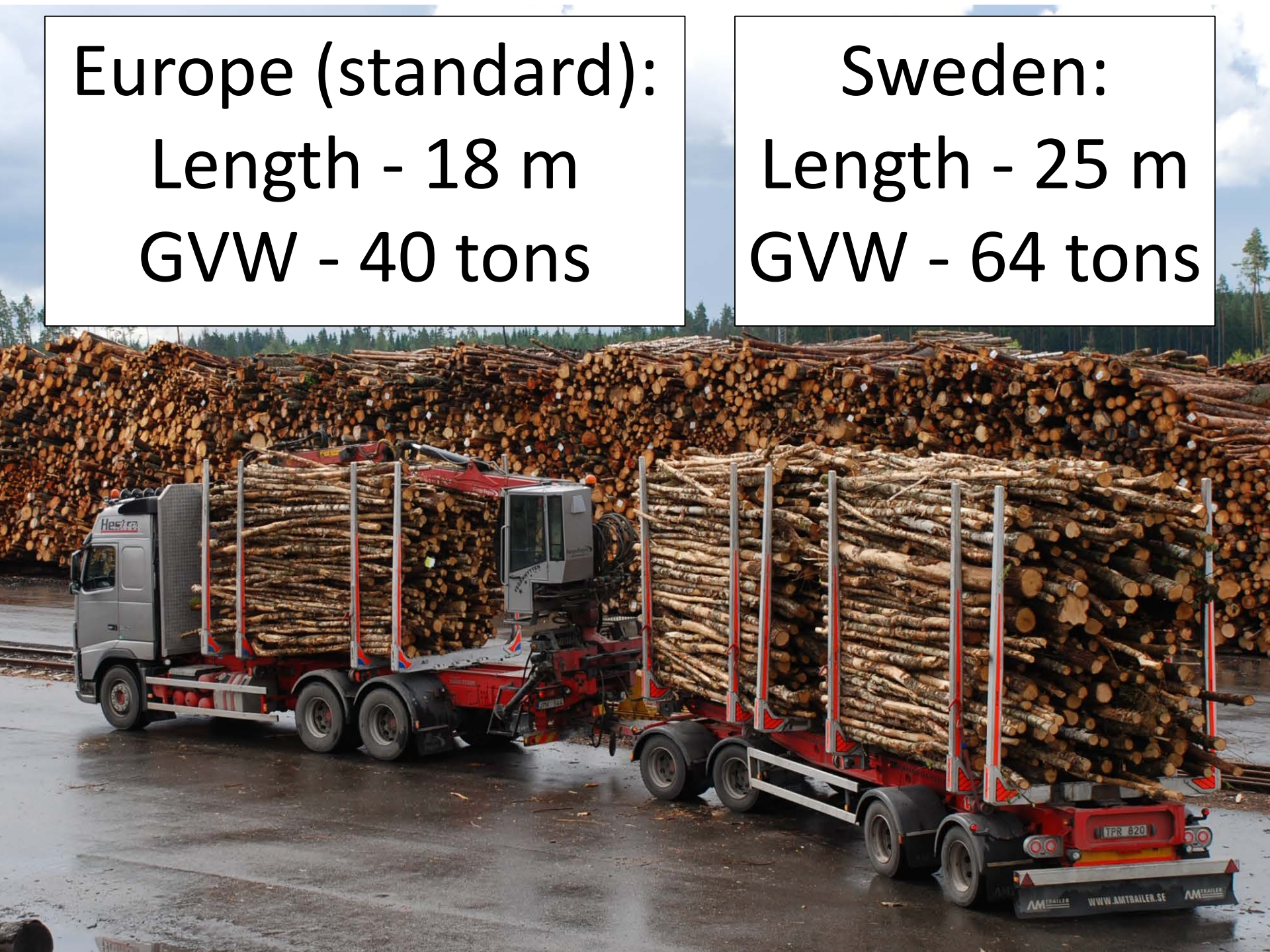
Gunnar Svenson, Patrik Flisberg, Mikael Rönnqvist

SKOGFORSK

FORMEC 2015 – Forest engineering: Making a positive contribution. October 4 – 8, 2015, Linz, Austria

Europe (standard):
Length - 18 m
GVW - 40 tons

Sweden:
Length - 25 m
GVW - 64 tons




Stress
Driving time
Safety
Hilliness
Fairness
Curvature
Maintenance
Distance
Fuel consumption
100
10%
10%
50
70
50t
km
CO_2

1500 key-routes:
Best practice agreed between forest and transport companies

Objectives

- Fairness
- Distance
- Driving time
- Safety
- Fuel consump.
- Work environ.
- Maintenance
- Stress
- Curvature
- Hilliness

Objectives

- Fairness
- Distance
- Driving time
- Safety
- Fuel consump.
- Work environ.
- Maintenance
- Stress
- Curvature
- Hilliness

Road feature (No. attributes)

- Functional road class (10)
- Maximum speed (13)
- Road width (16)
- Bearing class (4)
- Terrain class (3)
- Road owner (3)
- Timber route (2)
- Passing route (2)
- Length (1)
- Ferry line (1)
- Surface type (2)

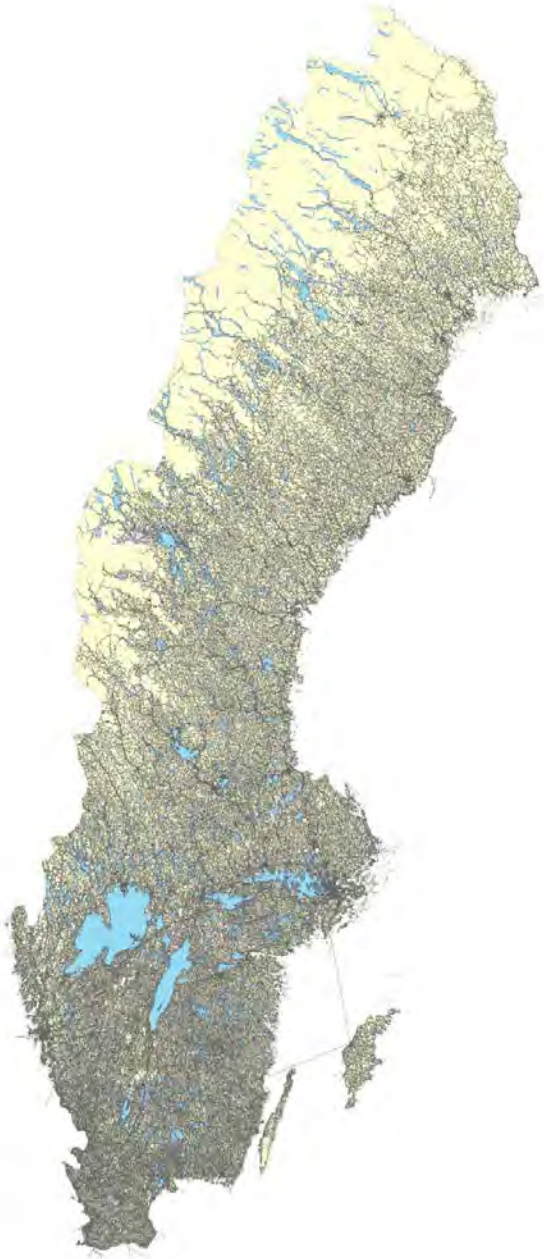
The National Road Database

542 000 km roads

- 102 000 km government
- 56 000 km communities
- 384 000 km private

GIS network

- 4.43 million arcs
- 2.20 million nodes



Objectives

- Fairness
- Distance
- Driving time
- Safety
- Fuel consump.
- Work environ.
- Maintenance
- Stress
- Curvature
- Hilliness

Road feature (No. attributes)

