Road user charging and actual road burden evaluation with data derived from heavy vehicles - a trial project.

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Project

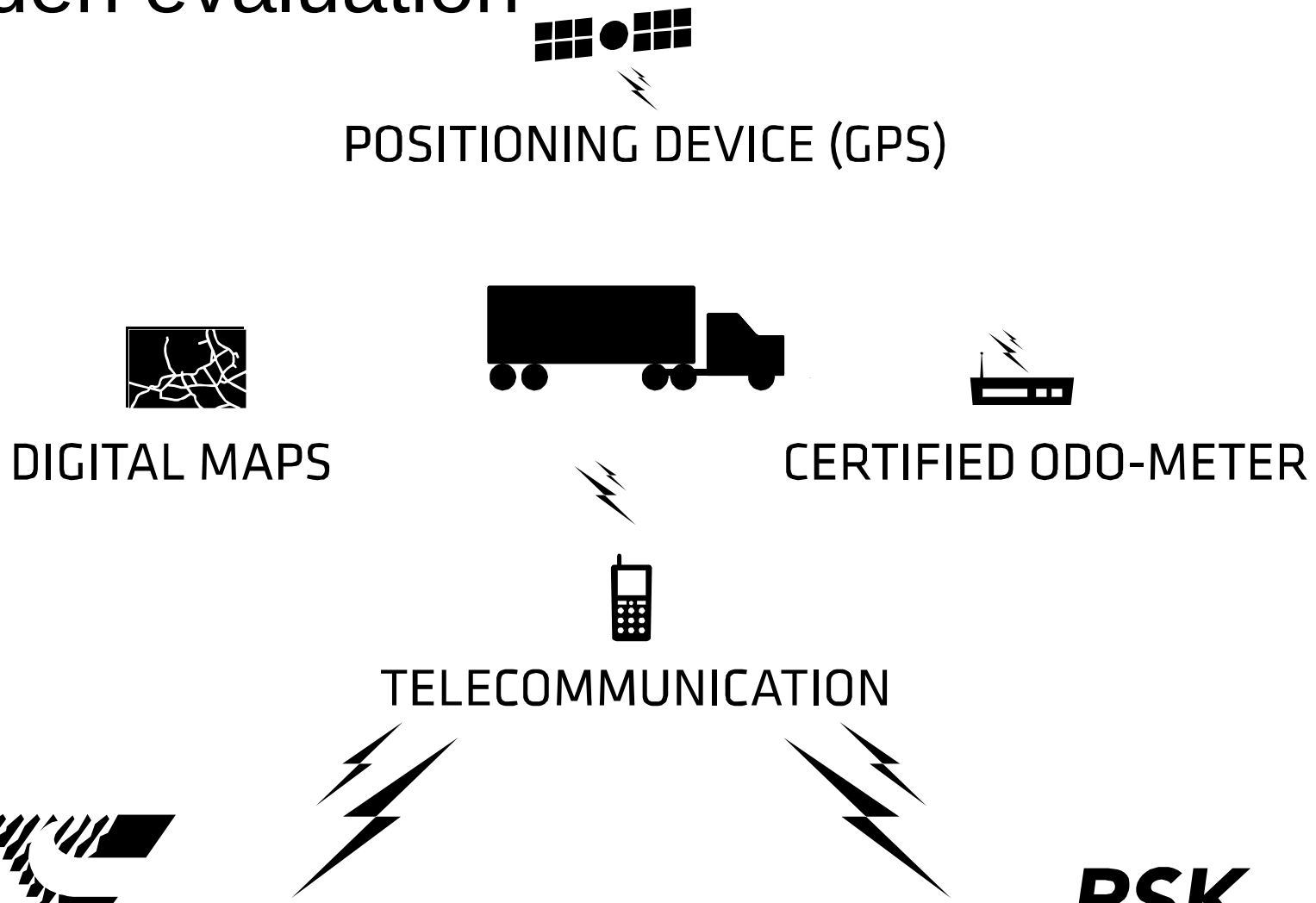
The project:

