

Light Pollution in Belgium Status & Low Cost Measurement Project

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Astronamur Club

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Topics

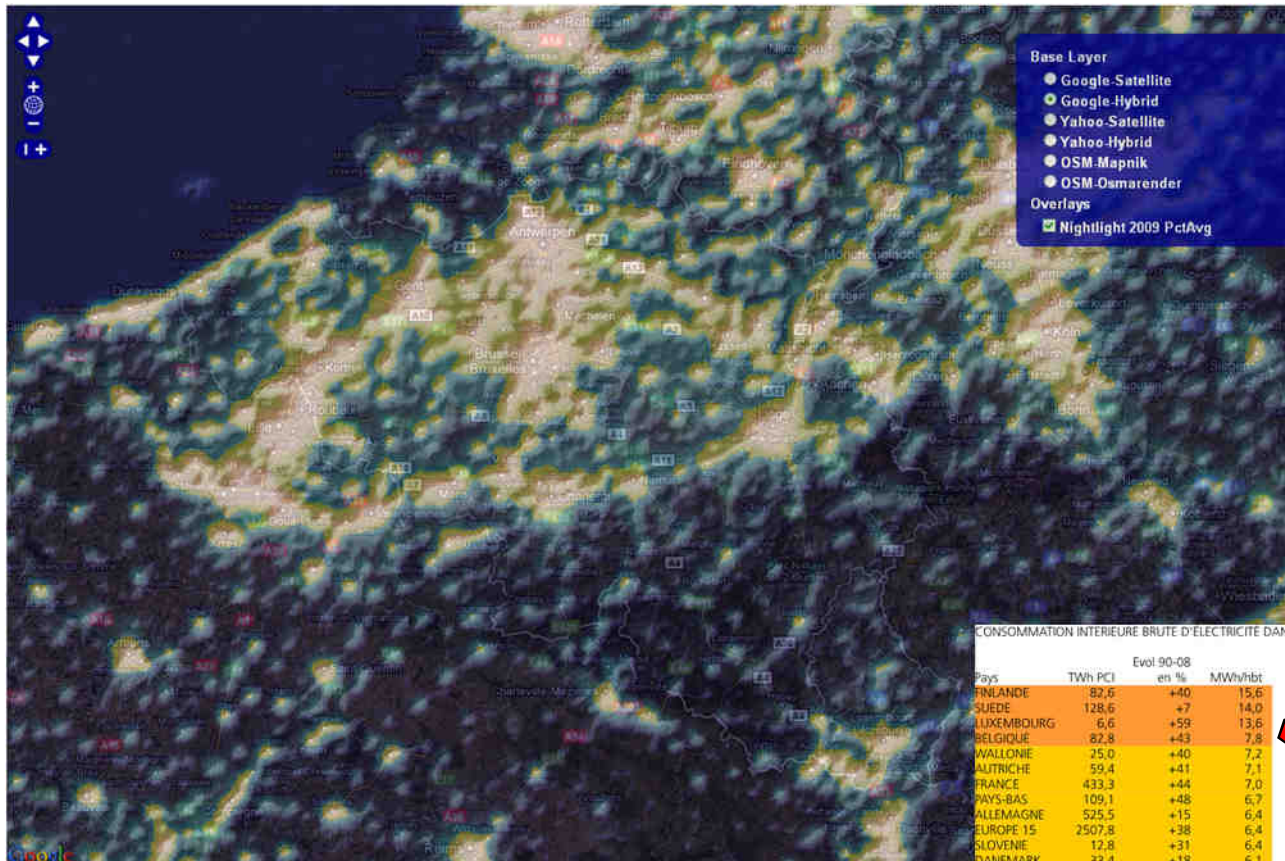
- Belgium LP : Status
- Associations : Action
- Measuring : LPMD
- Conclusion

LP : A « rich » country problematic...



Belgium – Woluwe-St-Lambert - 2009

Belgium : Light Pollution



Belgium global (Mc Kinsey)

- all energy model
- 368 Mbp
(22080 M€ at 60€/barrel)

CONSOMMATION INTERIEURE BRUTE D'ELECTRICITE DANS L'UNION EUROPEENNE (2008)

Pays	TWh PCI	Evol 90-08 en %	MWh/hbt
FINLANDE	82,6	+40	15,6
SUEDE	128,6	+7	14,0
LUXEMBOURG	6,6	+59	13,6
BELGIQUE	82,8	+43	7,8
WALLONIE	25,0	+40	7,2
AUTRICHE	59,4	+41	7,1
FRANCE	433,3	+44	7,0
PAYS-BAS	109,1	+48	6,7
ALLEMAGNE	525,5	+15	6,4
EUROPE 15	2507,8	+38	6,4
SLOVENIE	12,8	+31	6,4
DANEMARK	33,4	+18	6,1
IRLANDE	25,9	+118	5,9
CHYPRE	4,6	+165	5,9
ESPAGNE	265,1	+111	5,9
EUROPE 27	2855,5	+33	5,7
TCHÉQUIE	58,0	+20	5,6
ROYAUME-UNI	341,6	+24	5,6
ESTONIE	7,0	+3	5,2
ITALIE	308,8	+44	5,2
GRECE	56,6	+99	5,1
SLOVAQUIE	24,8	+6	4,6
PORTUGAL	48,4	+105	4,6
MALTE	1,9	+103	4,5
BULGARIE	28,7	-19	3,8
HONGRIE	34,3	+9	3,4
POLOGNE	117,5	+23	3,1
LETTONIE	6,6	-20	2,9
LITUANIE	9,0	-25	2,7
ROUMANIE	42,5	-17	2,0



At Belgium's city level,

- traffic light consumption is around 40 to 50% of common electricity cost.
- traffic light budget is around 2 to 5% of town budget.

