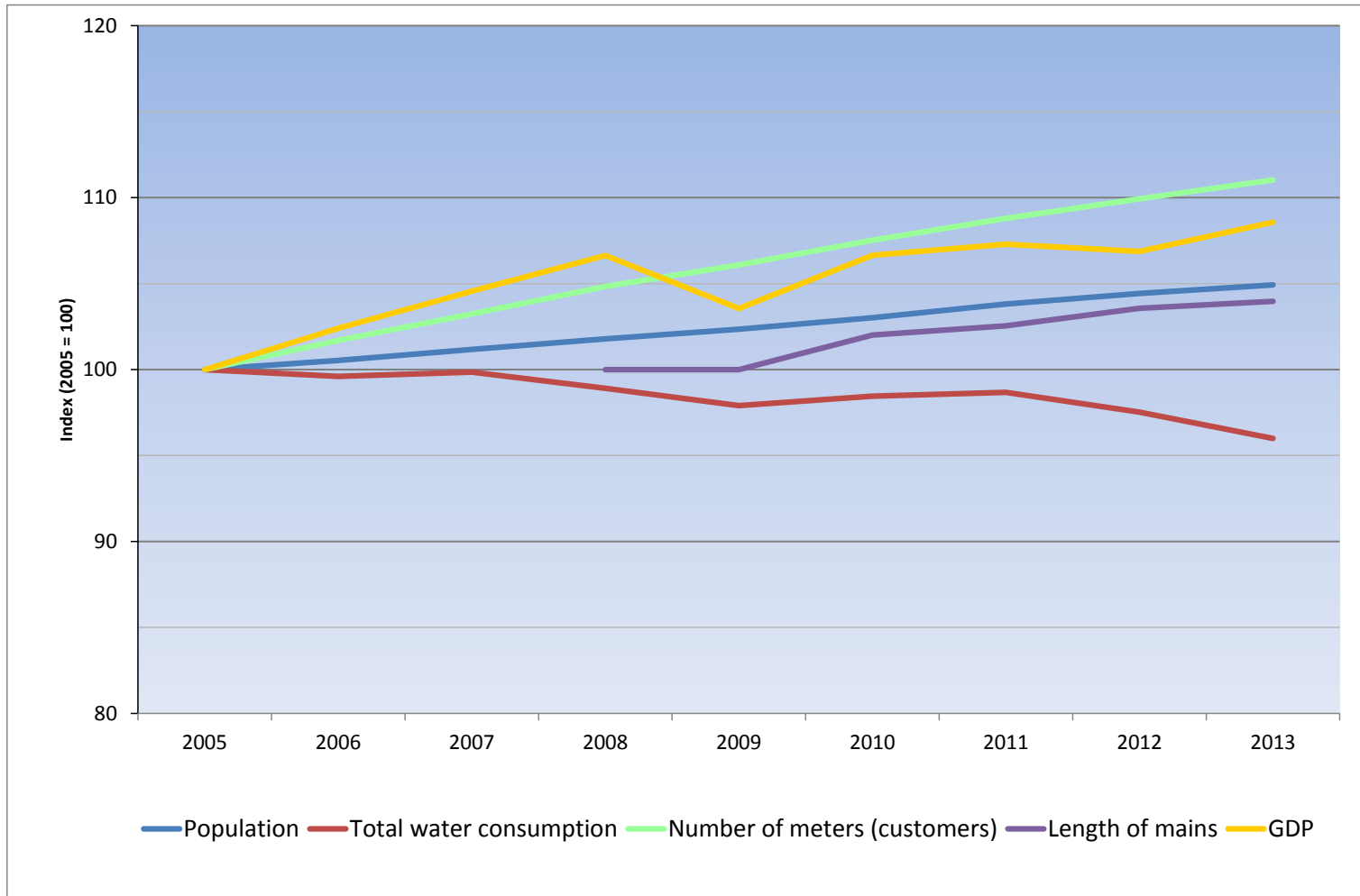




Analysis of the water consumption decrease in Wallonia

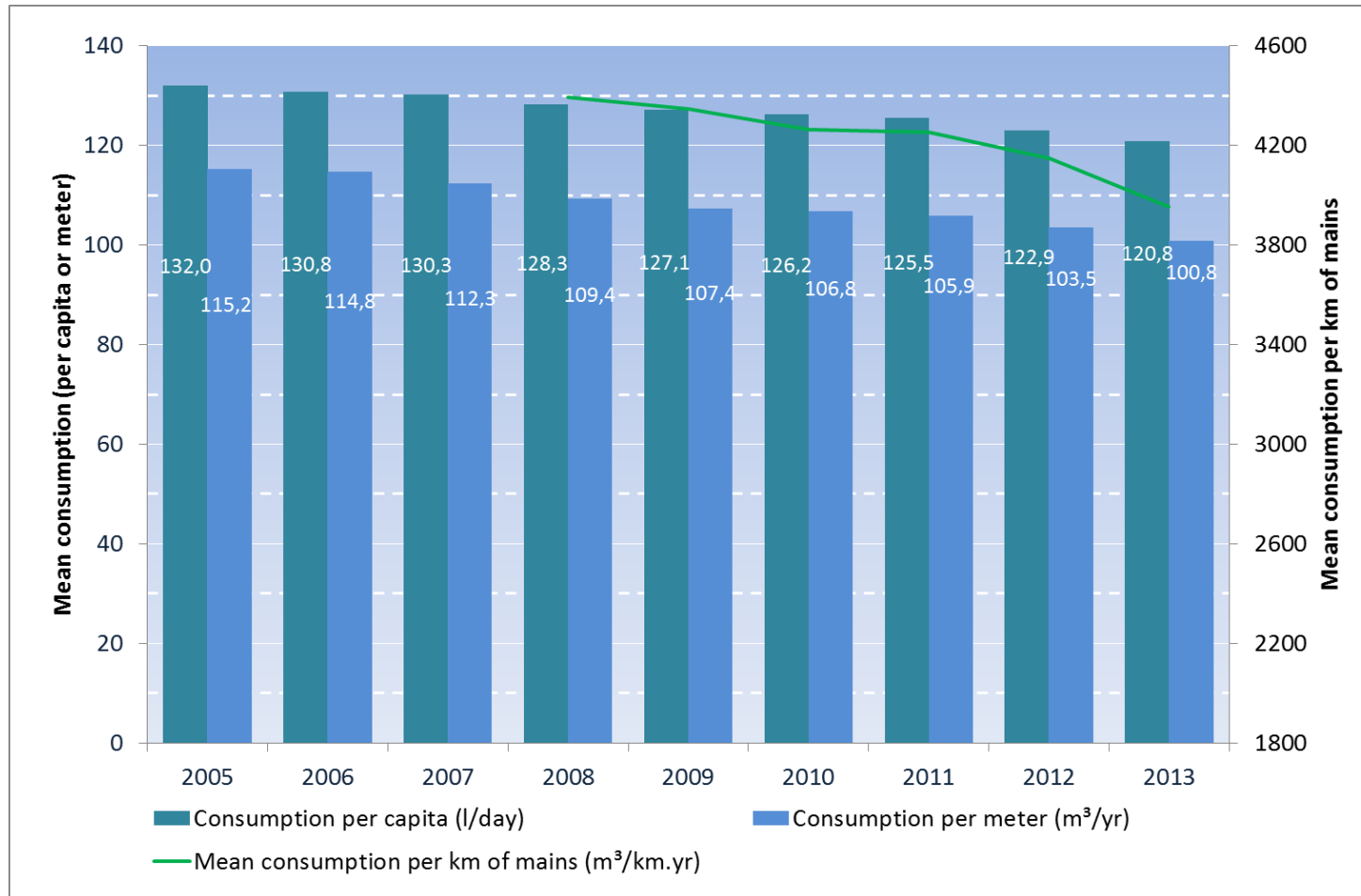
Cédric Prevedello

Evidences in Wallonia



→ Small decrease in total water consumption since 2005 at least (-2% in 7 years) though population and wealth production raises.