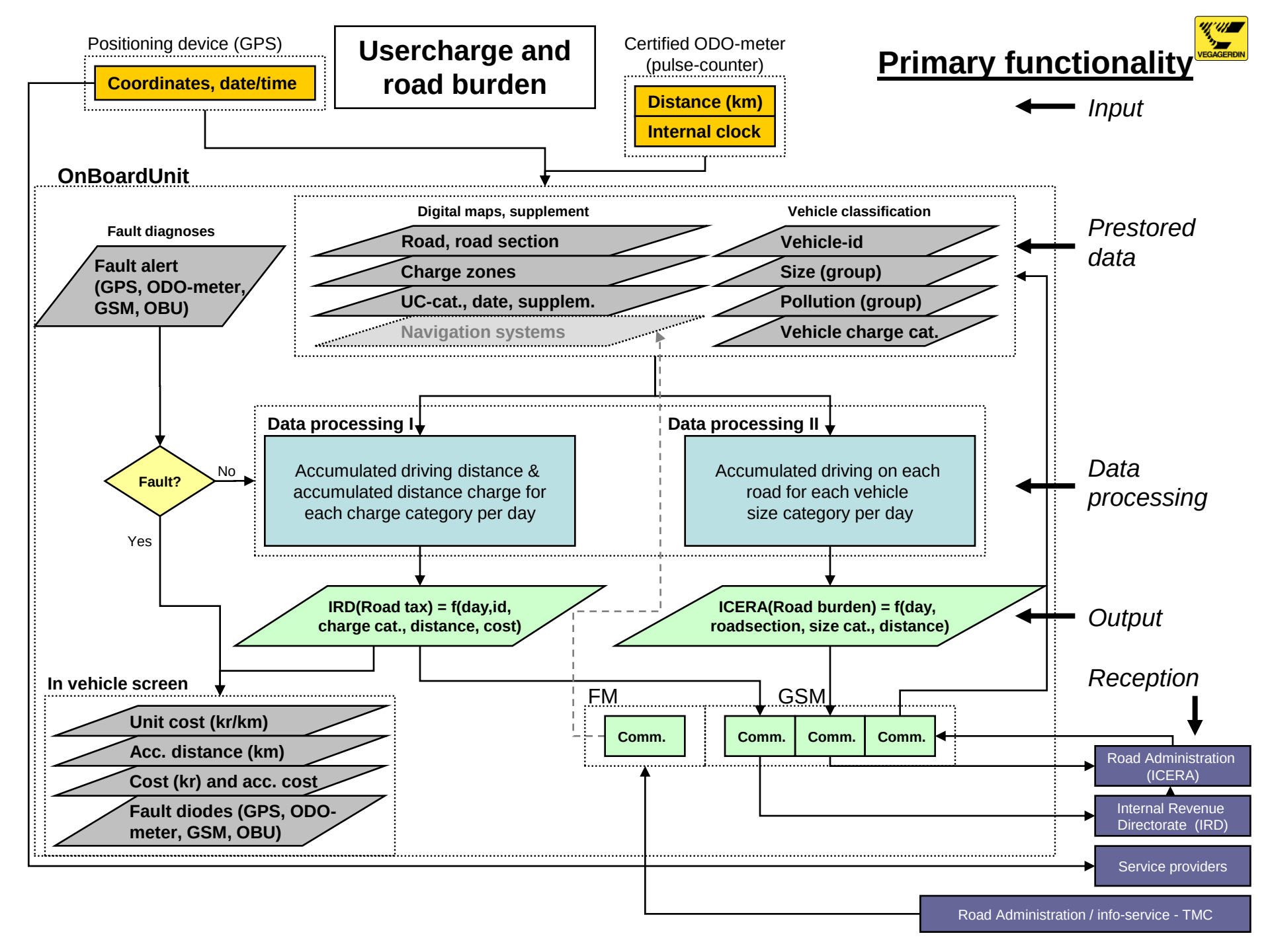
- To develop a trial prototype:
  - an OnBoardUnit for RUC and road burden evaluation viable solution for the market.

…questions to be answered

- Is road user charging technically feasible?
- Is it possible to automatically collect information about traffic induced weight strain and road brakedown?
- Is it possible to adopt RUC without curtailing personal rights?