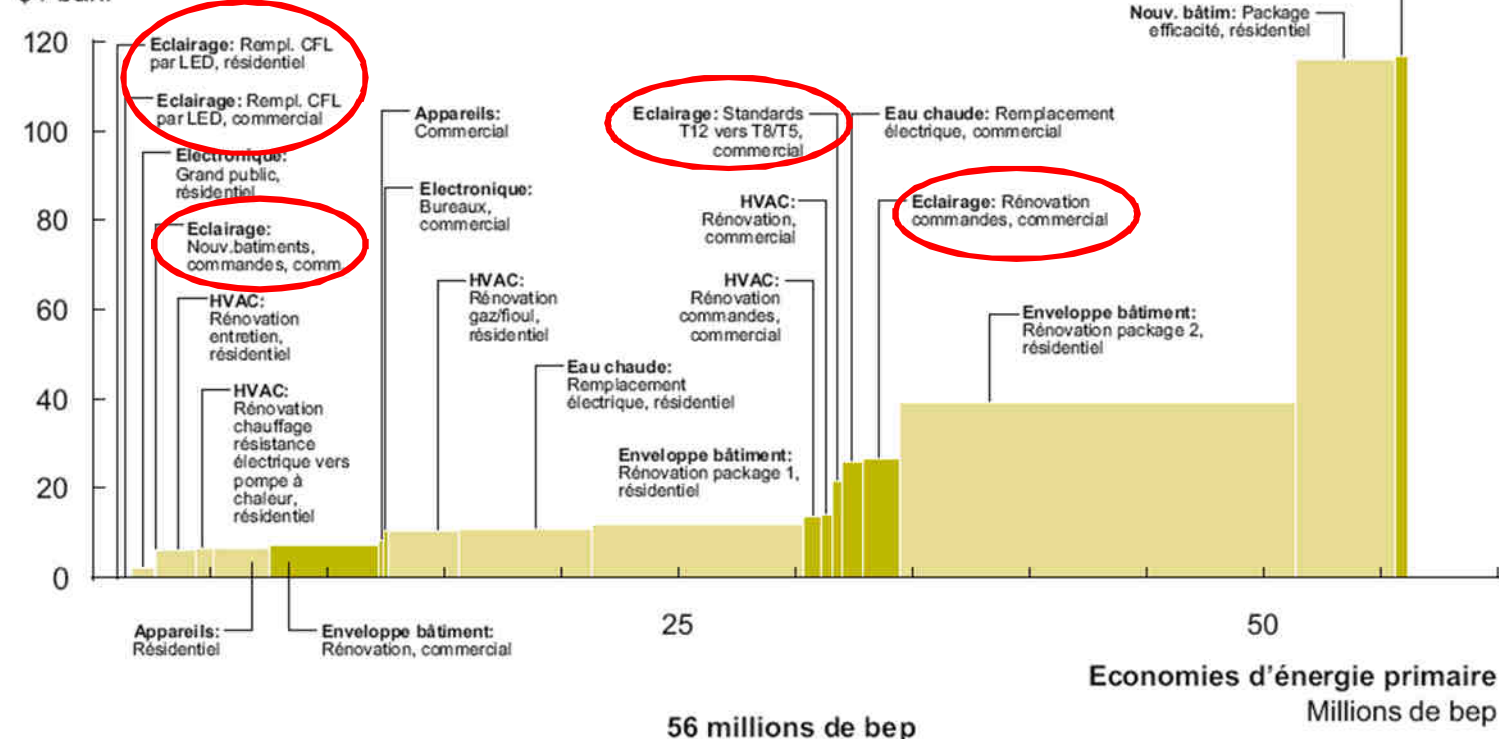
Belgium : Energy reduction targets

Potentiel théorique d'économie d'énergie dans les bâtiments en Belgique

Mesures liées à des investissements, 2030

Seuil de rentabilité en fonction du prix du brut

\$ / baril

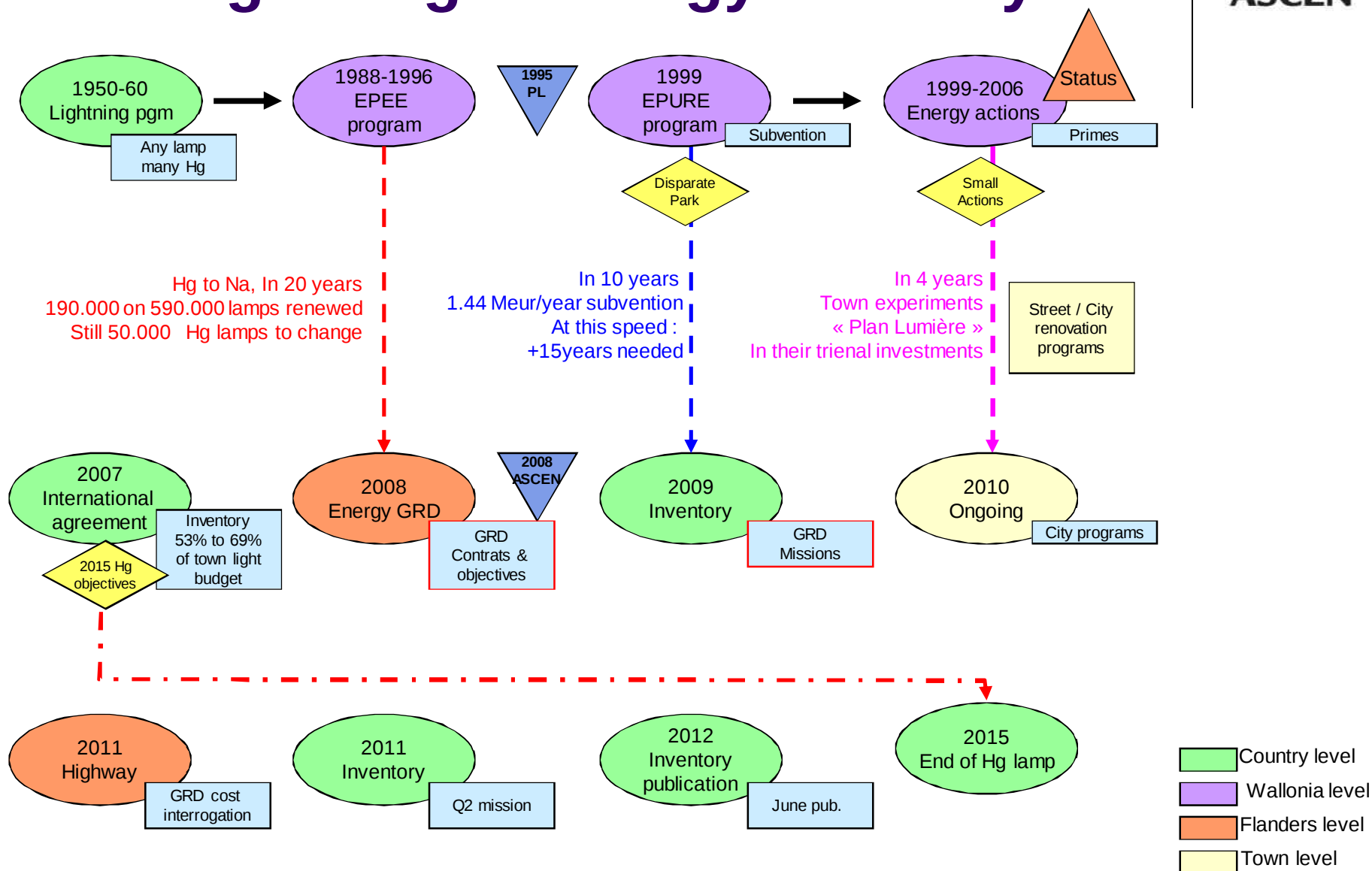


Réduction des émissions de gaz à effet de serre¹ : 25 MtCO₂e

¹ Inclut les mesures non liées à des investissements

SOURCE: Analyse McKinsey

BE - Lightning & Energy - History



LP in Belgium : Association actions

Around LP problematic in Wallonia :

....

« ... nothing in Region Political Declaration does concern this aspect... »

*Answers made to ASCEN's president inquiry – Made by Environment Minister
- 2010*

All LP aspects :

in GRD missions (1 chapter)

energy providers have to study and solve them

- *No direct region subvention to another studies*
- *Light pollution : region & federal public sensitization actions*
 - *(Night of Darkness – Earth Hour)*
- *Town could propose projects*

Association objectives :

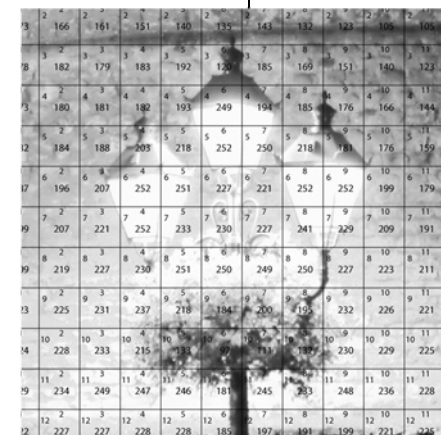
⇒ Help in town renovation actions

⇒ Audit town situation

⇒ Communicate around today situation & possible actions

Audit : which low cost methods ?