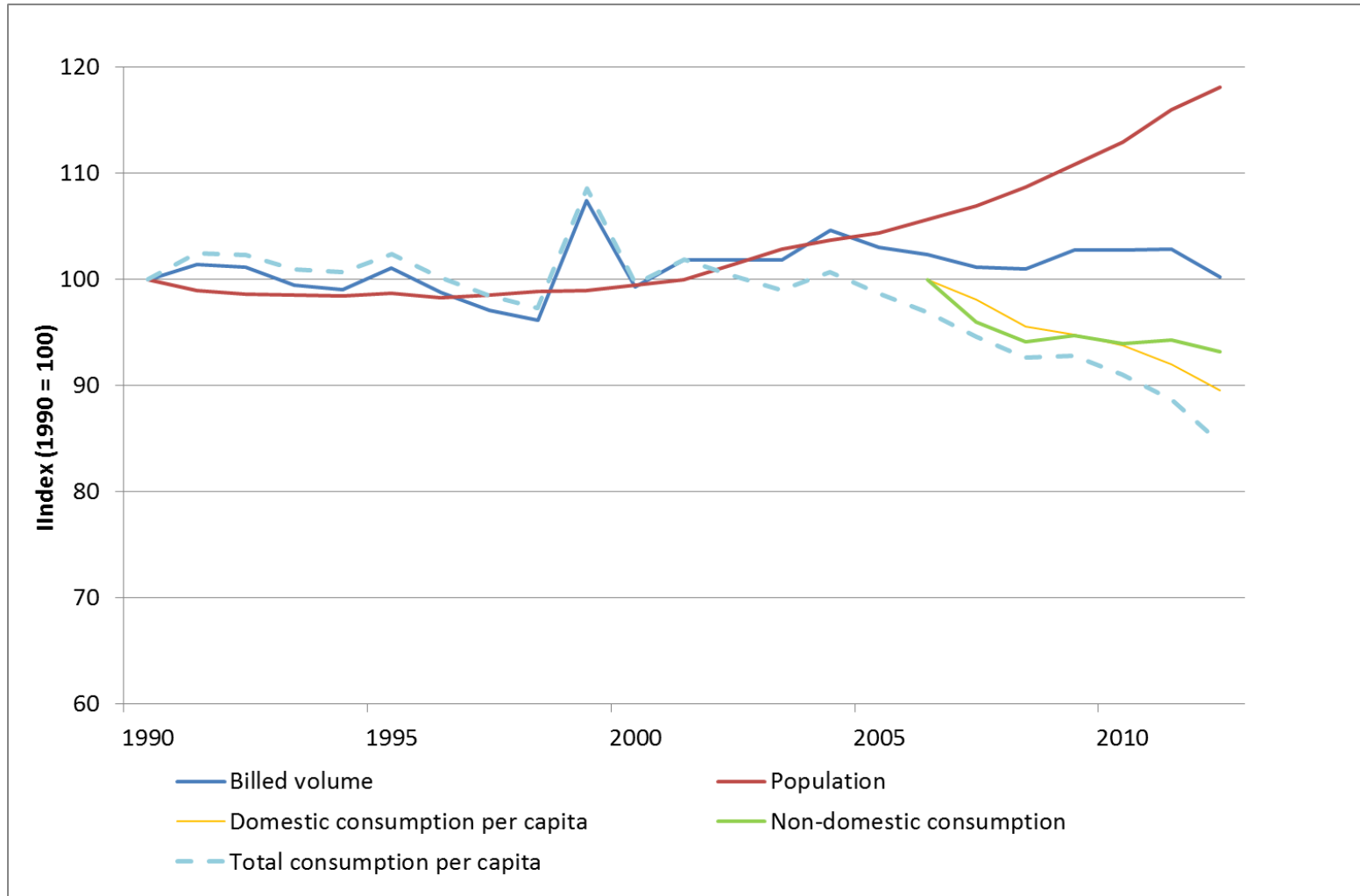
Evidences in Wallonia



- Resulting in a reducing consumption per capita between 1 to 1.5% per year;
- Coupled with an ongoing dispersal of activities on the territory, consumption per kilometer of main is falling drastically (and so the cost-effectiveness of water services).