Road user charging and actual road burden evaluation




Positioning device (GPS)
Coordinates, date/time
Usercharge and road burden
Certified ODO-meter (pulse-counter)
Distance (km)
Internal clock
Primary functionality
Input
OnBoardUnit
Digital maps, supplement
Road, road section
Charge zones
UC-cat., date, supplem.
Navigation systems
Vehicle classification
Vehicle-id
Size (group)
Pollution (group)
Vehicle charge cat.
Prestored data
Fault diagnoses
Fault alert (GPS, ODO-meter, GSM, OBU)
Fault?
No
Yes
Data processing I
Accumulated driving distance & accumulated distance charge for each charge category per day
Data processing II
Accumulated driving on each road for each vehicle size category per day
Data processing
IRD(Road tax) = f(day,id, charge cat., distance, cost)
ICERA(Road burden) = f(day, roadsection, size cat., distance)
Output
Reception
In vehicle screen
Unit cost (kr/km)
Acc. distance (km)
Cost (kr) and acc. cost
Fault diodes (GPS, ODO-meter, GSM, OBU)
FM
GSM
Comm.
Comm.
Comm.
Comm.
Road Administration (ICERA)
Internal Revenue Directorate (IRD)
Service providers
Road Administration / info-service - TMC

Prerequisite for heavy vehicle taxation

Axleweight	Max total tons
0,0002	
0,0052	
0,0032	
0,016	
1,5	(18)
N/A	
1,8	(26)
2,0	(32)
1,7	(32)
2,7	(36)
3,2	(44)
2,4	(28)
2,4	(40)

Vehicle Classification Table GR03-EUR13

1	Car, Light Van	
	Light Goods Vehicle (LGV)	
	Car/LGV & 1-Axle Caravan/Trailer	
	Car/LGV & 2-Axle Caravan/Trailer	
2	Rigid 2-Axle Truck (HGV)	
3	~~Rigid 3-Axle Truck (HGV)~~	
	Rigid 3-Axle Truck (HGV)	
4	Rigid 4-Axle Truck (HGV)	
	Rigid 4-Axle Truck (HGV)	
5	Rigid 2-Axle Truck & 2-Axle Drawbar Trailer	
	Rigid 2-Axle Truck & 3-Axle Drawbar Trailer	
	Rigid 2-Axle Truck & 1-Axle Caravan/Trailer	
	Rigid 2-Axle Truck & 2-Axle Trailer/Caravan	
6	Rigid 3-Axle HGV & 2-Axle Drawbar Trailer	
	Rigid 3-Axle HGV & 3-Axle Drawbar Trailer	
7	Artic, 2-Axle Tractor & 1-Axle Semi-Trailer	
8	Artic, 2-Axle Tractor & 2-Axle Semi-Trailer	
9	Artic, 2-Axle Tractor & 3-Axle Semi-Trailer	
10	Artic, 3-Axle Tractor & 1-Axle Semi-Trailer	
	Artic, 3-Axle Tractor & 2-Axle Semi-Trailer	
11	Artic, 3-Axle Tractor & 3-Axle Semi-Trailer	
12	Bus or Coach 2-Axle	
	Bus or Coach 3-Axle	
13	Vehicle with 7 or more Axles	
	Vehicle not classified above	

2,6	(40)
2,0	(44)
2,4	(28)
4,6	(38)
2,1	(40)
2,7	(36)
2,2	(40)
1,9	(44)
1,5	(18)
1,8	(26)

Usercharge - zone charging rules

[1)] Primal charge = (independent of vehicle size i.e. 10 kr/km)