LP : A citizen interest...

[illegible]

- ⇒ *Manual measure*
- ⇒ *Drawing*
- ⇒ *Photos*
- ⇒ *Visits*



Analysis :

- a) Too slow...
- b) Problems...

How obtain info more quickly ?
How convince ?

LPMD project

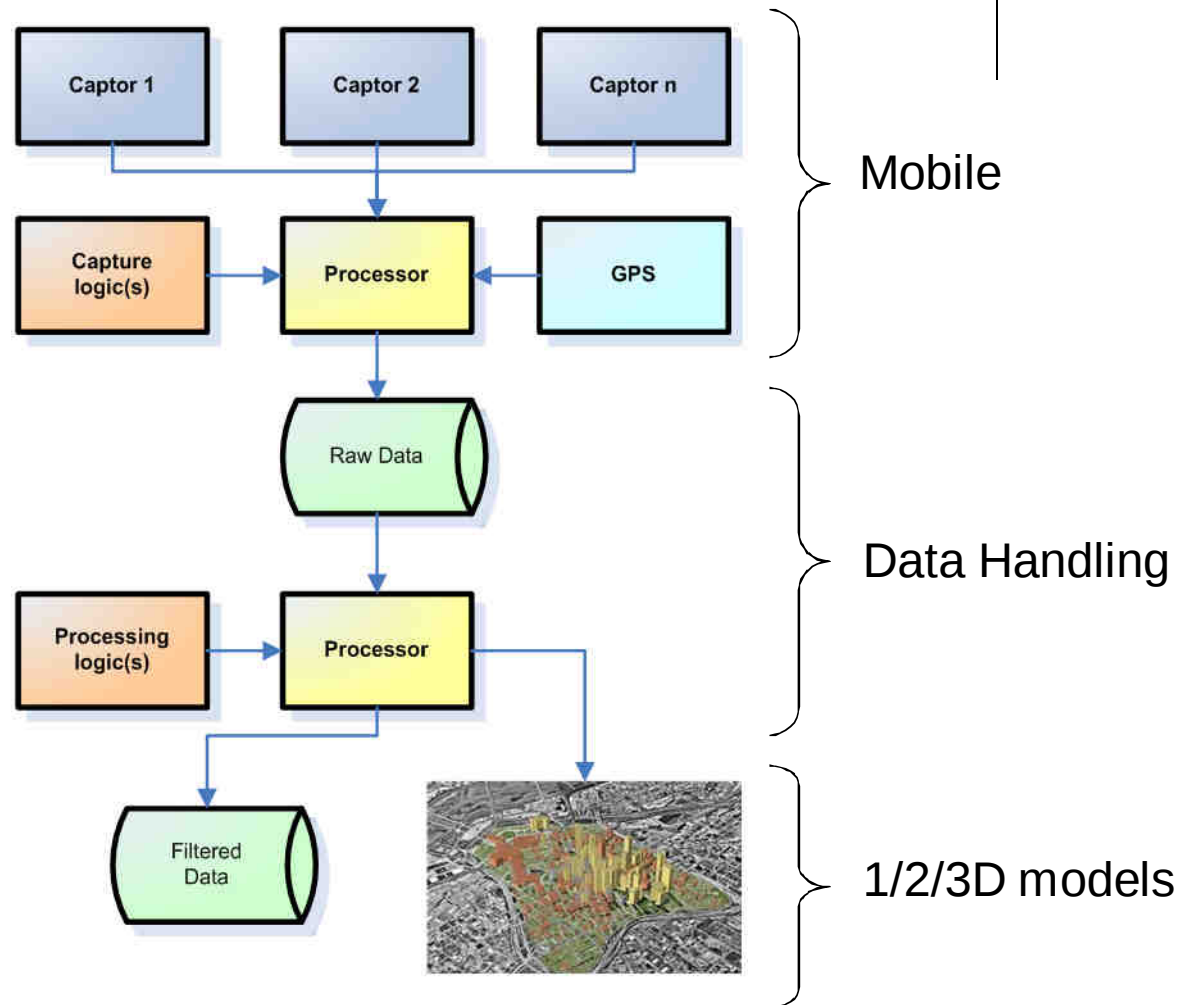
Light

Pollution

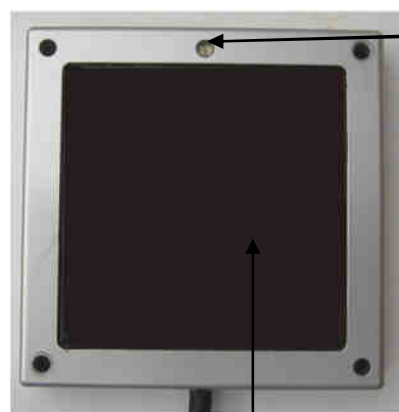
Mobile

Detector

« Less than
500 eur Project »



Detector(s) : today



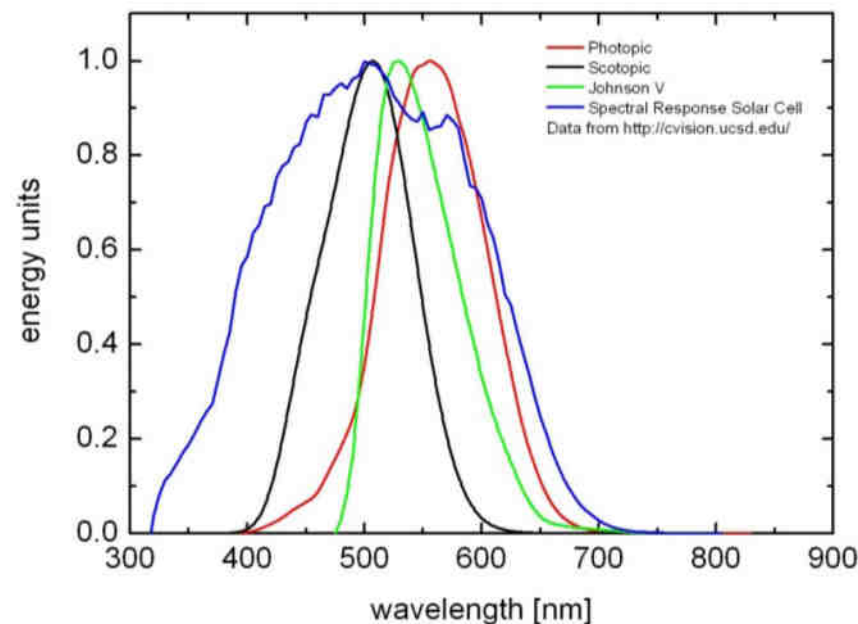
Detection area
from 0.0005 to 200 000 Lux

Day
NiR TSL2560 LIGHT-TO-DIGITAL CONVERTER
16 bits value



Weight 370 g
Measurement range
Noise
Recording rate adjustable
Detection limit
Operating temperature
Storage temperature
V2.3

(270 g sensor + 100 g USB-cable)
500 mikro-Lux to 200 000 Lux
20 mikro-Lux at 1 mLux
from 1 per s to 1 per hour
50 – 100 mikro-Lux
-25°C to 80°C
-30°C to 110°C
3 captors : visual, Daylight, Near Infrared