Evidences elsewhere in Europe

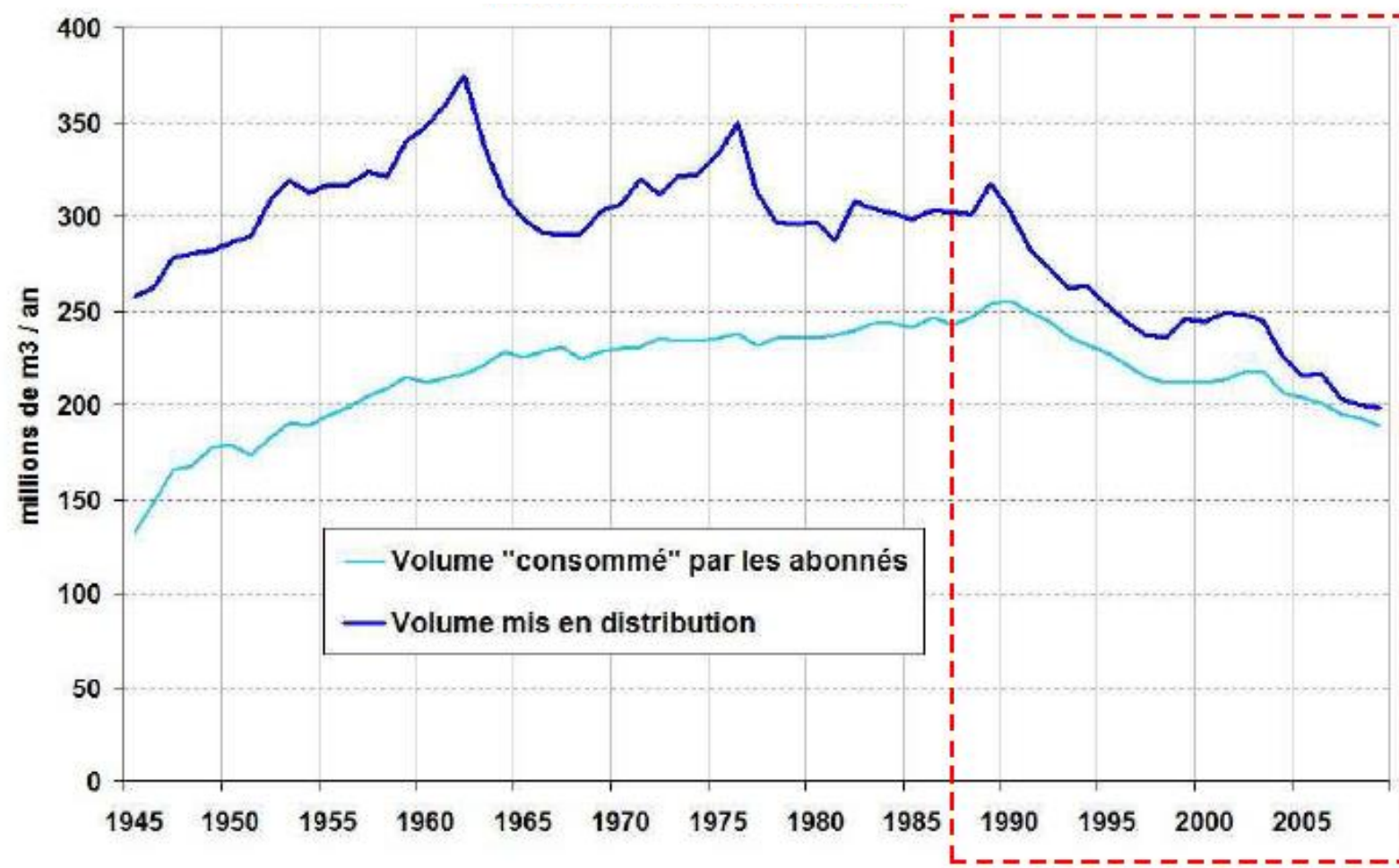
► Brussels



- Same observation than in Wallonia

Evidences elsewhere in Europe

► Paris

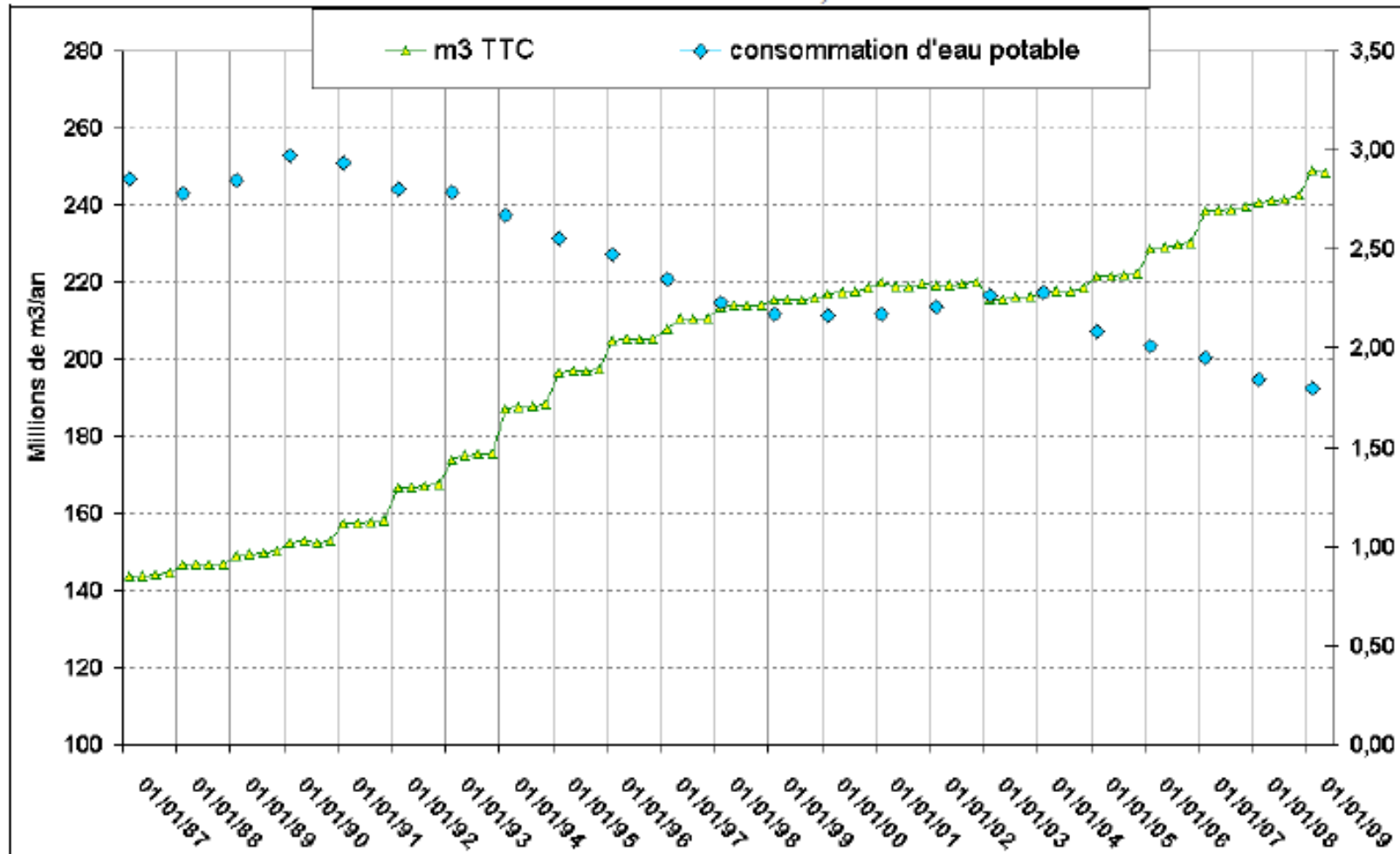


Dark blue line : volume put in distribution (X10E6 m³)

Light blue line : volume consumed by customers (X10E6 m³)

Evidences elsewhere in Europe

► Paris



Blue dots : drinking water consumption

Green dots : price per m³

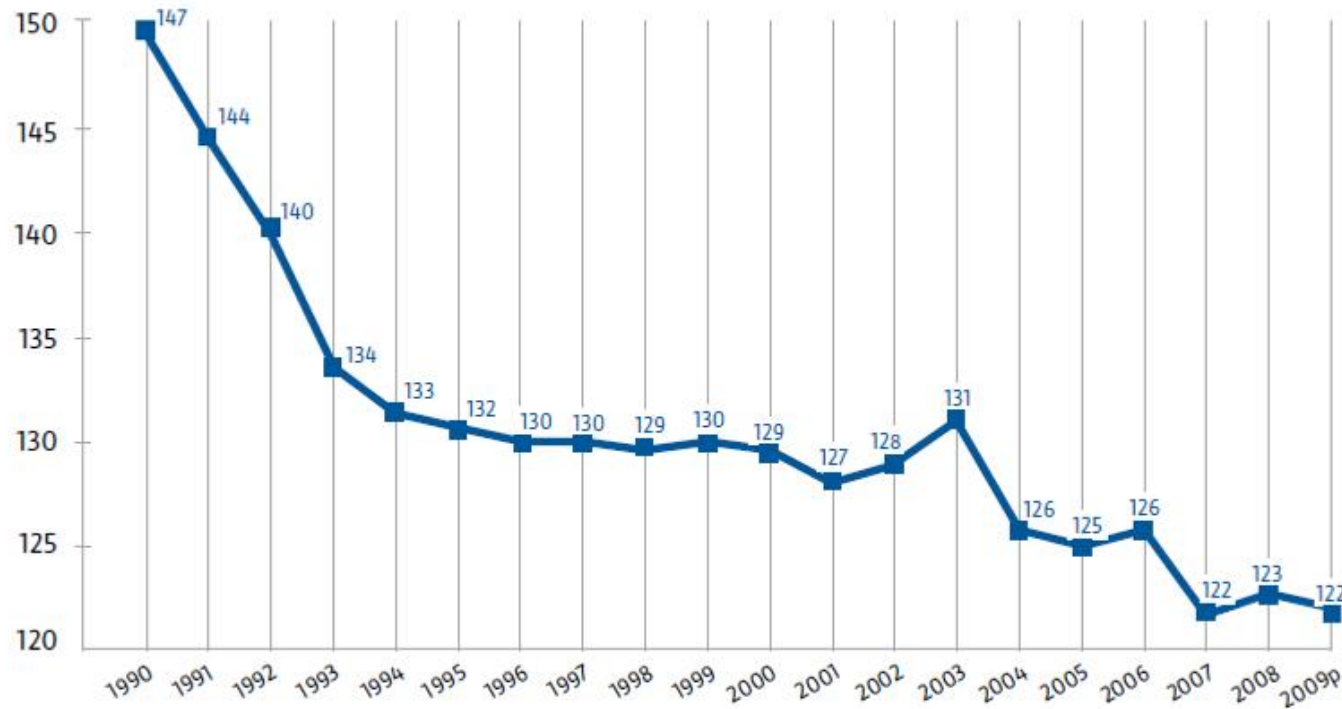
Evidences elsewhere in Europe

► Germany

Development of the per-capita water consumption

Data in litres per person and day, Germany

14



Source: BDEW Water Statistics, related to households and small trades, p = provisional

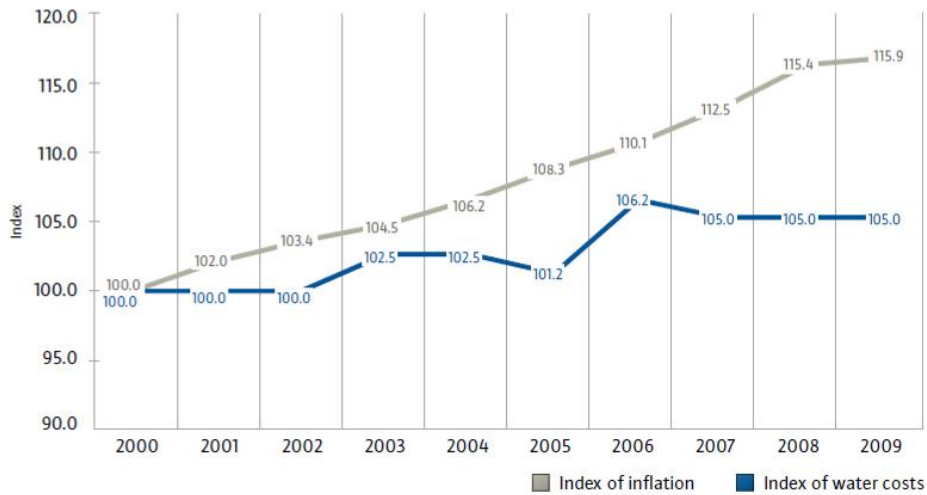
Evidences elsewhere in Europe

► Germany

Development of per capita expenditure on drinking water compared to inflation

per capita p.a., 2000 to 2009

46

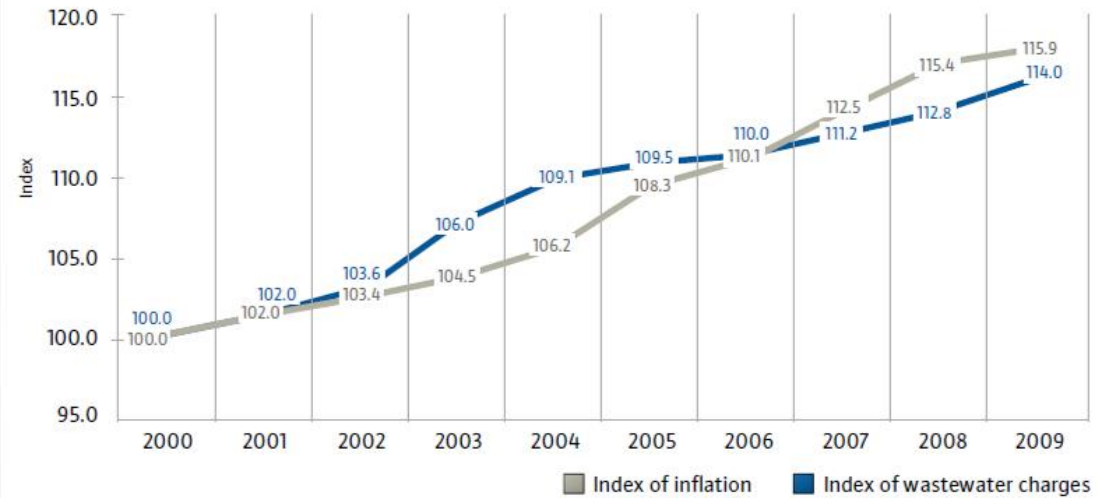


Source: BDEW, German Federal Statistical Office

Wastewater charges from 2000 to 2009 and inflation

Index (year 2000 = 100)