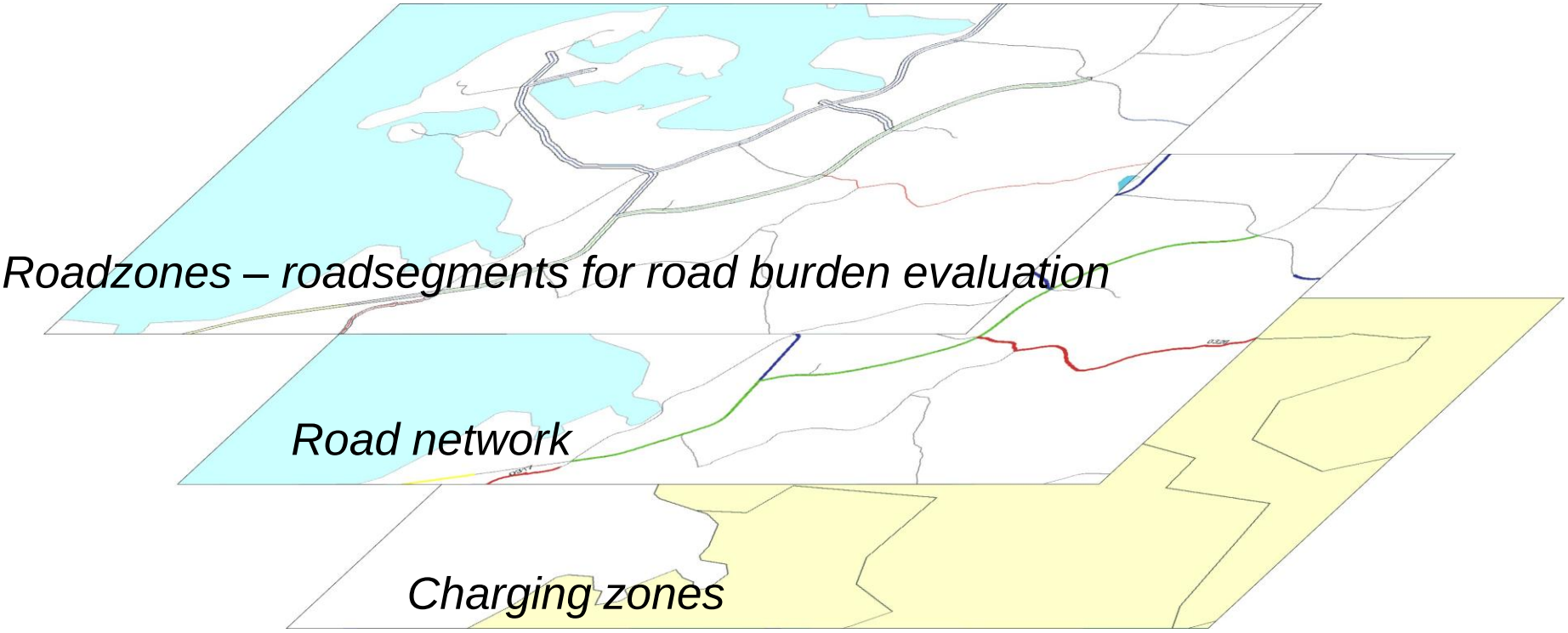
Skýring	Charge-areas	Date-time	Charge-category	Supple-ment 1 %	Supple-ment 2 %
Major roads in cities - during rushhour	Zone 1	Working days Kl. 07:30 – 09:00 and kl. 16:00 – 17:00	1	100%	100%
Major roads in cities – outside rushhour	Zone 1	otherwise	2	95%	95%
Other major roads	Zone 2	otherwise	2	95%	95%
Regional roads	Zone 3	otherwise	3	95%	15%
Rural roads	Zone 4	otherwise	4	90%	90%
Noncharge roads	Zone 5	otherwise	5	0%	0%
No GPS	N/A	All days	1	100%	100%

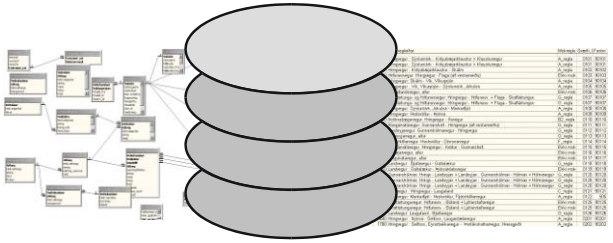
Tax-coll: Date, Vehicle_id, pollution charge, veh. size charge and supp1, primal charge [1)] and supp2, ∑Driven km

RUC (kr) = (pollution charge+(veh size charge*supp1)+(primal charge [1)] *supp2))* ∑Driven km

(Veh.size charge = (size charge (Euro13)*supp1 + pollution charge))