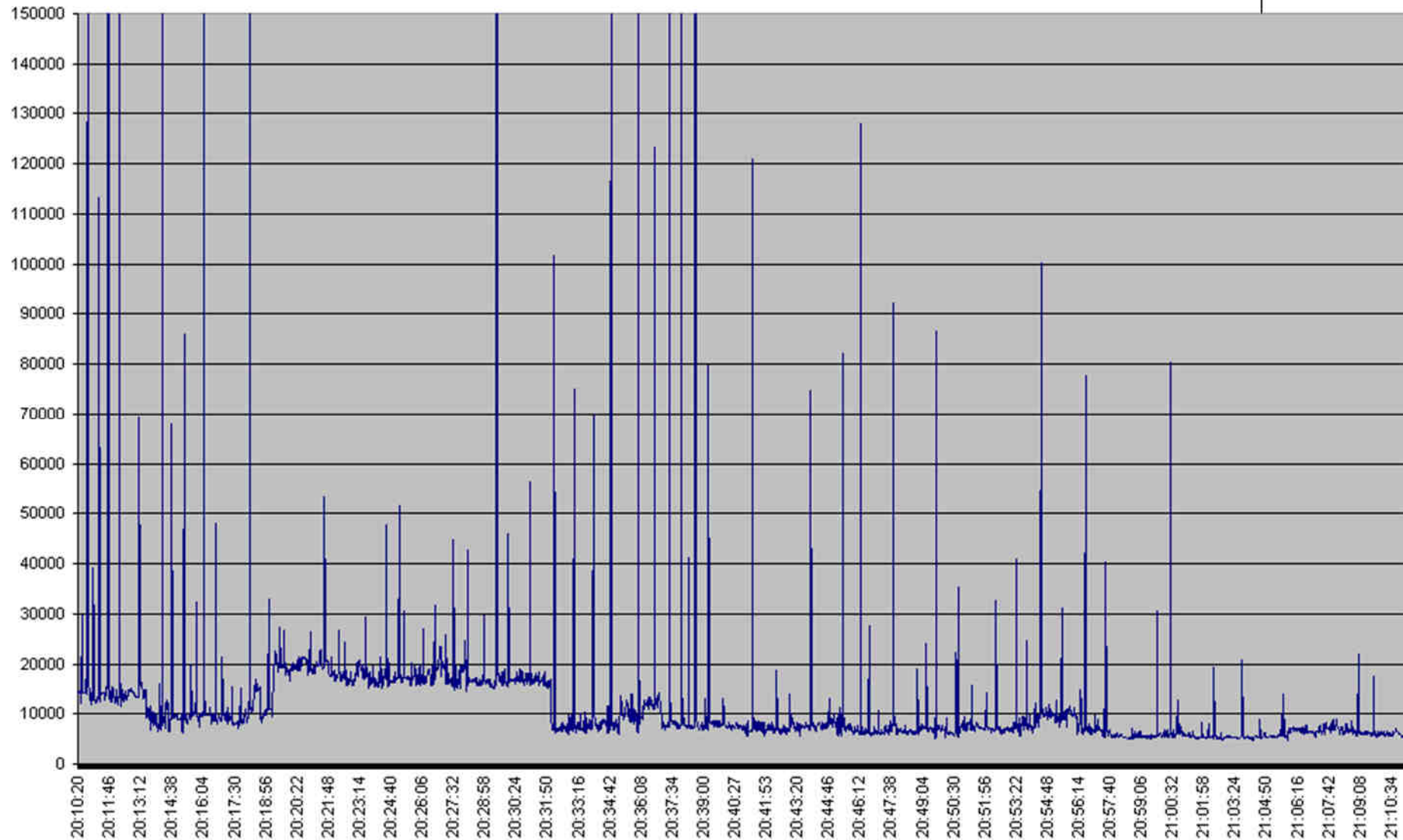


IYA Lightmeter project

Dr. Günther Wuchterl
Thüringer Landessternwarte Tautenburg
<http://kuffner-sternwarte.at/>

LPMD v1.0 – First light

October 2009 – Lightning's...



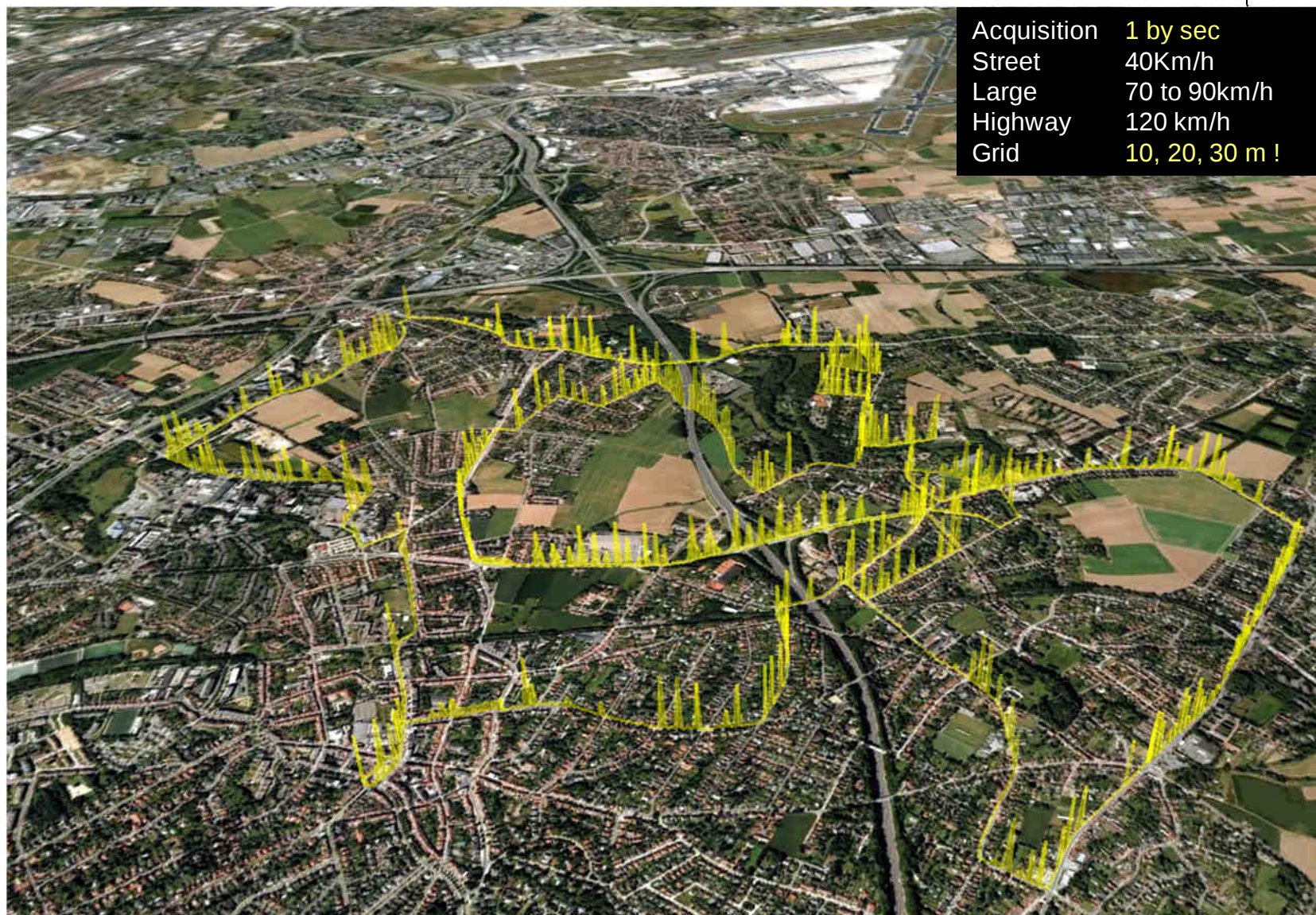
LPMD v2.0

First lights... in 15 mins !