47

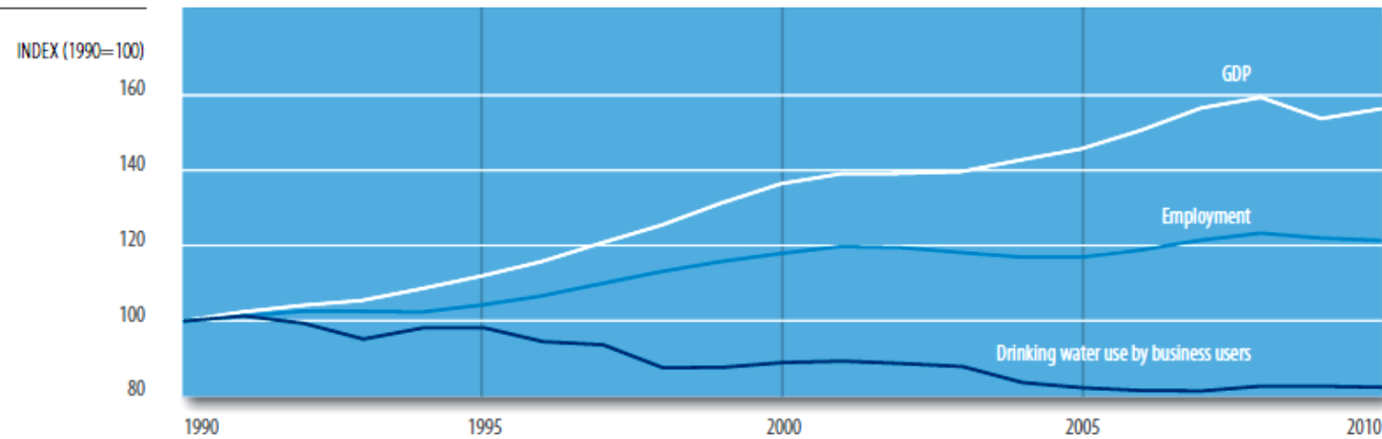


Source: German Federal Statistical Office

Evidences elsewhere in Europe

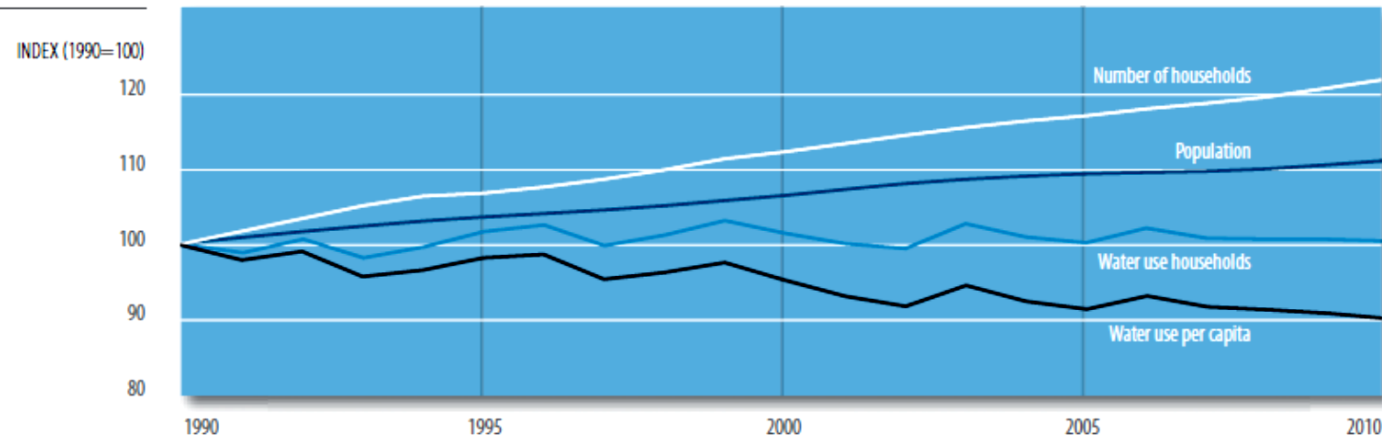
► The Netherlands

Figure 1.13 Drinking water use by business users vs. economic developments



SOURCE: Statistics Netherlands

Figure 1.14 Drinking water use by households vs. growth of population

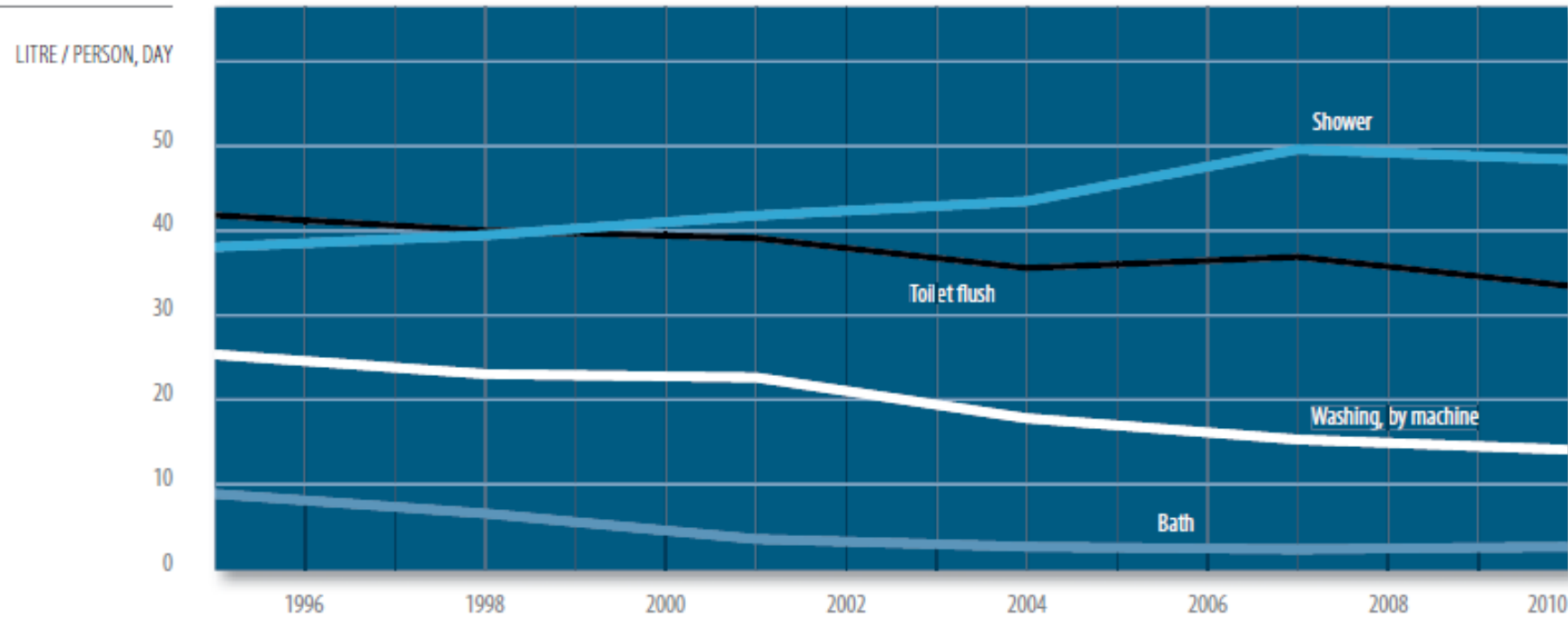


SOURCE: Statistics Netherlands

Evidences elsewhere in Europe

- ▶ The Netherlands
 - Substitution of bath by showers until 2002
 - Devices more and more water-saver

Figure 1.16 Development of household water usage by application



Evidences elsewhere in Europe

► The Netherlands

... Despite reducing tariffs ...



Why is this topic of interest

- ▶ Price of water

The fall in water consumption puts the price of water under pressure (fixed costs, variable income) and may lead to affordability problems.

- ▶ Leakages

The fall in water consumption involves a higher rate of leakage despite the fact that the state of the network stays steady.