- Functional road class (10)
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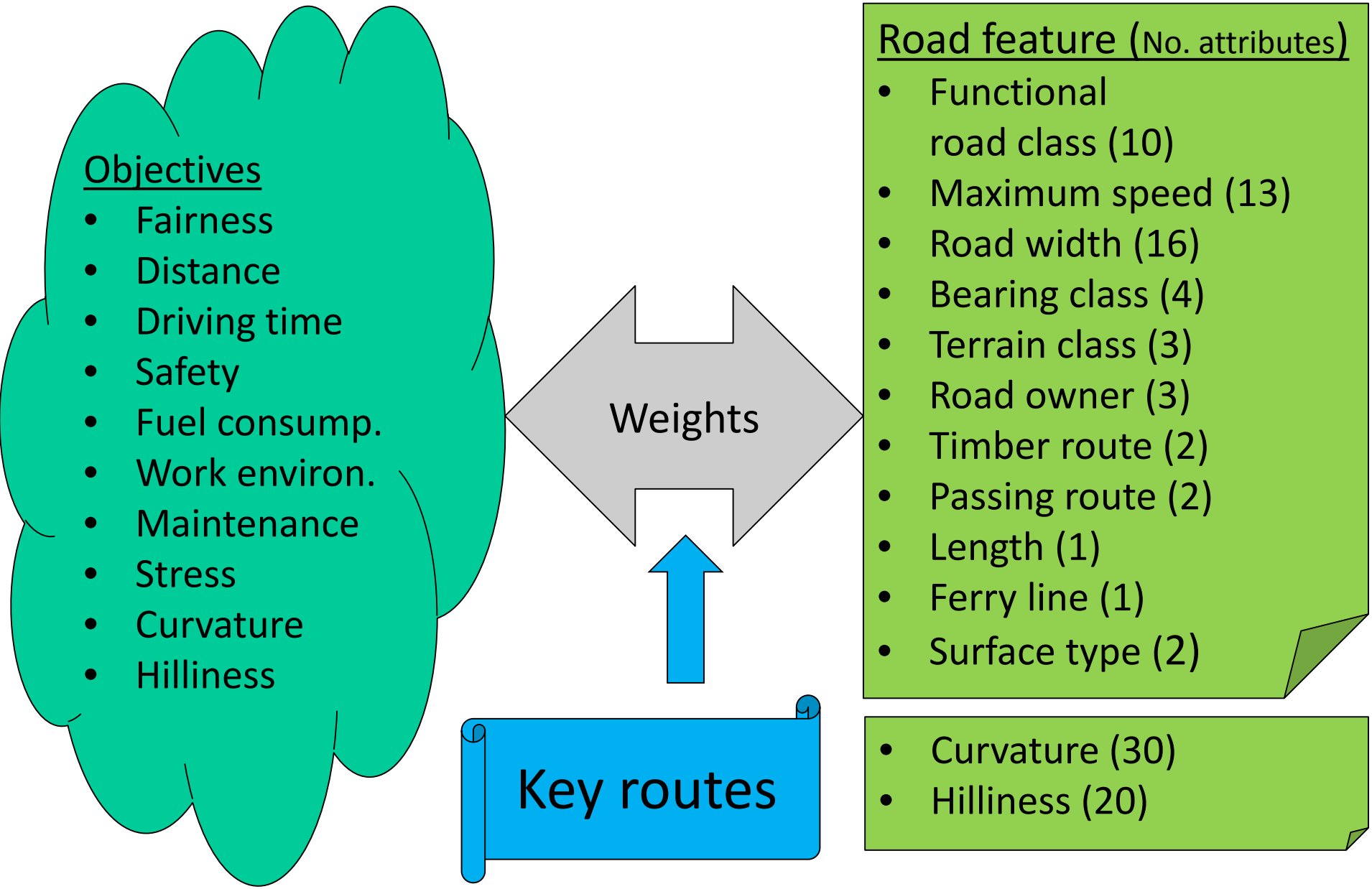
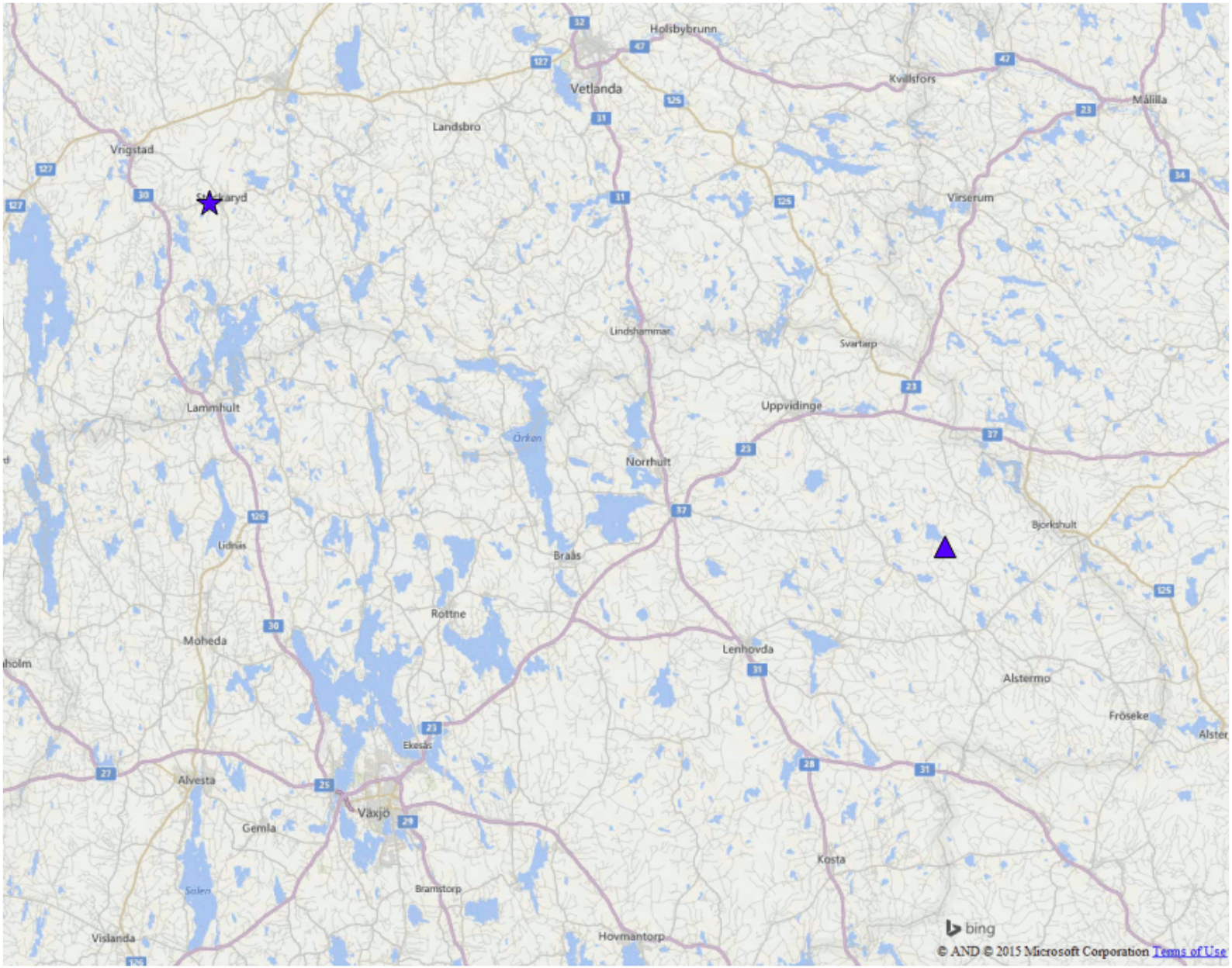
- Road owner (3)
- Timber route (2)
- Passing route (2)
- Length (1)
- Ferry line (1)
- Surface type (2)

- Curvature (30)
- Hilliness (20)


Objectives
Fairness
Distance
Driving time
Safety
Fuel consump.
Work environ.
Maintenance
Stress
Curvature
Hilliness
Weights
Road feature (No. attributes)
Functional road class (10)
Maximum speed (13)
Road width (16)
Bearing class (4)
Terrain class (3)
Road owner (3)
Timber route (2)
Passing route (2)
Length (1)
Ferry line (1)
Surface type (2)
Key routes
Curvature (30)
Hilliness (20)

CRF – how does it work?