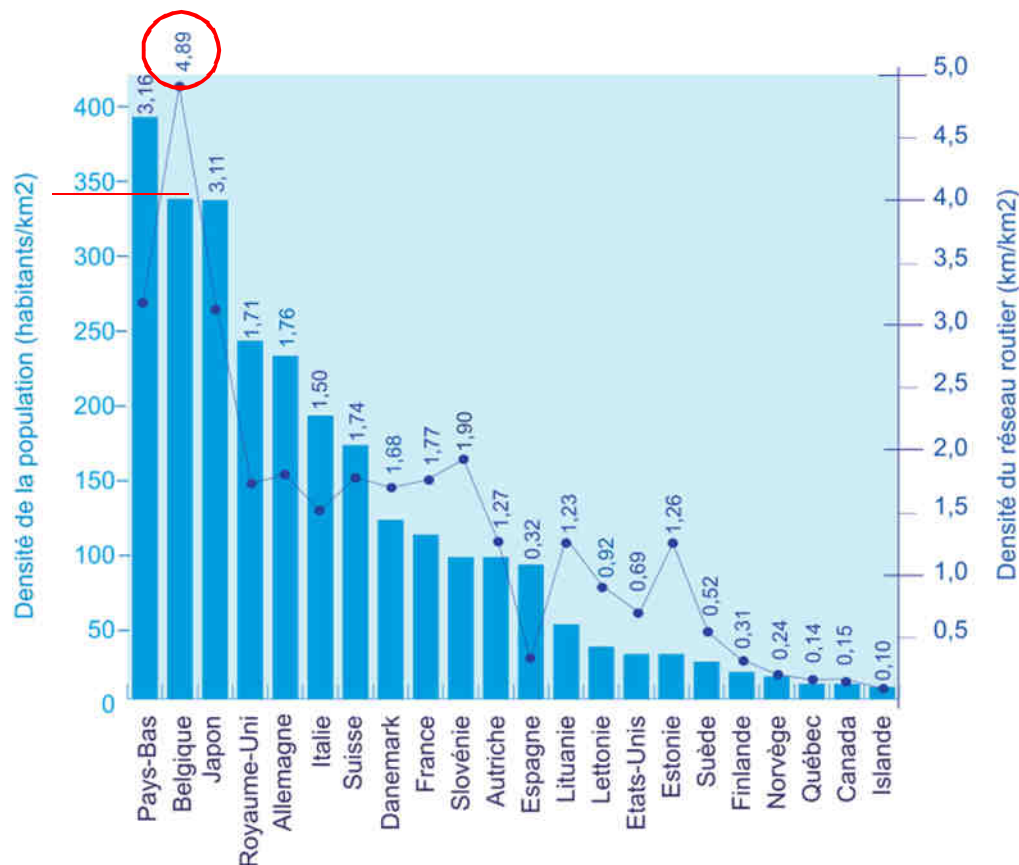
LPMD v2.0

14 km² in 34 min...

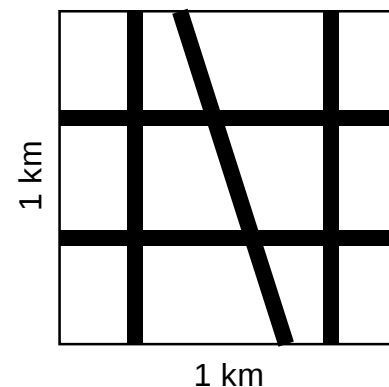


Acquisition	1 by sec
Street	40Km/h
Large	70 to 90km/h
Highway	120 km/h
Grid	10, 20, 30 m !

Belgium : traffic lights



Almost 5 km
of illuminated road
by km²



for 350 inh/km²

En km	2004	Wallonie	Flandre	Bruxelles-Capitale	Belgique (total)
Autoroutes		869	867	11	1.747
Routes régionales		6.839	5.372	320	12.531
Routes provinciales		714	635	0	1.349
Routes communales		70.840	62.550	1.550	134.940
Total		79.262	69.424	1.881	150.567

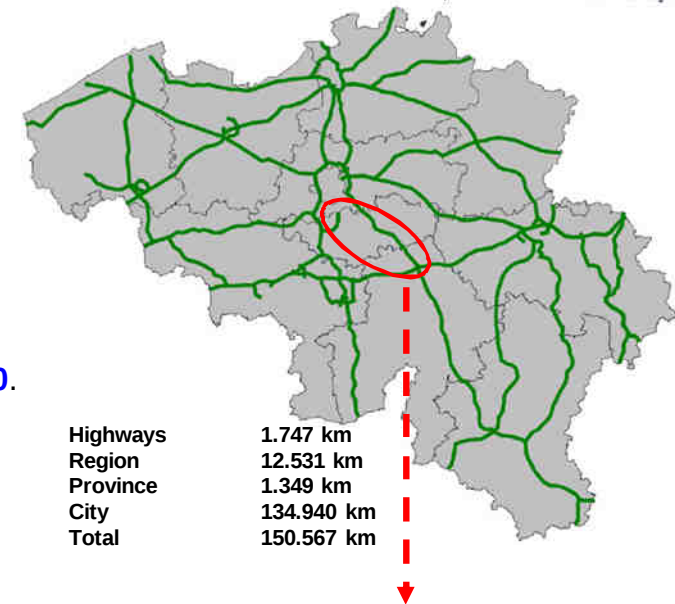
At country level, traffic light budget
= around 19 million euros by year

2011 Highways lights cut

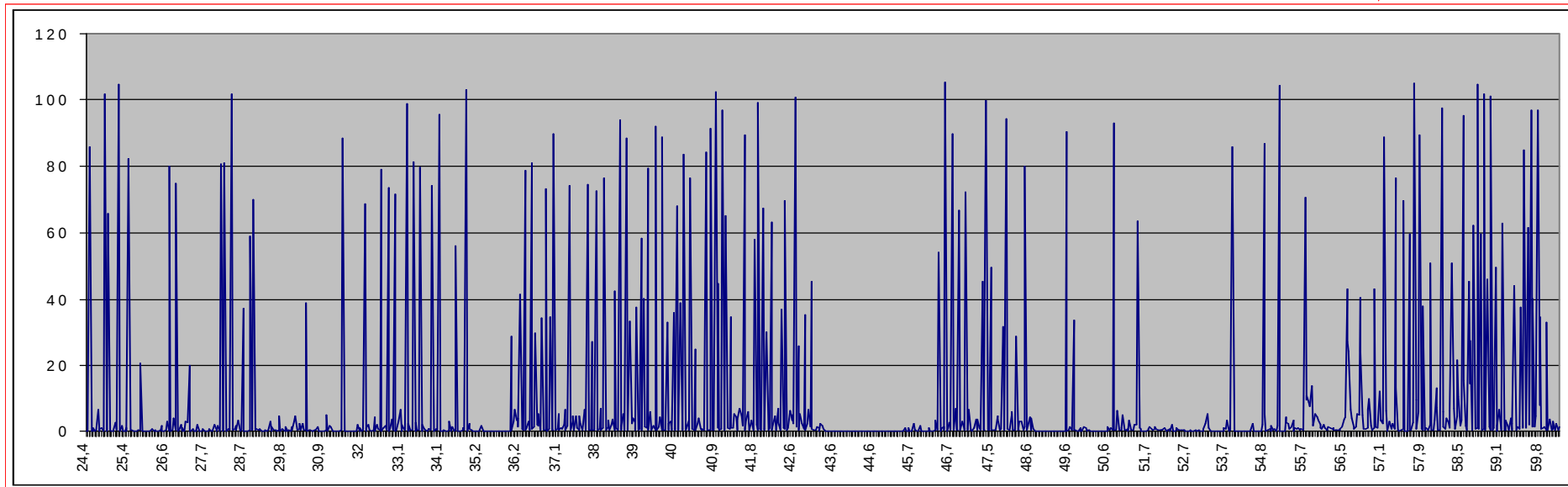
Belgium : 335.000 lamps
: around 19 million euros, 210 GWh per year