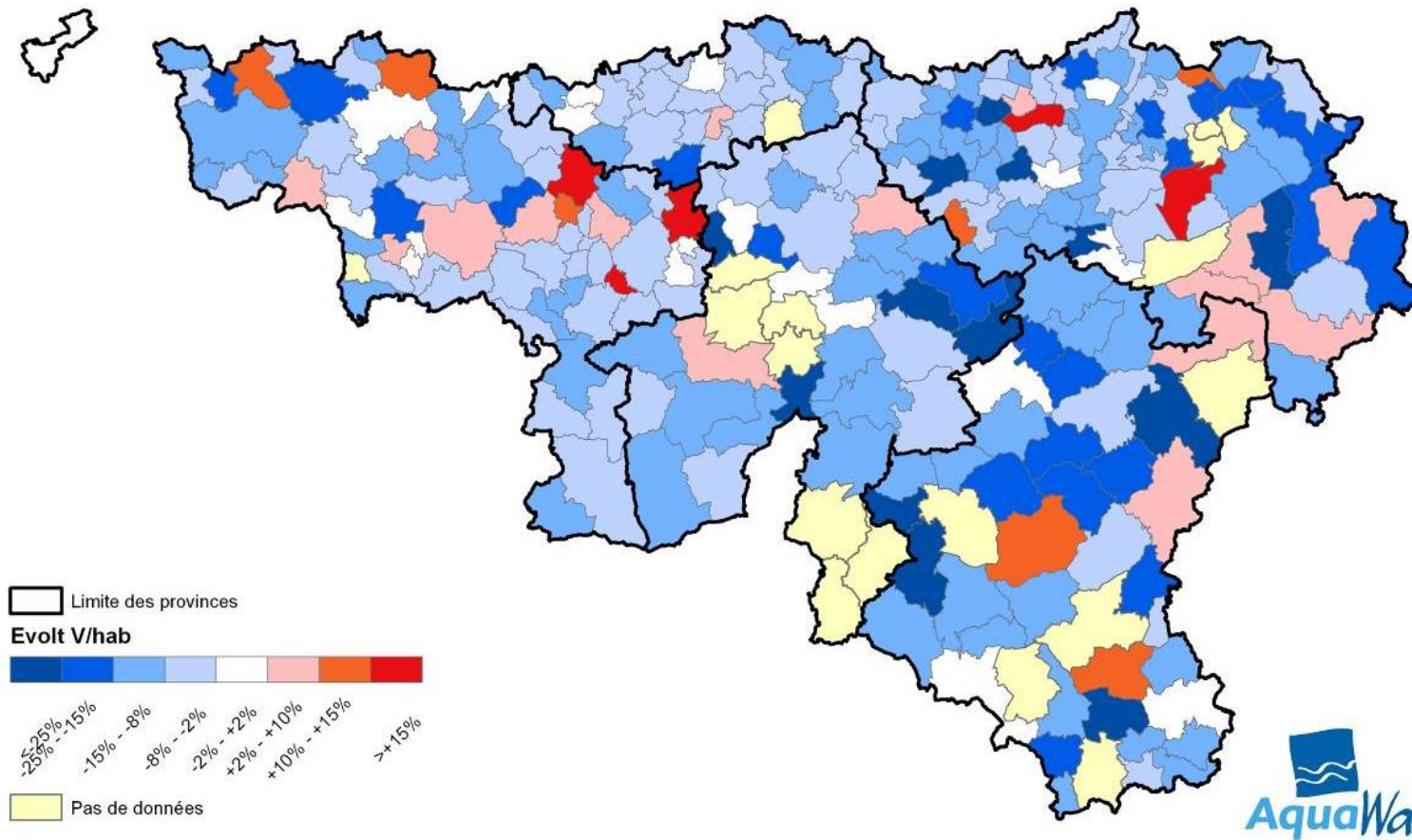
- ▶ Water quality

Fall in mains flows → increased risk of bacteriological deterioration.

- ▶ Image

Leakages ↑, price ↑, water quality ↓ → image sector ↓ ↓ especially in international comparisons based on those basic indicators.

Why is water demand falling ?

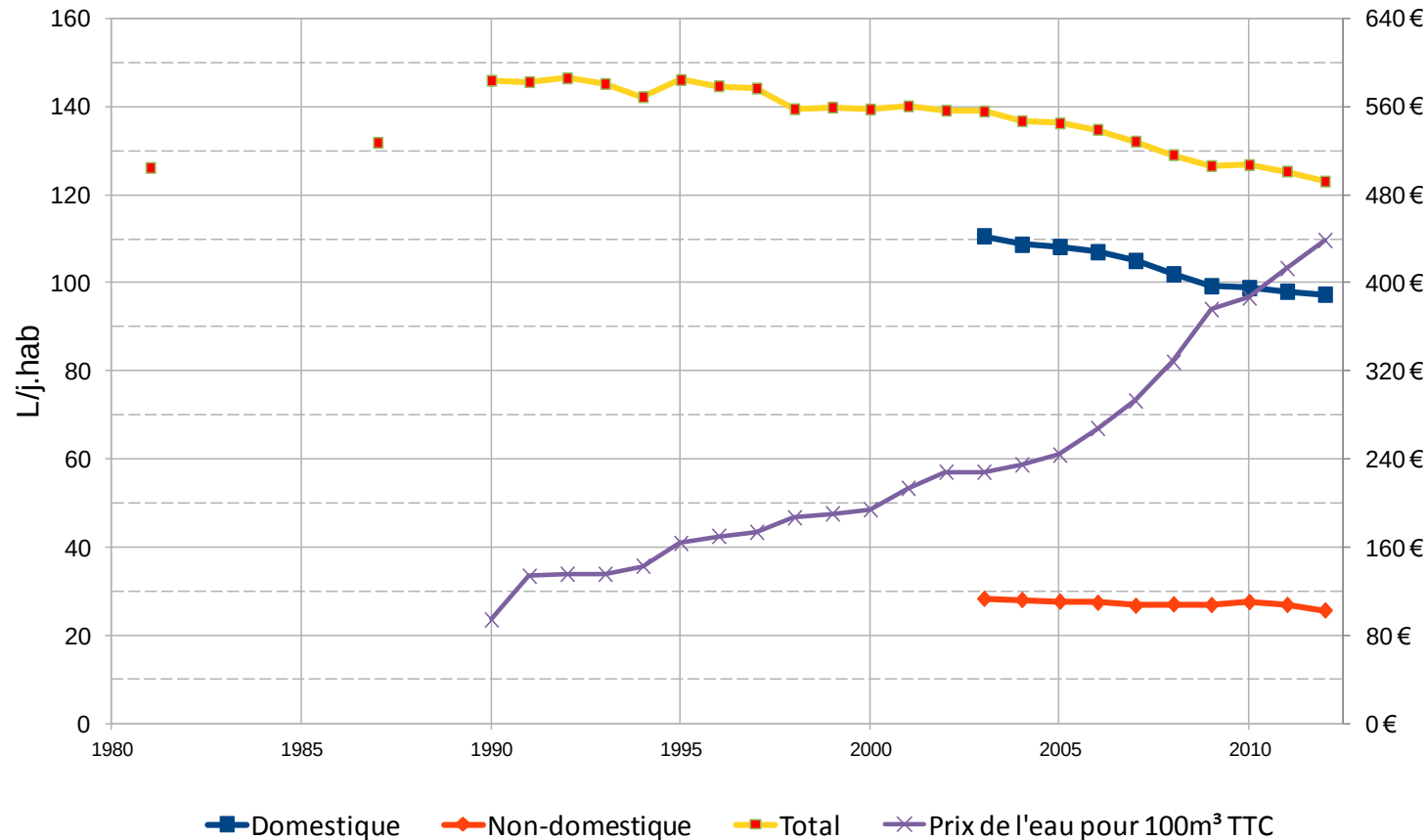


Evolution of water consumption 2004-2011 (in liters per capita per day)

- General trend
- No specific spatiality

Why is water demand falling ?

► Since when is it falling ?



Evolution of water consumption in the CILE area (in liters per capita per day)

- CILE data because of stability of supply zone for a long time
- Fall since early 90's but speeds up since 2004
- Recent decrease caused by domestic users

Why is water demand falling ?

► What kind of users is involved ?

▪ SWDE supply zone

Year	Annualized volume of 500 biggest consumers	Annualized volume of 335 recurrent consumers
2008	13.077.347 m ³	10.817.398 m ³
2009	12.460.892 m ³	10.258.787 m ³
2010	12.821.037 m ³	10.753.605 m ³
2011	12.877.829 m ³	10.826.818 m ³
2012	12.661.265 m ³	10.447.064 m ³

Year	Annualized volume of consumers exonerated from sanitation part of the bill among the 335 recurrent users	Annualized volume of consumers non-exonerated from sanitation part of the bill among the 335 recurrent users
2008	8.240.999 m ³	2.576.399 m ³
2009	7.625.697 m ³	2.633.090 m ³
2010	7.999.920 m ³	2.753.685 m ³
2011	8.115.205 m ³	2.711.612 m ³
2012	7.848.665 m ³	2.598.399 m ³

→ Small users are the cause of the observed decrease in demand (cf. also CILE data).

Why is water demand falling ?