- Key-routes + NVDB = weight/road attribute
- Each arc has one value for each attribute
- $\sum$ weight*arc length = resistance/arc
- CRF choses the combination of arcs that gives the lowest resistance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Bjorkshult
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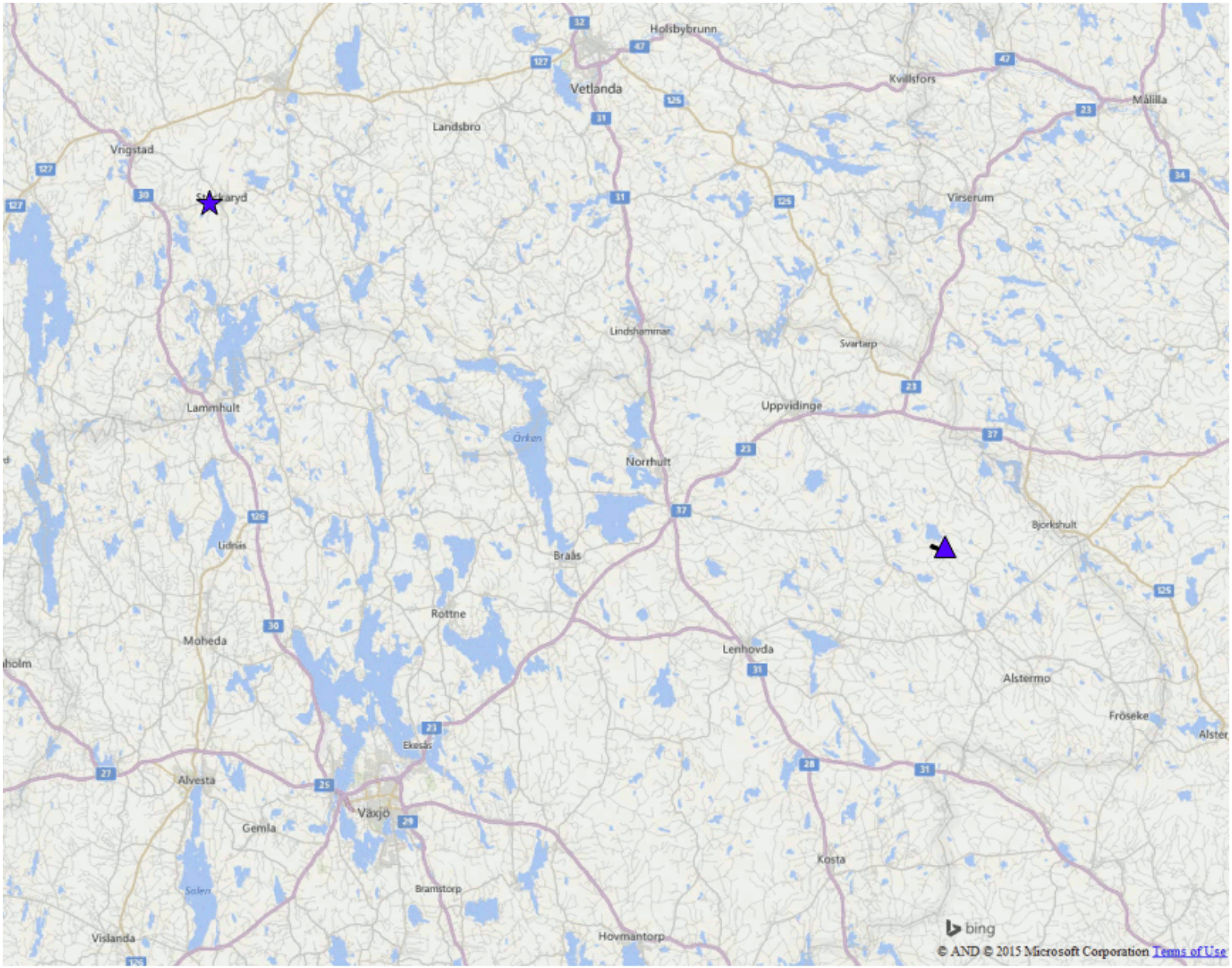