Flanders : partial cut off since 2007
: **full cut off on roads since 15/7/2011**
: still permanent on 18% of roads
: 869 km of roads
: **- 2 million euros per year**

Wallonia : **partial cut off since 2008, from 00h30 till 05h30.**
: 4.050 hours in 2006-2007
: 2.350 hours in 2008-2009
: 867 km of roads, several lightning profiles...

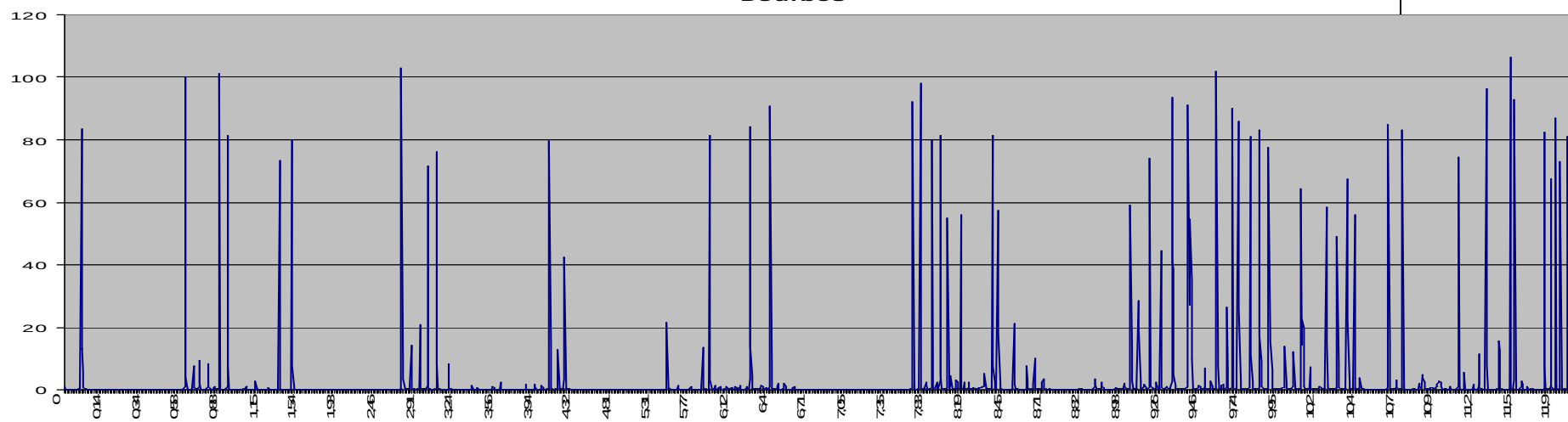


LPMD v2 : 2010/4 – E40 – Wallonia - highway illumination – 24 till 60 km

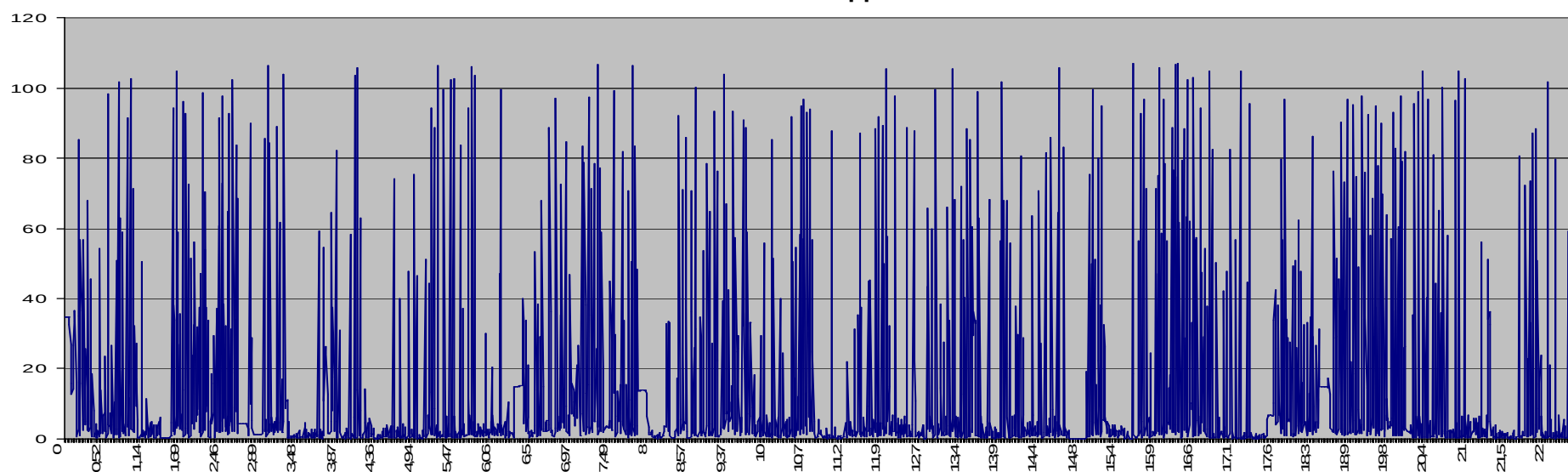