- ▶ Analysis of the decrease in demand among small users

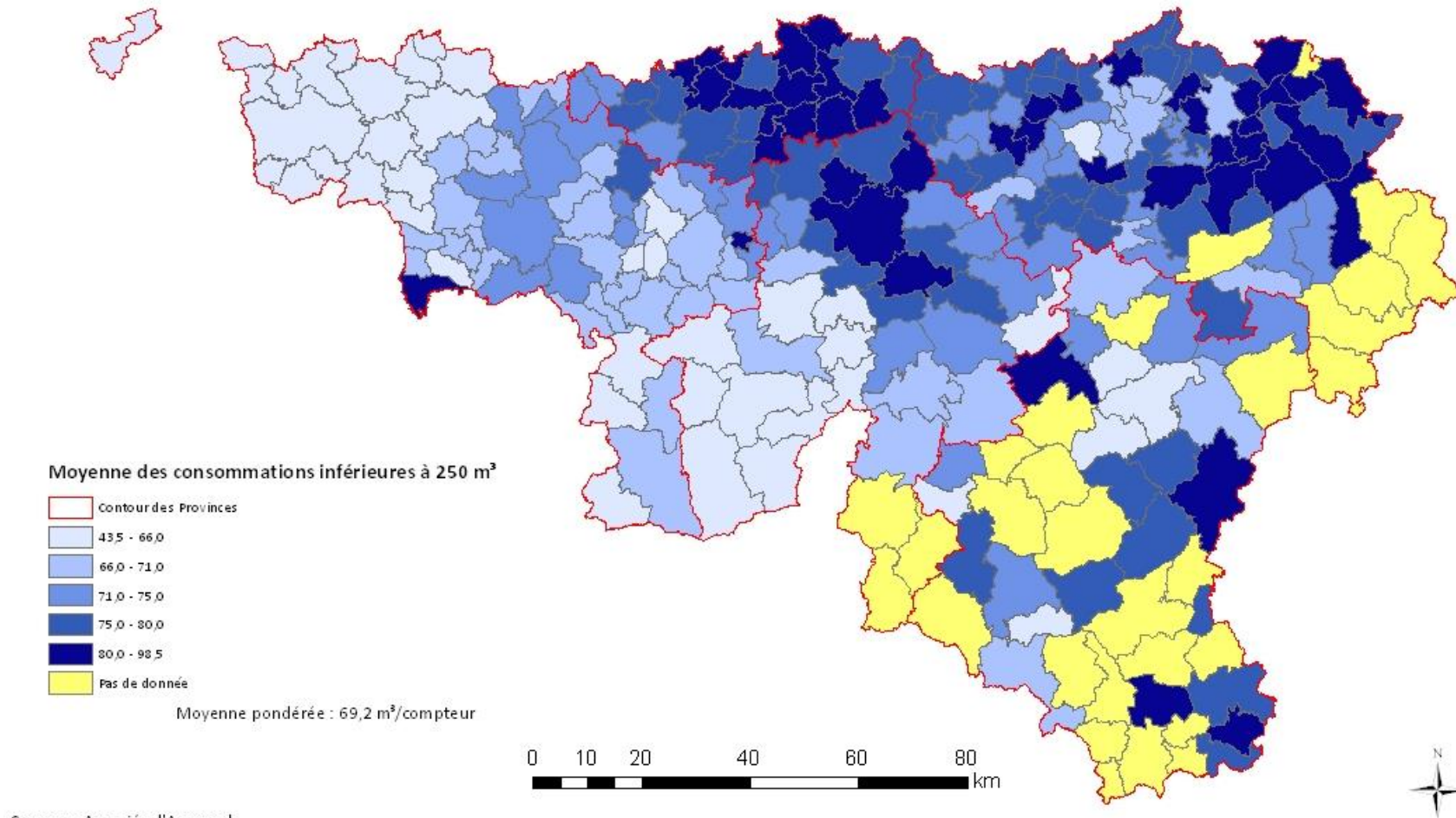
Data: volume of consumers using less than 250 m³/year

Flaws linked to these data:

- Highest consuming households fall outside the scope (but very rare)
- Inclusion of SME's (especially Very Small Enterprises)

Why is water demand falling ?

► Analysis of the fall for small users



Sources : Associés d'Aquawal
Calculs : SA Aquawal

Domestic water consumption in Wallonia - year 2011 (m³/meter)

Why is water demand falling ?

- Analysis of the fall for small users

Why this spatial pattern ?

Two factors have an influence on the spatial pattern of water consumption per capita : the presence of rainwater tanks and the socio-economic level of the population

Equation 2004 : Consumption = $-0.352 \times \text{share of rainwater tanks} + 1.377 \times \text{income per capita} + 79.304$

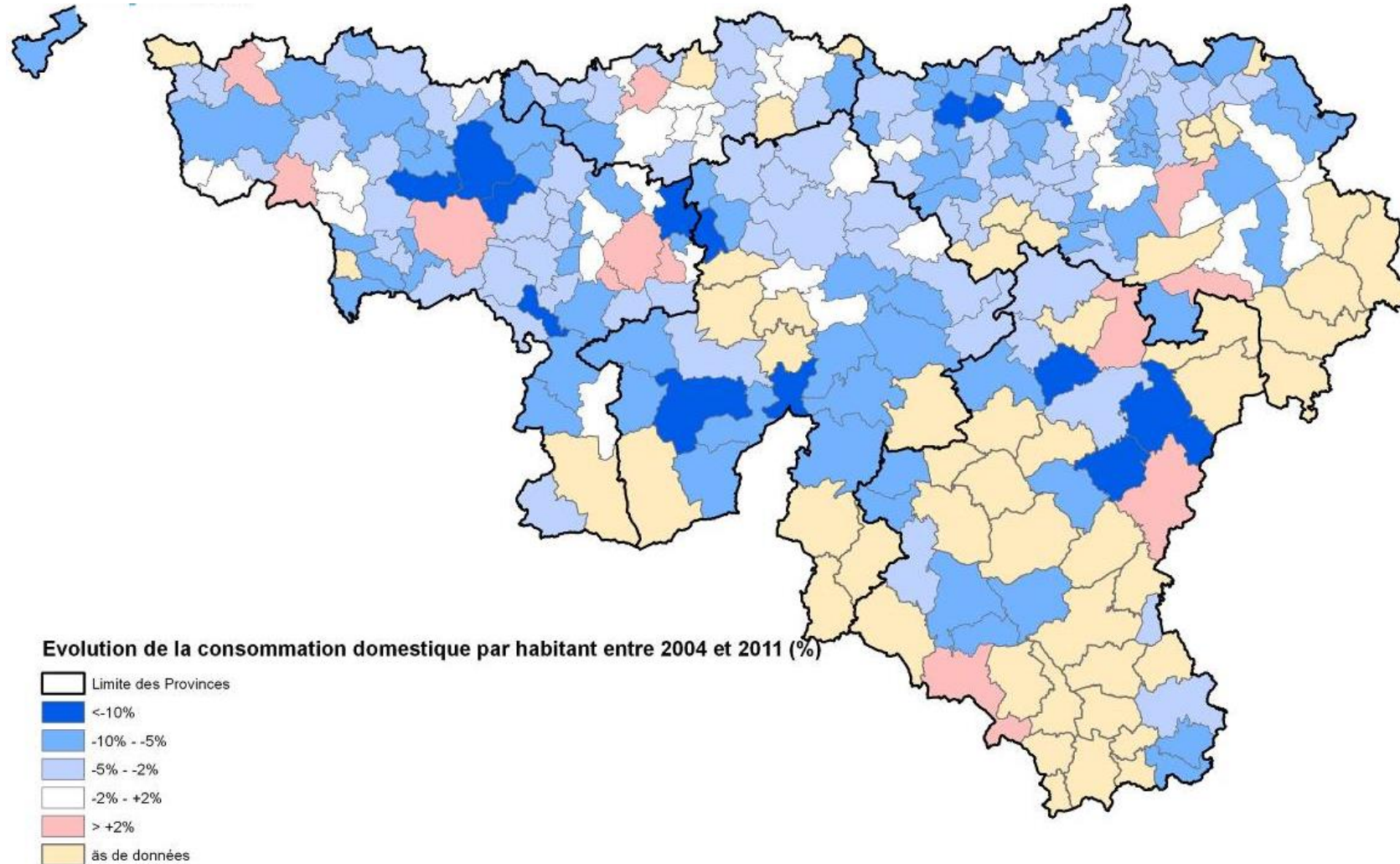
$R^2 = 0.354$, $R = 0.595$

Equation 2011 : Consumption = $-0.365 \times \text{share of rainwater tanks} + 1.417 \times \text{income per capita} + 72.225$

$R^2 = 0.435$, $R = 0.660$

Why is water demand falling ?