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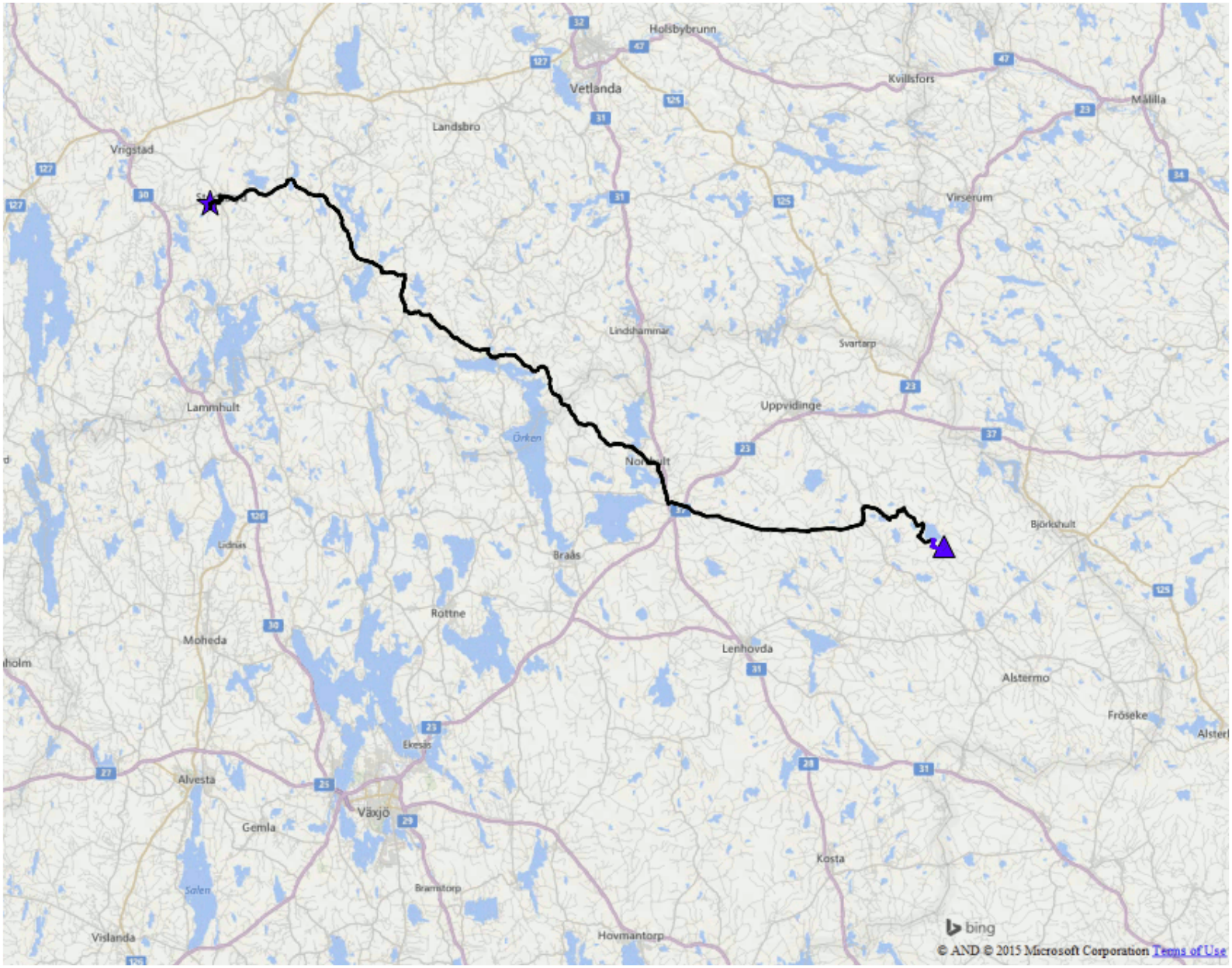
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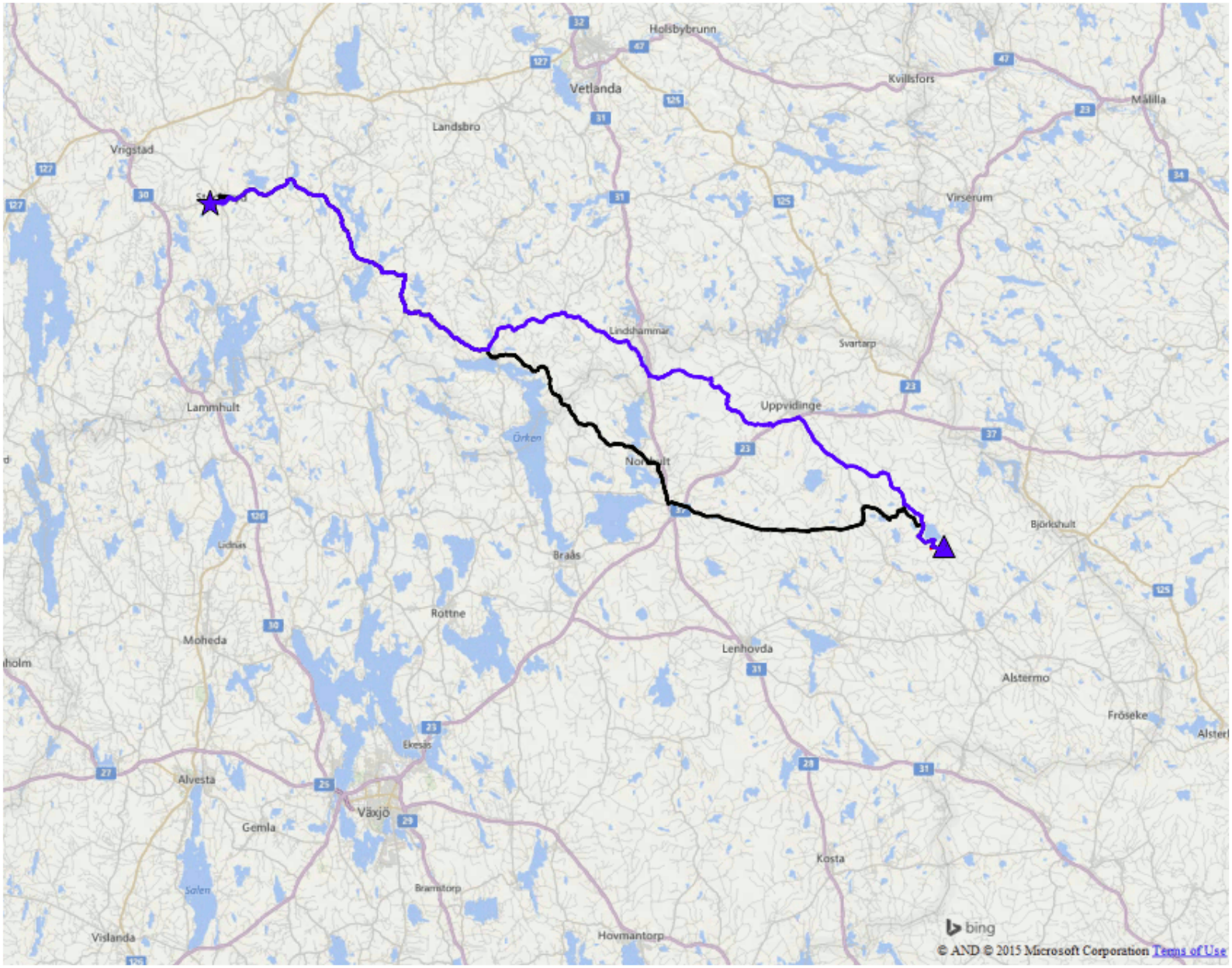
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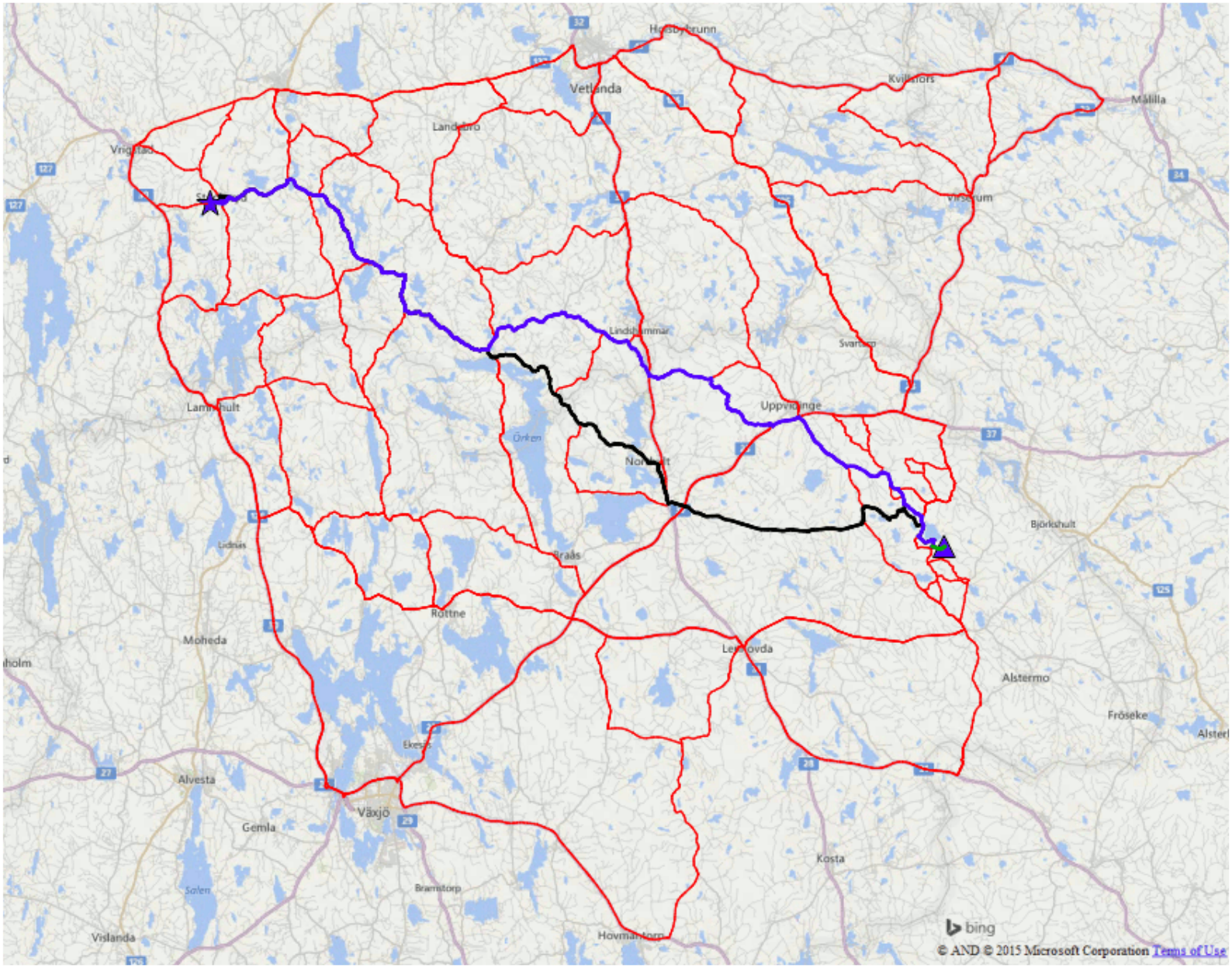
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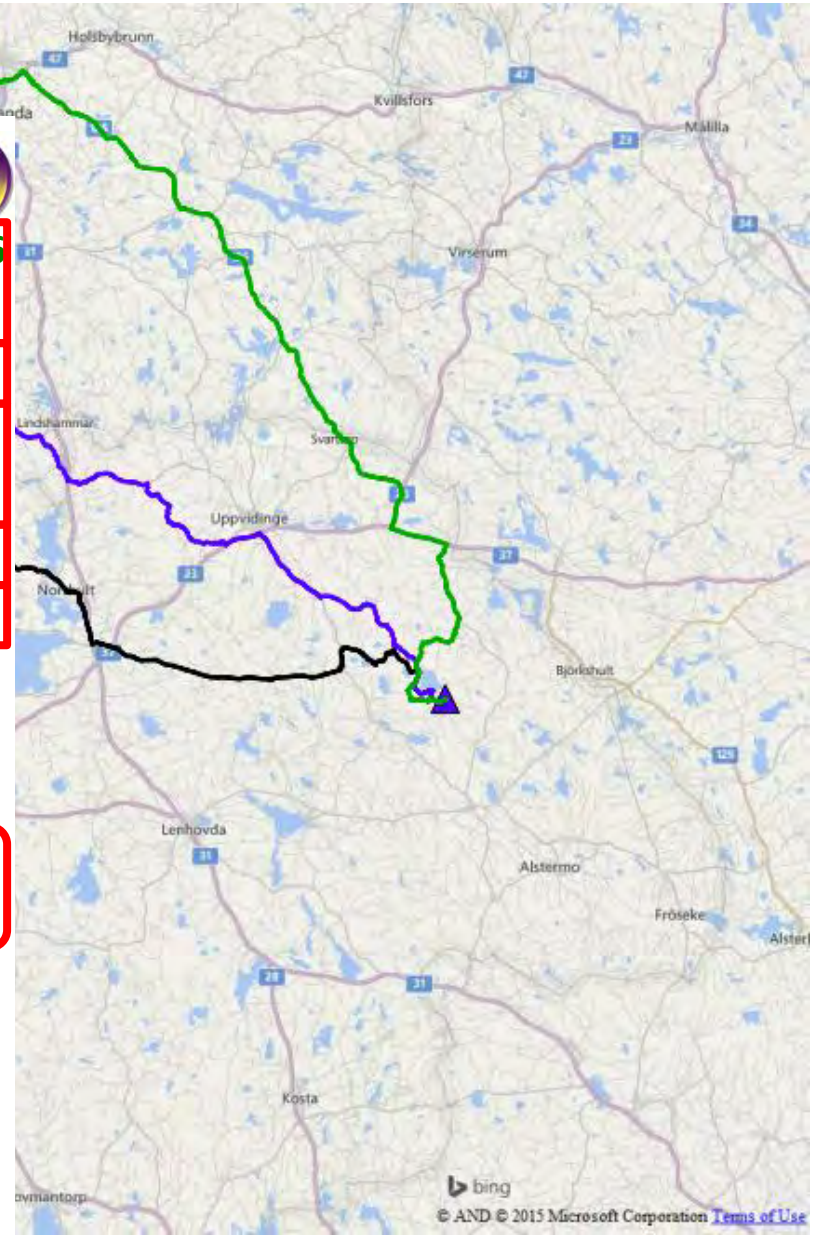