LPMD : Town differences

Dourbes



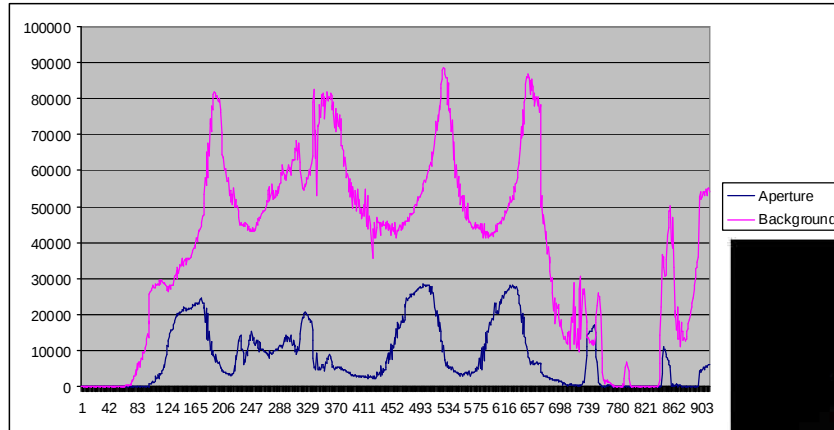
Wezembeek-Oppeem



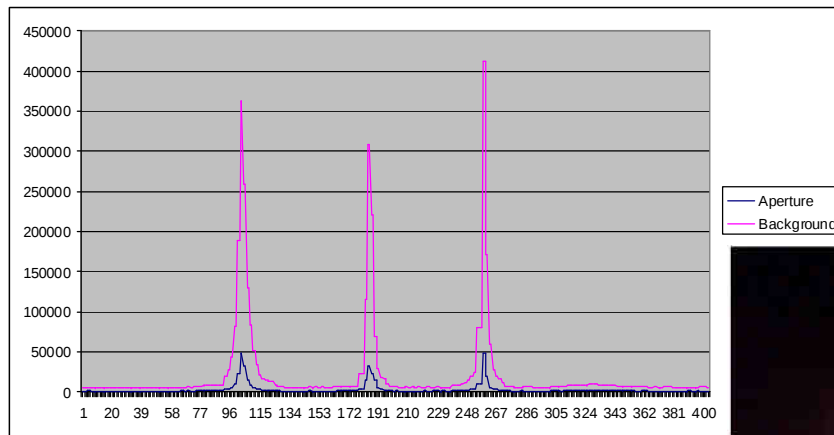
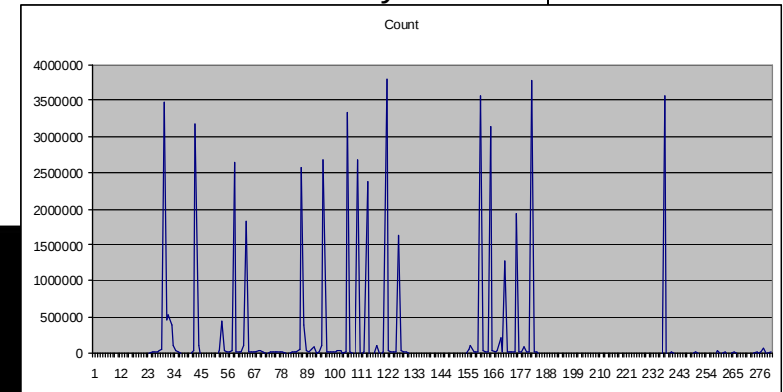
LPMD v3.2

Detectors + camera : enhanced capture

Sky view



Front view



Top view

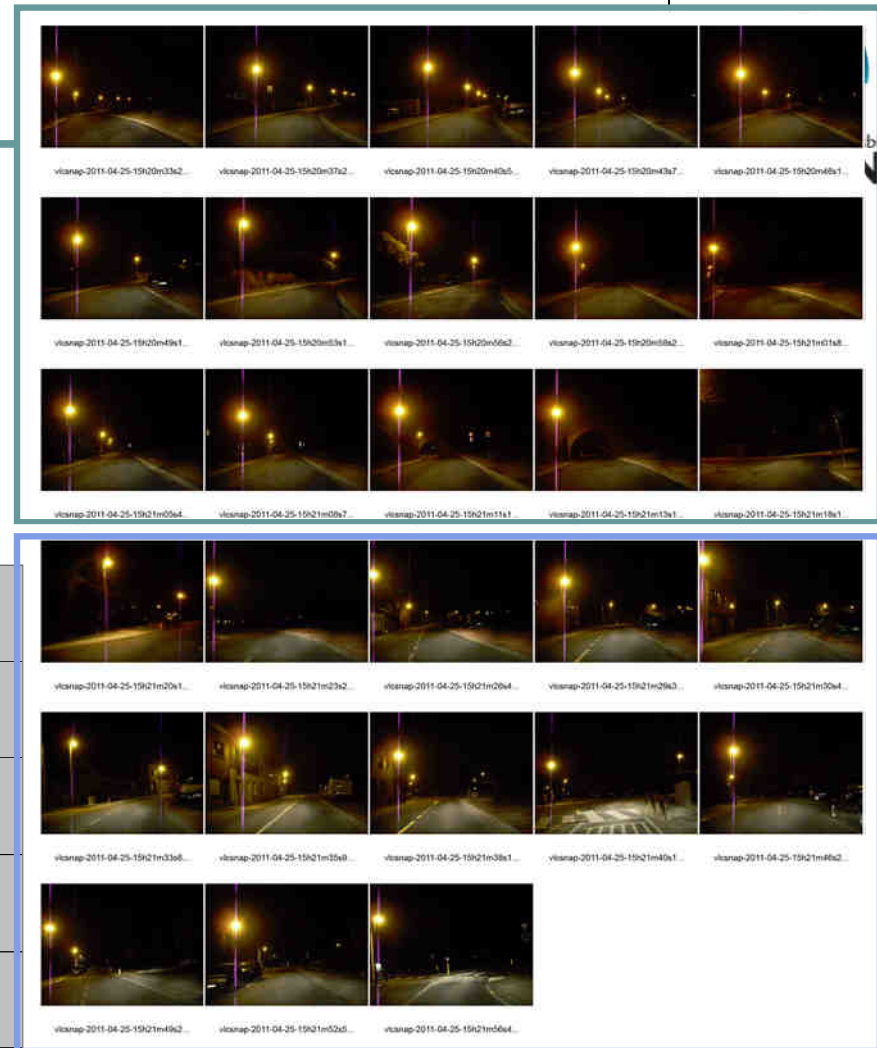
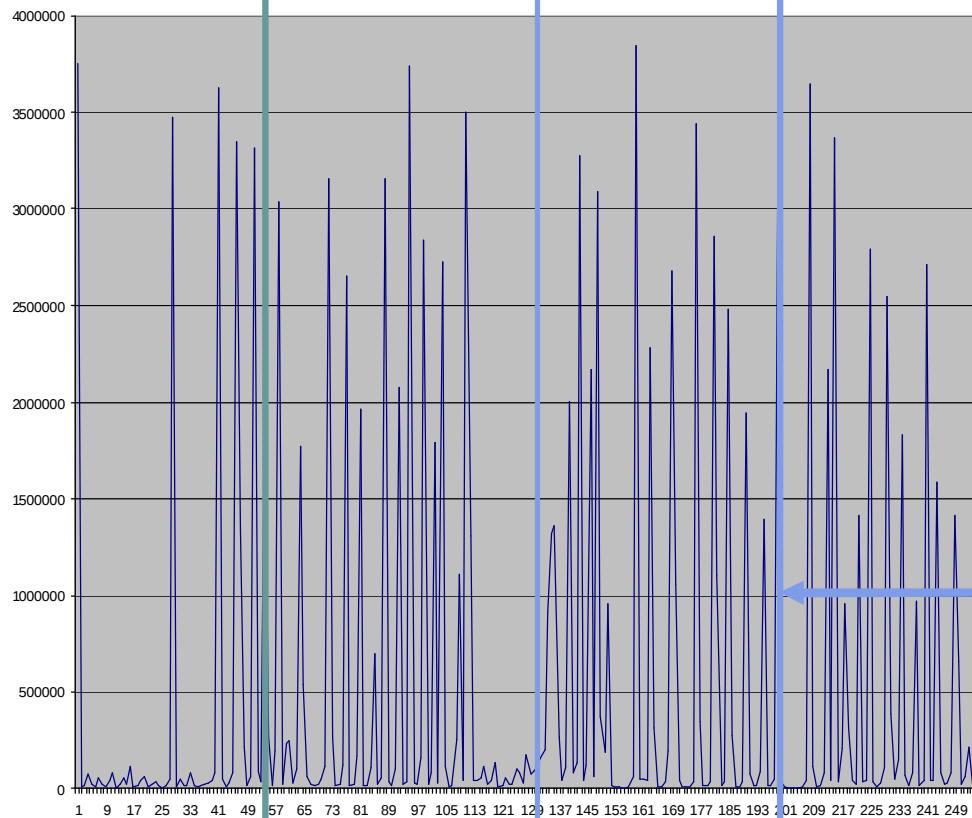


LPMD v3.4

Analysis :

- 14 lights (camera)
- 12+ 2 lights (peak + limit)

=> Limit to fix around weather conditions.