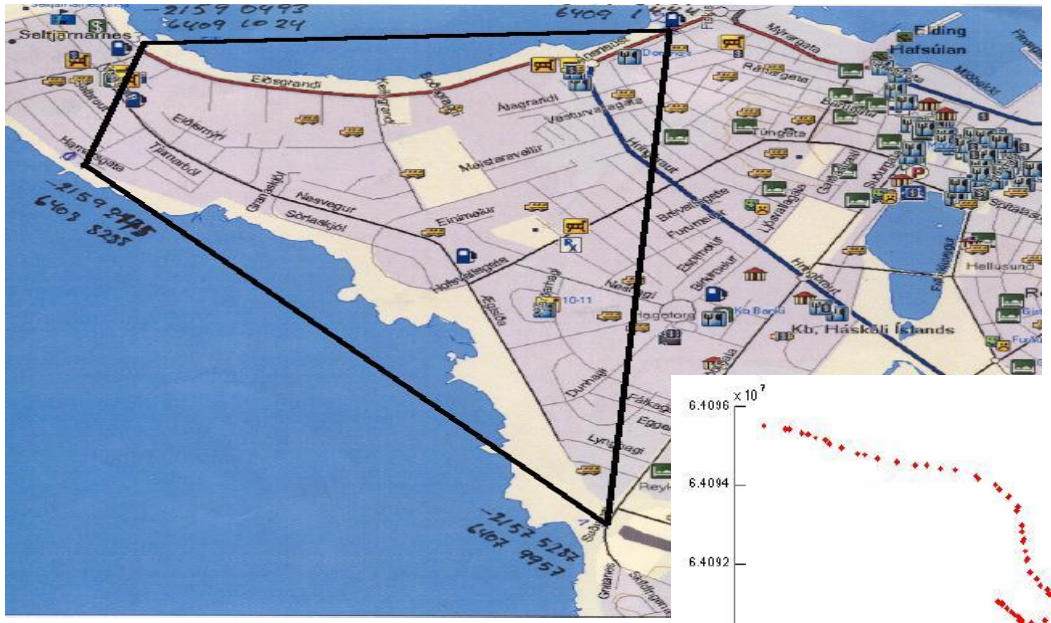
Dataprocessing (OnBoardUnit) – underlying data