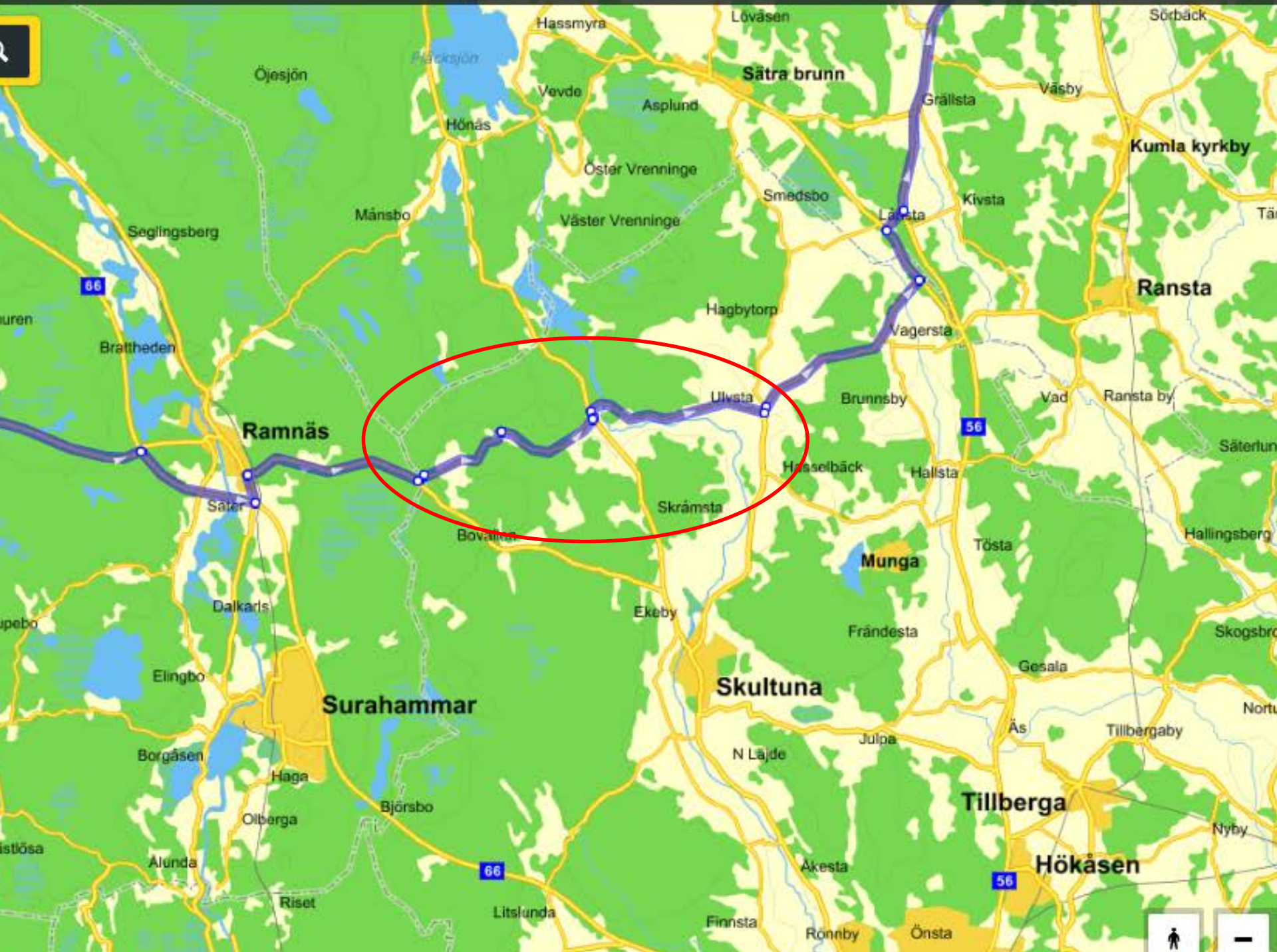
	shortest path	fastest path	
Distance (km)	84.3	85.8	105.6
Time (min)	74.7	72.6	87.1
total resistance (points)	2094	2407	1492
Curviness (points)	161	190	55
Hilliness (points)	74	36	3
Width 3-3.5m (km)	8	19	0
Gravel road (km)	20	33	9
RC 0 (km)	0	0	0
RC 1	1	0	3
RC 2	0	2	4
RC 3	0	0	67
RC 4	9	19	14
RC 5	18	13	0
RC 6	44	24	6
RC 7	3	5	9
RC 8	3	14	0
RC 9	7	8	1