► Analysis of the fall for small users

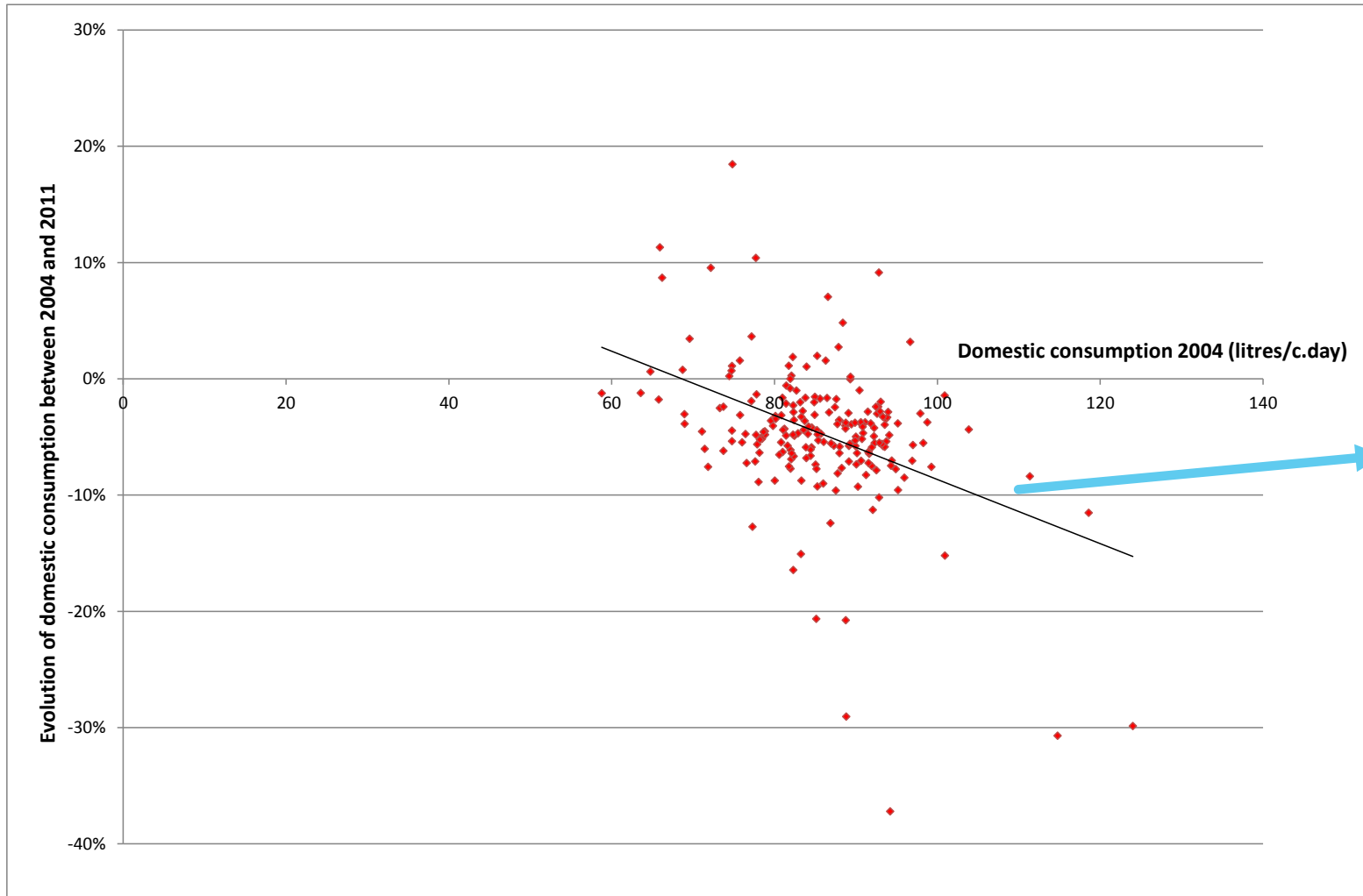


Evolution of the domestic water consumption per capita between 2004 and 2011 (%)

Why is water demand falling ?

- Analysis of the fall for small users

Catching up effect



Why is water demand falling ?

► Analysis of the fall for small users

Consumption class (liters/capita.day)	Average 2004	Average 2011	Variation (%)
<70	66,1	67,0	+1,4%
70-80	76,2	74,1	-2,8%
80-90	84,8	80,7	-4,8%
90-100	93,1	87,9	-5,6%
>100	110,6	94,0	-15,1%

Why is water demand falling ?

- Analysis of the fall for small users

Correlation between residuals (**regression 1**) and other explicative factors.

Variable	Correlation coefficient with residuals
Income per capita 2005	0,12
Evolution of per capita income 2005-2011	0,08
Evolution of the household size 2004-2011	-0,21
Share of new 4 faces dwellings	-0,07
Share of new dwellings	-0,08
Domestic water consumption in 2004	0,00

→ Low correlations

Why is water demand falling ?

- ▶ Analysis of the fall for small users

The price effect

Between 2005 and 2012 : increase of 70% of the price and decrease of per capita consumption of 7% → Apparent Price-elasticity of water demand : -0,1, twice lower than the usually admitted coefficient : -0,2.

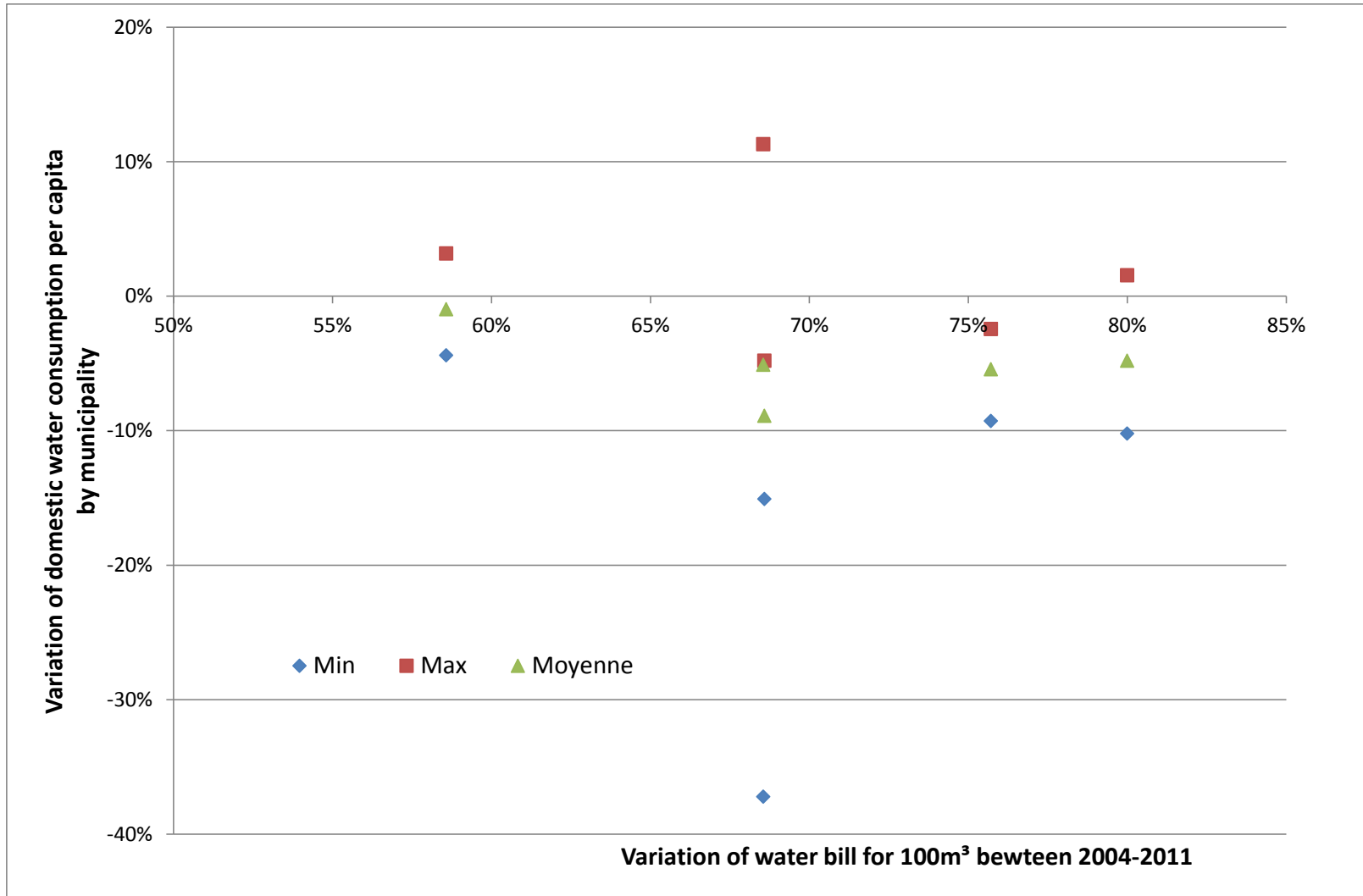
But can the price evolution have an influence on consumption ?

Arguments against this influence :

- Consumption variations are very diverse on the territory despite the quite similar price increase. Variability in a supplier zone is higher than the variability between different water supplier zones.
- Big consumers do not react in different ways following the application of the wastewater charge.
- Case of the Netherlands, Germany, Paris.

Why is water demand falling ?