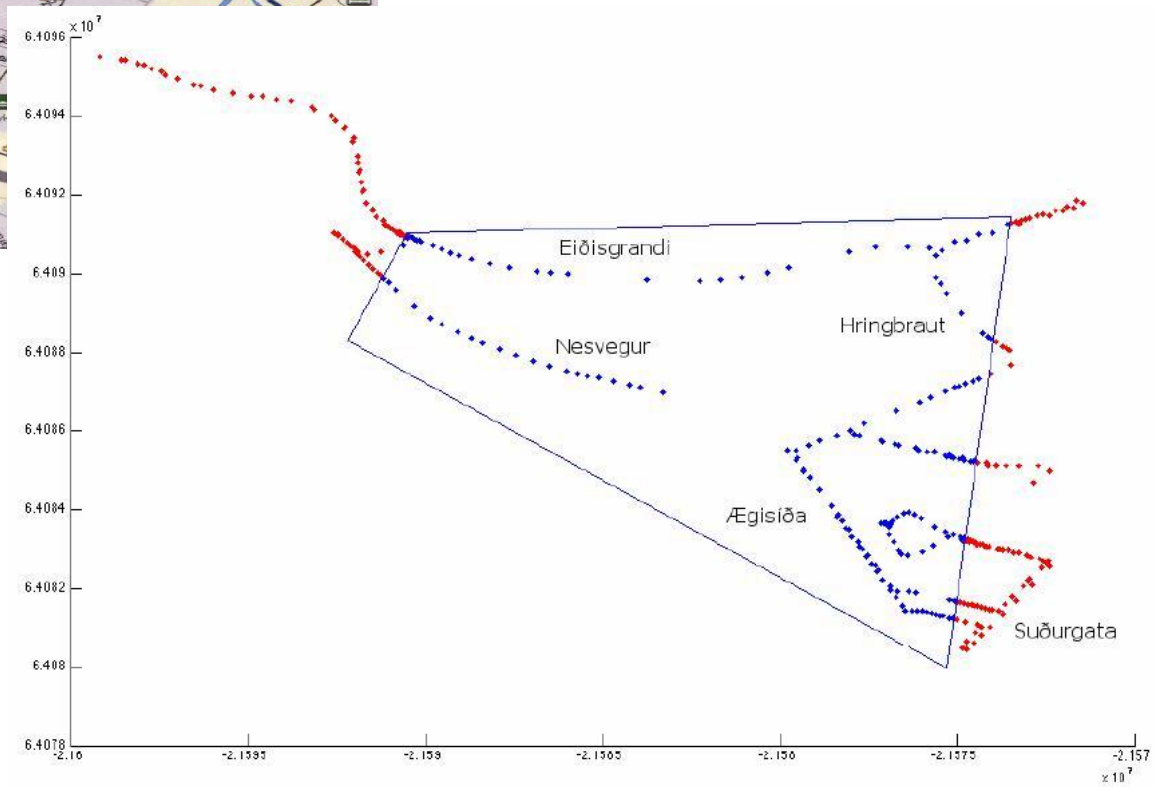




Charge category, time/date and supplement

Result example





Levied taxes – examples*

Flokkur	Óxulígildi	Heildarþyngd	Grunngjald	Alags-	Stærðargjald	Alags-	Mengunargjald	Akstursgjald	Dæmi1	Dæmi 2	Dæmi 3	Dæmi 4
		tonn	kr/km		kr/km		kr/km	kr/km	15.000km	20.000km	50.000km	100.000km
1a	0,0002	1	5	1,00	1	1,00	0,07	6,07	91.050	121.400	303.500	607.000
1b	0,052	3,5	5	1,00	2	1,00	0,24	7,24	108.600	144.800	362.000	724.000
1c	0,0032	1,5	5	1,00	1,2	1,00	0,1	6,30	94.500	126.000	315.000	630.000
1d	0,016	2,5	5	1,00	1,5	1,00	0,17	6,67	100.050	133.400	333.500	667.000
2	1,5	18	5	1,00	6,80	1,00	1,23	13,03	195.386	260.515	651.286	1.302.573
3	1,8	26	5	1,00	13,20	1,00	1,77	19,97	299.614	399.485	998.714	1.997.427
4a	2	32	5	1,00	17,21	1,00	2,18	24,39	365.844	487.792	1.219.481	2.438.961
4b	1,7	32	5	1,00	17,21	1,00	2,18	24,39	365.844	487.792	1.219.481	2.438.961
5a	2,7	36	5	1,00	17,21	1,00	2,45	24,66	369.894	493.192	1.232.981	2.465.961
5b	3,2	44	5	1,00	20,00	1,00	3	28,00	420.000	560.000	1.400.000	2.800.000
5c	2,4	28	5	1,00	14,81	1,00	1,91	21,72	325.746	434.328	1.085.820	2.171.641
5d	2,4	40	5	1,00	16,80	1,00	2,73	24,53	367.886	490.515	1.226.286	2.452.573
6a	2,6	40	5	1,00	16,80	1,00	2,73	24,53	367.886	490.515	1.226.286	2.452.573
6b	2	44	5	1,00	20,00	1,00	3	28,00	420.000	560.000	1.400.000	2.800.000
7	2,4	28	5	1,00	14,81	1,00	1,91	21,72	325.746	434.328	1.085.820	2.171.641
8	4,6	38	5	1,00	17,21	1,00	2,59	24,80	371.994	495.992	1.239.981	2.479.961
9	2,1	40	5	1,00	16,80	1,00	2,73	24,53	367.886	490.515	1.226.286	2.452.573
10a	2,7	36	5	1,00	17,21	1,00	2,45	24,66	369.894	493.192	1.232.981	2.465.961
10b	2,2	40	5	1,00	16,80	1,00	2,72	24,52	367.736	490.315	1.225.786	2.451.573
11	1,9	44	5	1,00	20,00	1,00	3	28,00	420.000	560.000	1.400.000	2.800.000
12a	1,5	18	5	1,00	6,80	1,00	1,23	13,03	195.386	260.515	651.286	1.302.573
12b	1,8	26	5	1,00	13,20	1,00	1,77	19,97	299.614	399.485	998.714	1.997.427

* For illustration only

Next step

- Put together in one OnBoardUnit; ODO-meter, GPS, communication and software as demonstrated. Connection for value added applications such as fleet management, driving behavior and navigation.

- Install 20 OBU in 20 heavy-vehicles for one year trial.

Thank you