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Sörbäck
Öjesjön
Sätra brunn
Vevde
Asplund
Grällsta
Väsby
Hönäs
Kumla kyrkby
Öster Vrenninge
Smedsbo
Kivsta
Månsbo
Väster Vrenninge
Seglingsberg
66
Ransta
Hagbytorp
Vagersta
Brattheden
Ulvsta
Brunnsby
Vad
Ransta by
Ramnäs
56
Säterlun
Hesselbäck
Hallsta
Säter
Skrämsta
Bovallna
Hallingsberg
Tösta
Munga
Dalkarls
Ekeby
Frändesta
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Elingbo
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Skultuna
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Borgåsen
Haga
Björsbo
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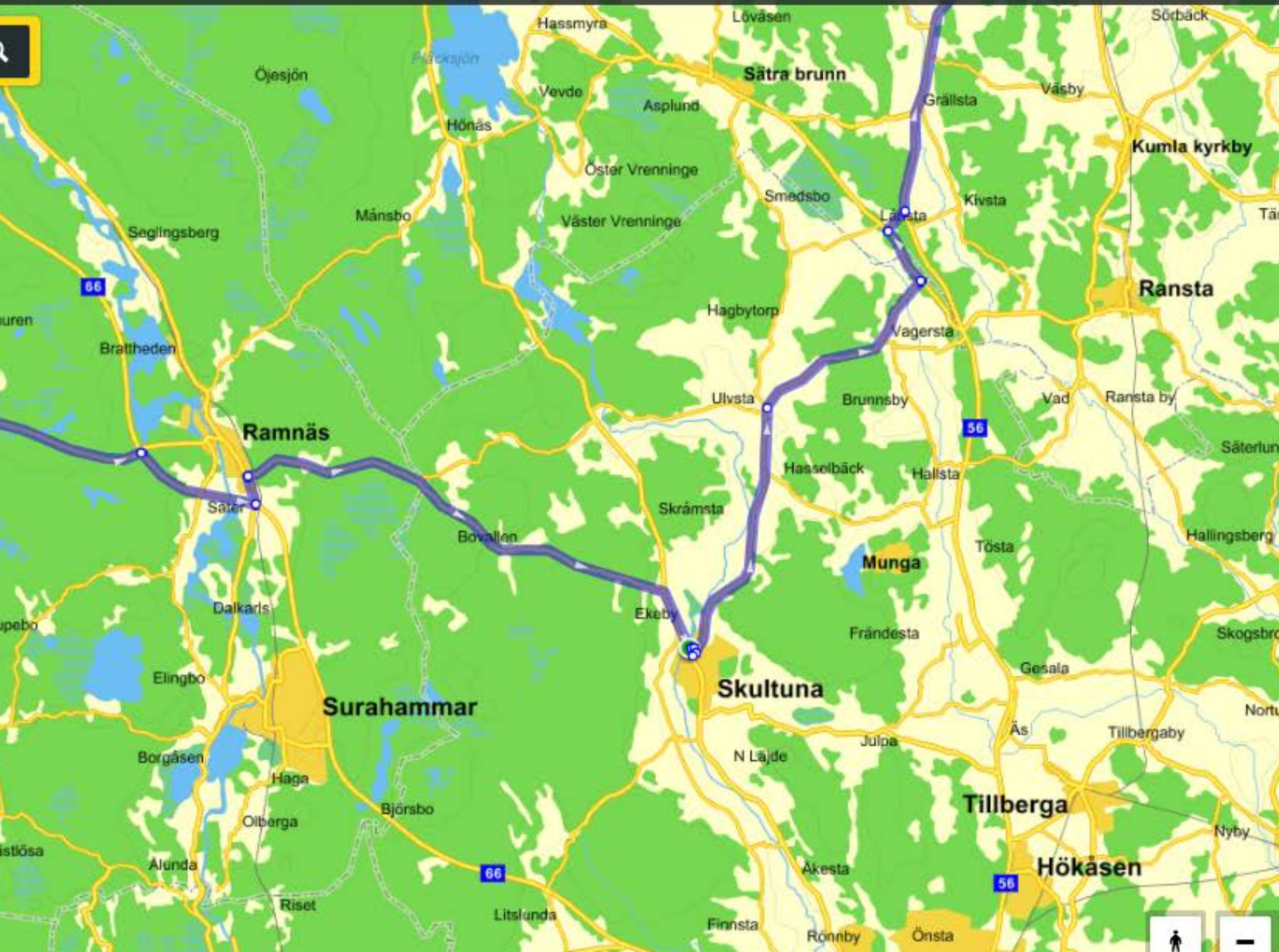
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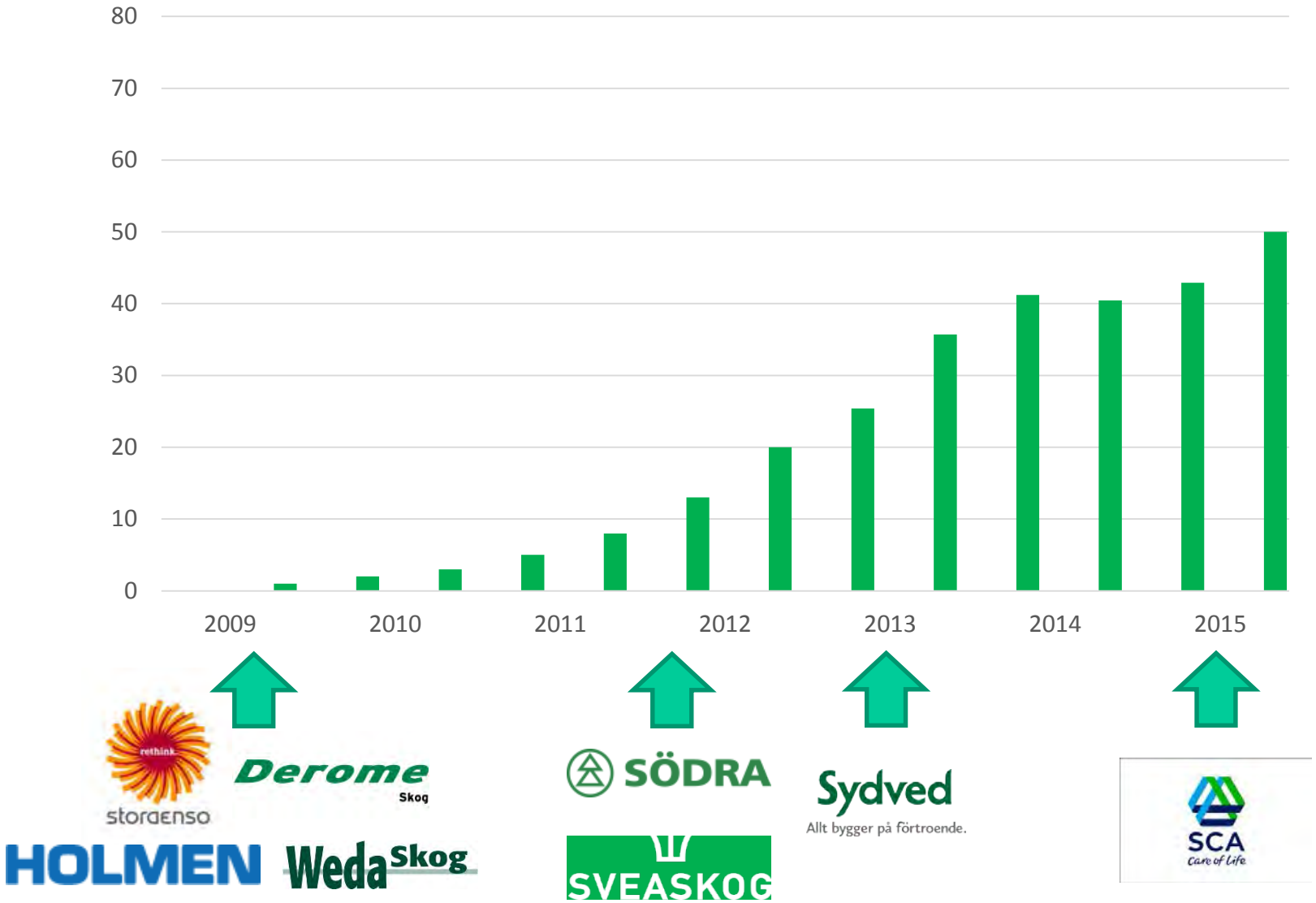
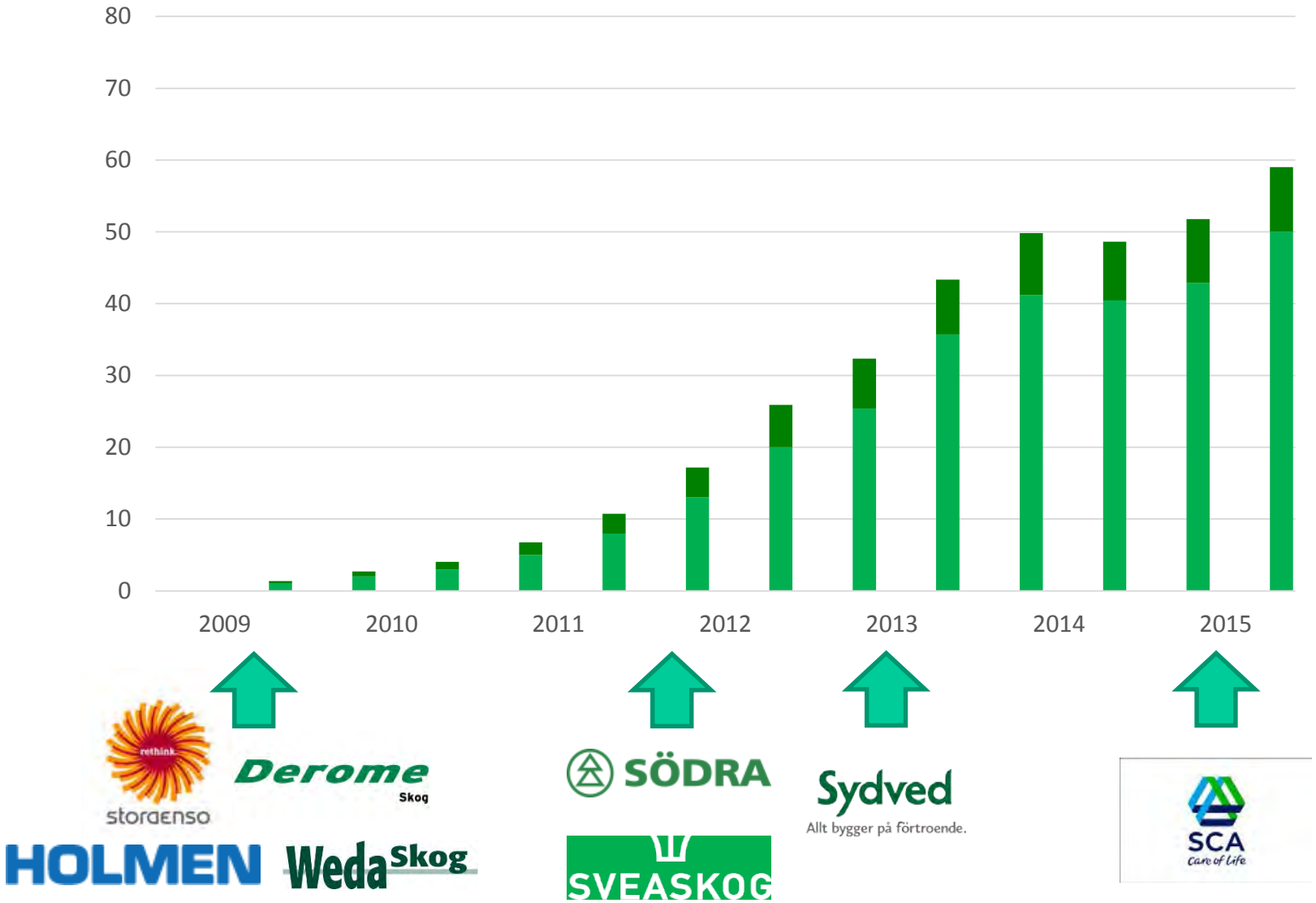
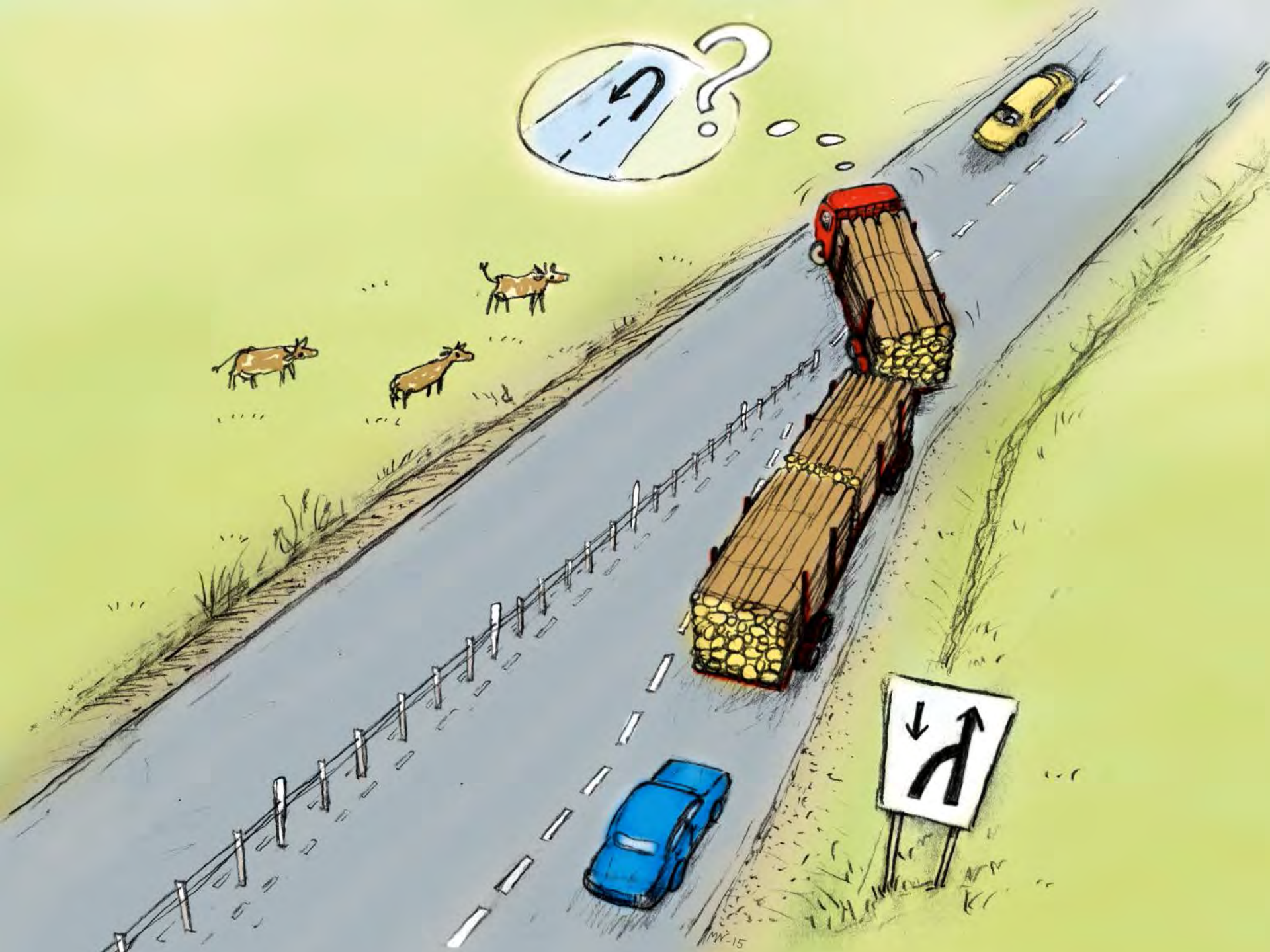
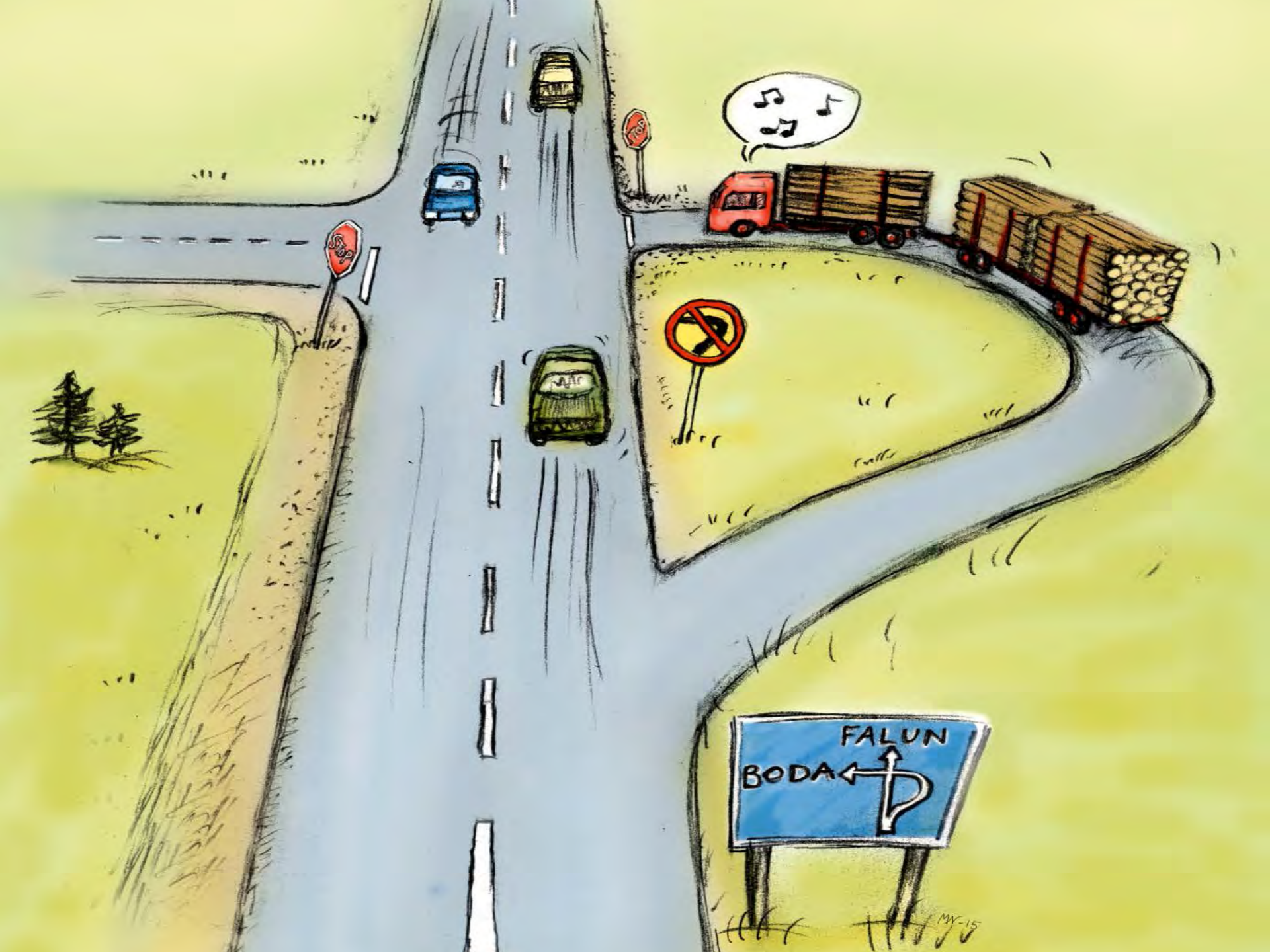
CRF – Development over time