Analysis :

- 13 lights (camera)
- 12 + 2 lights (peak + limit)
- 1 light = transition light (long time)

LPMD v3.6

Analysis :

- Light model
- Flow quantification
- Light implementation (2 travels)
- Anomalies...

Simulation

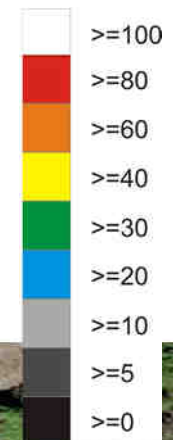
$H = 7\text{m}$, $UFF=40\%$

$Q1 > Q3 > Q2$: Why ?

$a1, a3 < a2$: Why ?



LPMD v3.6



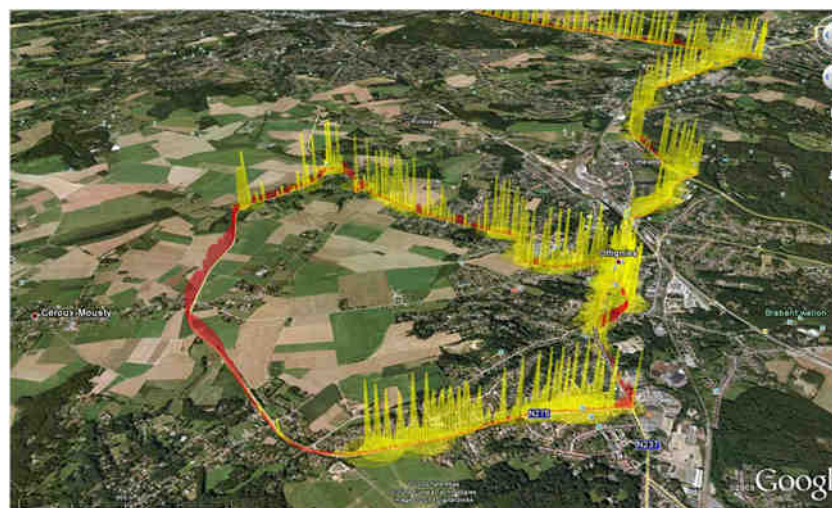
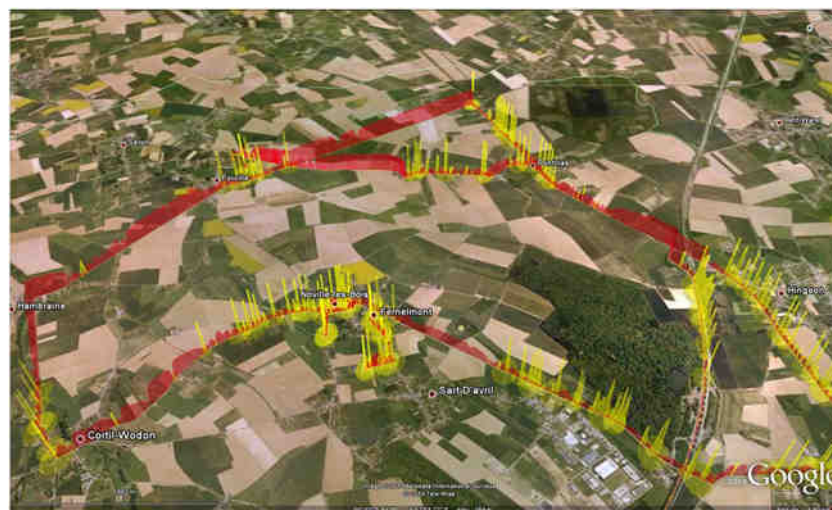
Analysis :

- Light pollution
- Lamp height, UFF/DFF scenario
- Determines attention point for discussion with local authorities



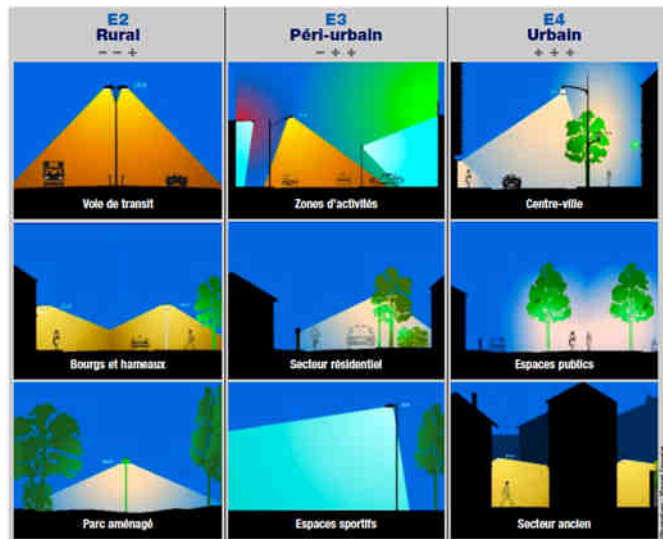
LPMD : Towns profile database

Target : a Belgian version of ANPCEN « *Villages étoilés* » project

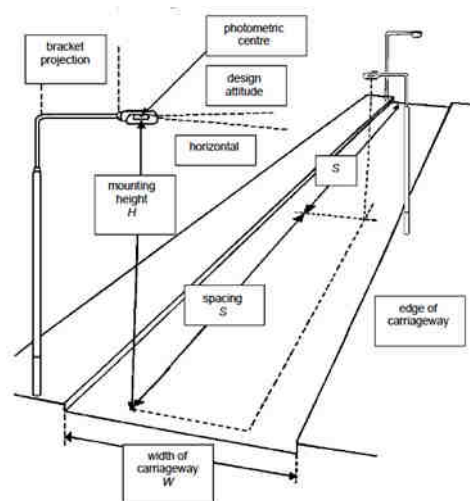
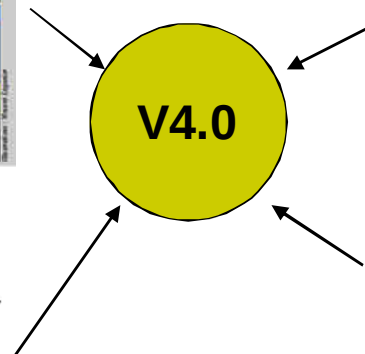


LPMD V4.0 : Energy / Usage analysis

End 2012



UFF 10% & Lumen view



> 30 Lux lamps in an EN-13201 « 15 lux » area

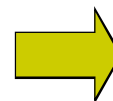
LP Amator's measurement : Conclusion

- | | |
|-------------------------------|--|
| Manual measuring | : slow, good for a very local aspect
: difficult, takes time |
| Digital Camera capture | : good of a specific study (région, places)
: result = quality of captor & lens + calibration |
| Others (specialized) | : cost ! |

My need :

A quickly obtained database of all traffic lights (place, characteristics)
at city, road, street level.

- LPMD**
- No accessible data at town council level
(traffic light management = energy provider)
 - Need to acquire them automatically
 - Quickly
 - Directly usable for a discussion



***Indicate,
Try to convince,
then..***

***Let specialists play
their role...***

LPMD



Thanks for your attention