CRF – Development over time



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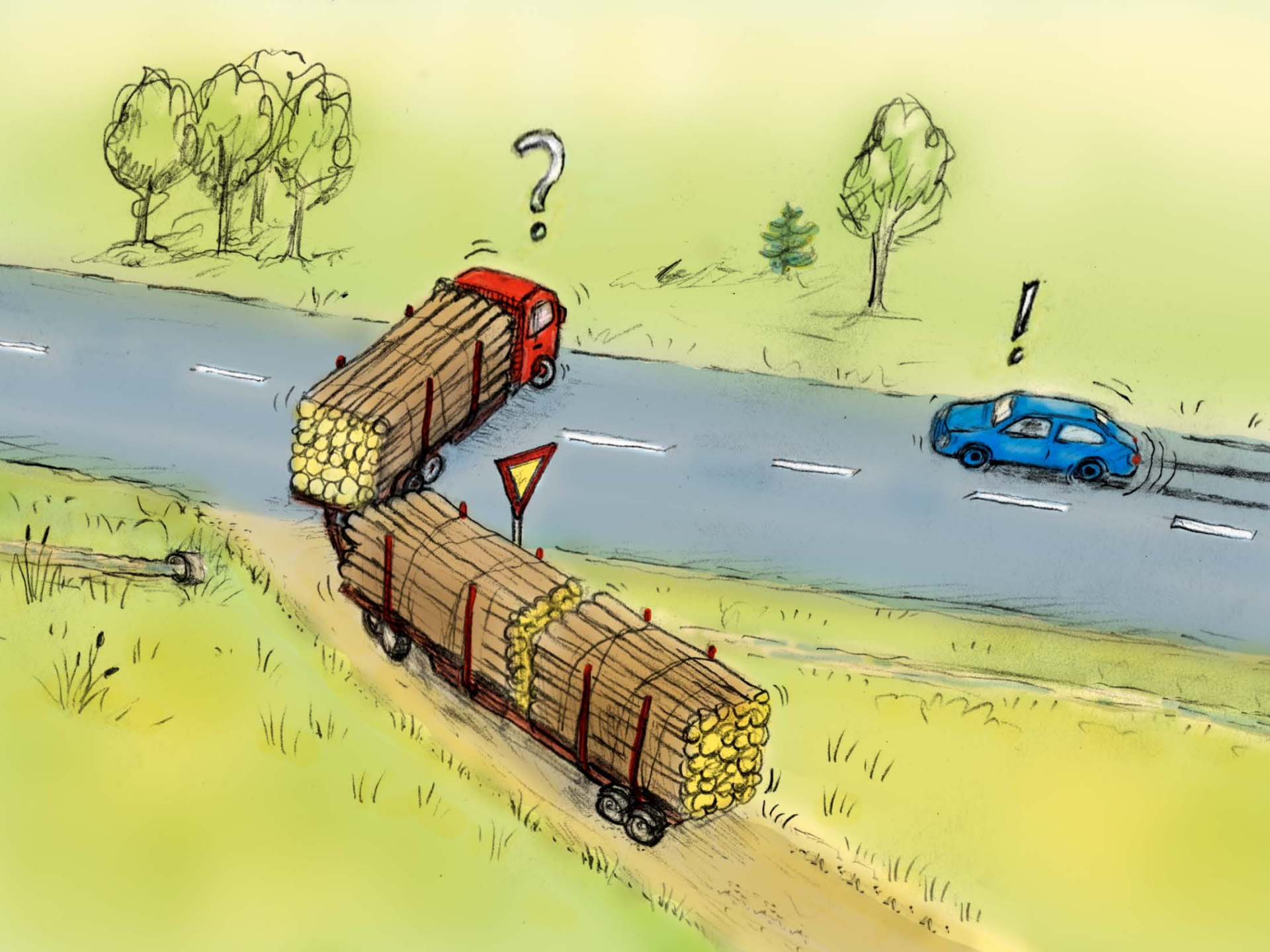
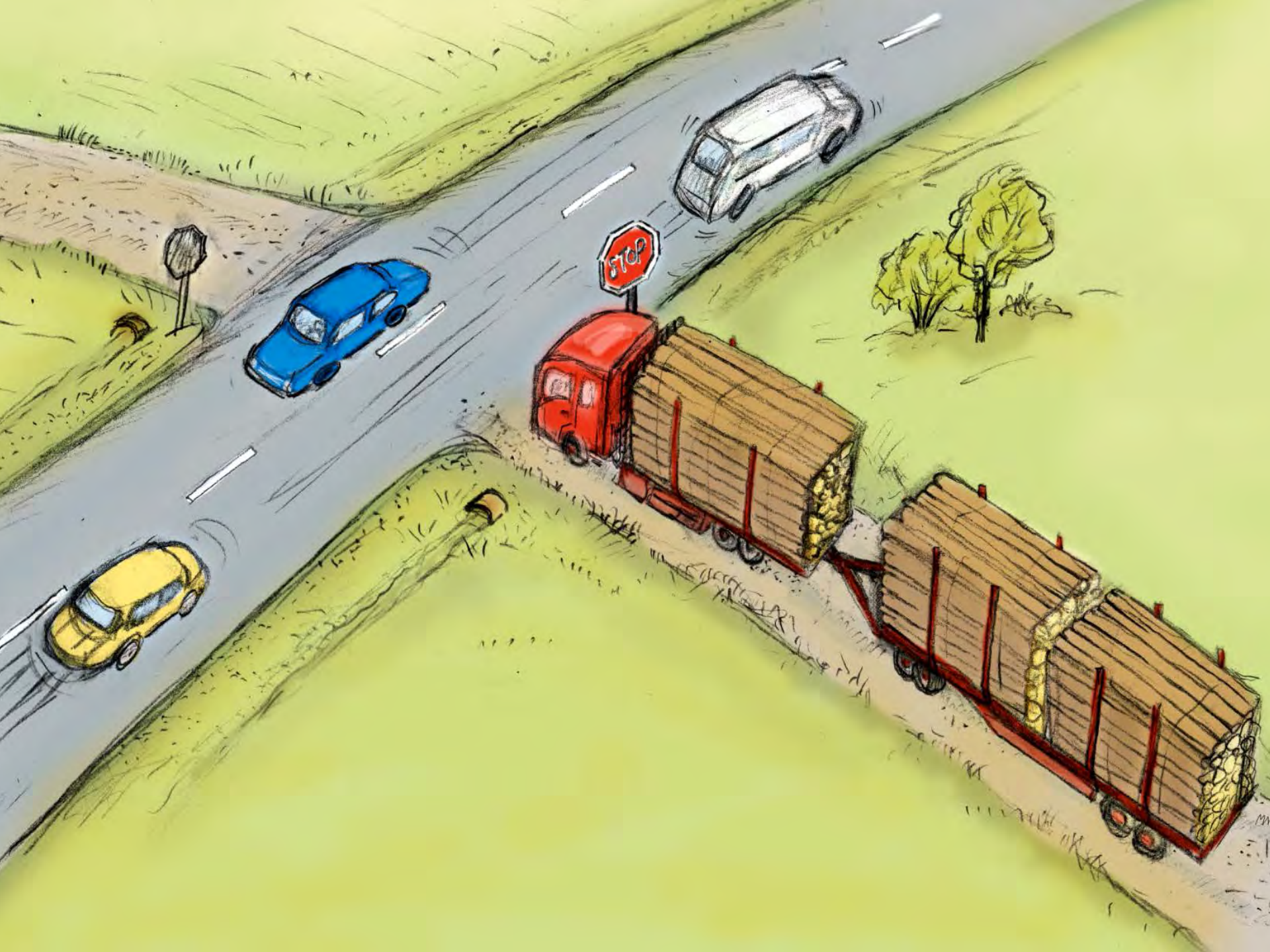
BODA




STOP

Summary

- Balance many objectives including traffic safety, stress, cost, environment, etc.
- Improves road safety and fairness
- Transparent and standardized system
- Standard and verified economic transactions
- Enables better use of transport resources
- System analysis (e.g. tax, CO_2, new regulations)

Next step

- Stop and start in crossings
- Augmented/expanded network
- Evaluate payment based on more than distance – fuel/time consumption, resistance points, etc