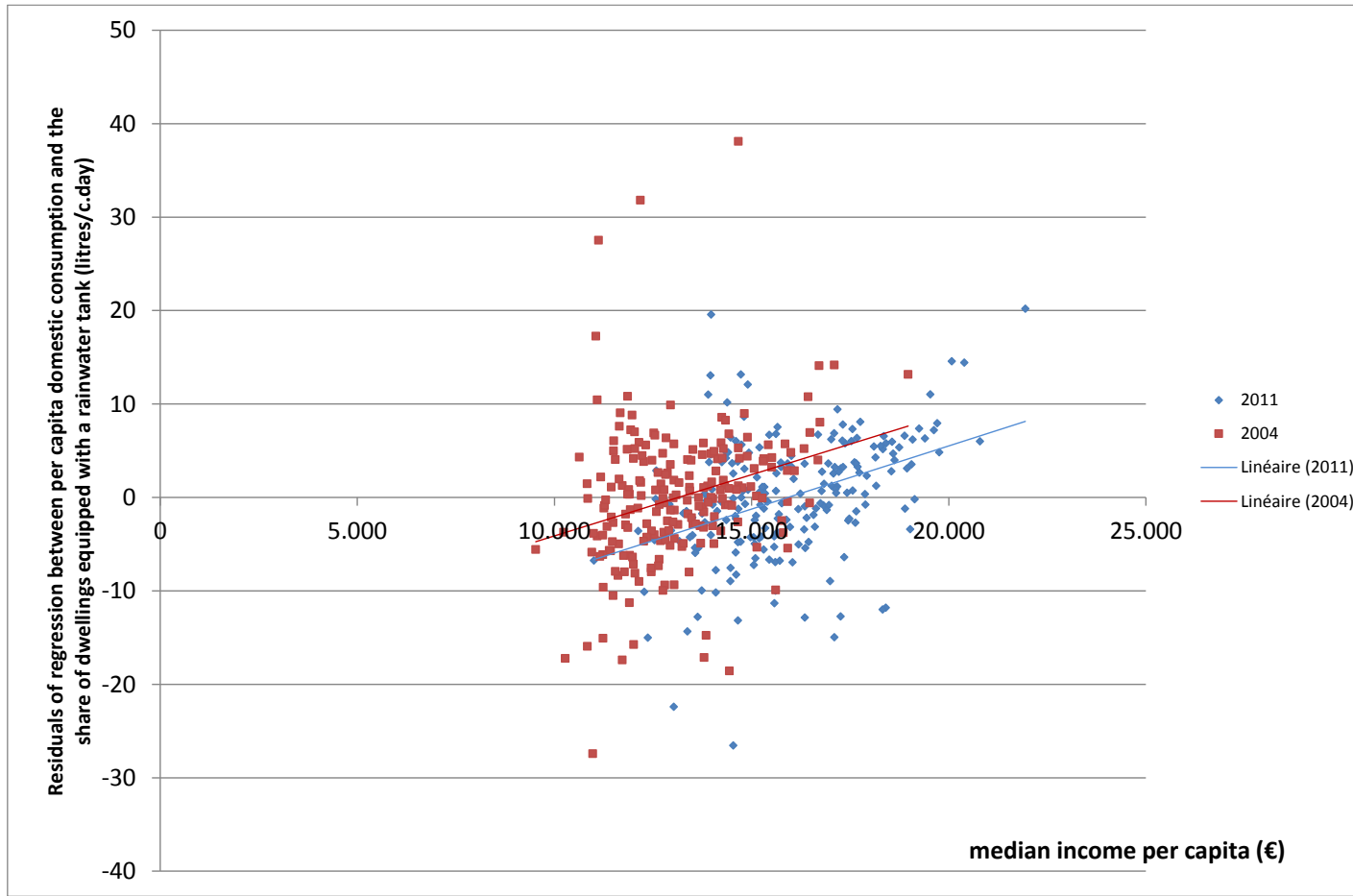
► Analysis of the fall for small users



Why is water demand falling ?

- Analysis of the fall for small users

Income effect ?



No income effect (parallel second order regressions) and non-significant first-order correlation.

Why is water demand falling ?

- ▶ Analysis of the fall for small users

Alternative water resource effect ?

- No correlation with the renewal rate for dwellings, neither with a specific type of dwellings.
- New houses built on the period represent 4.6% of 2011 dwellings. So that even if each one was equipped with a rainwater tank, the involved decrease in consumption would have been of only **7.5%**.

→ No effect dwellings/alternative water resource.

Why is water demand falling ?

- Analysis of the fall for small users

Effect of water consuming devices ?

Few data available. But several elements go in favour of this factor :

- Fall in water demand in the Netherlands :

46 | Gemiddeld watergebruik wasmachines

	1992	1995	1998	2001	2004	2007	2010
Gemiddeld aantal liters per wasbeurt	100	97	87	80,3	63,9	56,9	55,6

Evolution of average amount of water used y washing cycle 1992-2010.

58 | Gemiddelde watergebruik vaatwasmachines

	1992	1995	1998	2001	2004	2007	2010
Gemiddeld aantal liters per vaatwasbeurt	25	25	23,6	19,9	18,1	16,5	15,8

Evolution of average amount of water used by dishwashing machine cycle 1992-2010.

Why is water demand falling ?

- ▶ Analysis of the fall for small users

Effect of water consuming devices ?

- Main factor advanced by dutch and parisian studies
- Could explain the synchrone decreases in consumption oberver in several countries : markets for theses devices are at least paneuropean if not worldwide.
- Could explain heterogeneity of decrease by municipalities and the cactching up effect.

Main conclusions

- ▶ General falling trend, but more important in areas where consumption is historically high.
- ▶ This fall is generated by domestic users.
- ▶ The fall started in early 90's but speeded up since 2004 (at least in the Liege areas)
- ▶ Water price does not seem to be the determining factor of the observed decrease.
- ▶ Water consumption stays determined by the presence of rainwater tanks and the socio-economic level.
- ▶ Rainwater use does not seem to explain the observed decrease.
- ▶ The likeliest reason is the renewal of water consuming devices and the technological evolution.
- ▶ These conclusions are valid on the 2004-2011 period. Factors may evolve in the future.

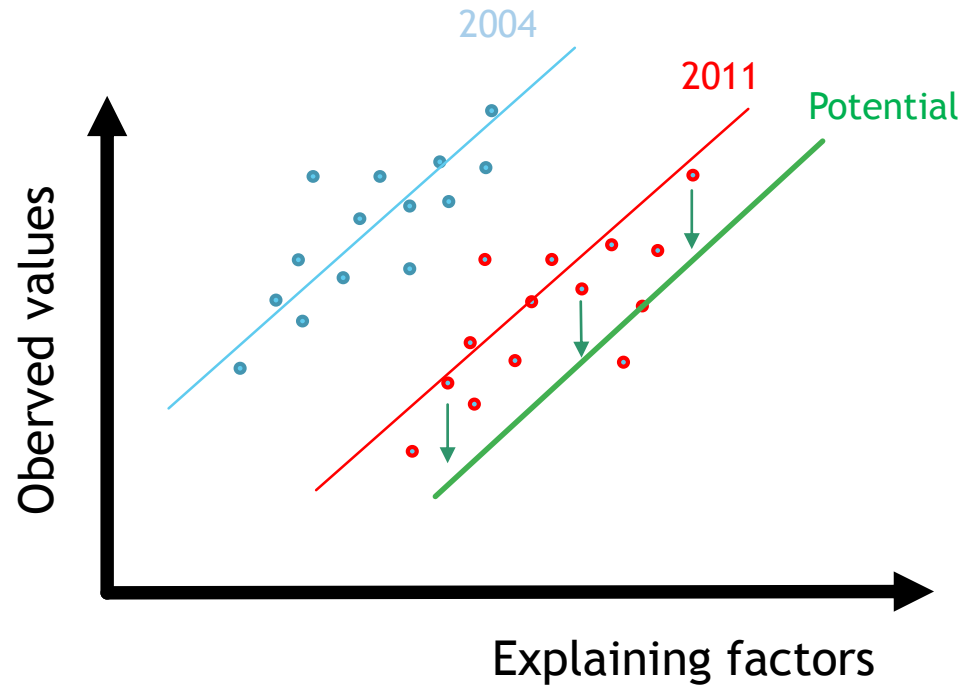
Is it likely to continue ?

- ▶ In order to assess the residual potential of decrease, we start from the evidence that :
 - Intermunicipality variabilites keep on being explained by the presence of rainwater tanks and the socio-economic level.
 - Differences compared to this model are explainable by the equipment level in water consuming devices of dwellings.

Based on these evidences, it is possible to assess the residual potential in considering that an harmonization of water consuming devices take place on the entire territory.

Statistically speaking, this can be made through an alignement of points on the regression line. The latter stays parallel to the 2004 and 2011 models but passing throuh the lowest point in the cloud (percentile 5 of residuals).

Is it likely to continue ?

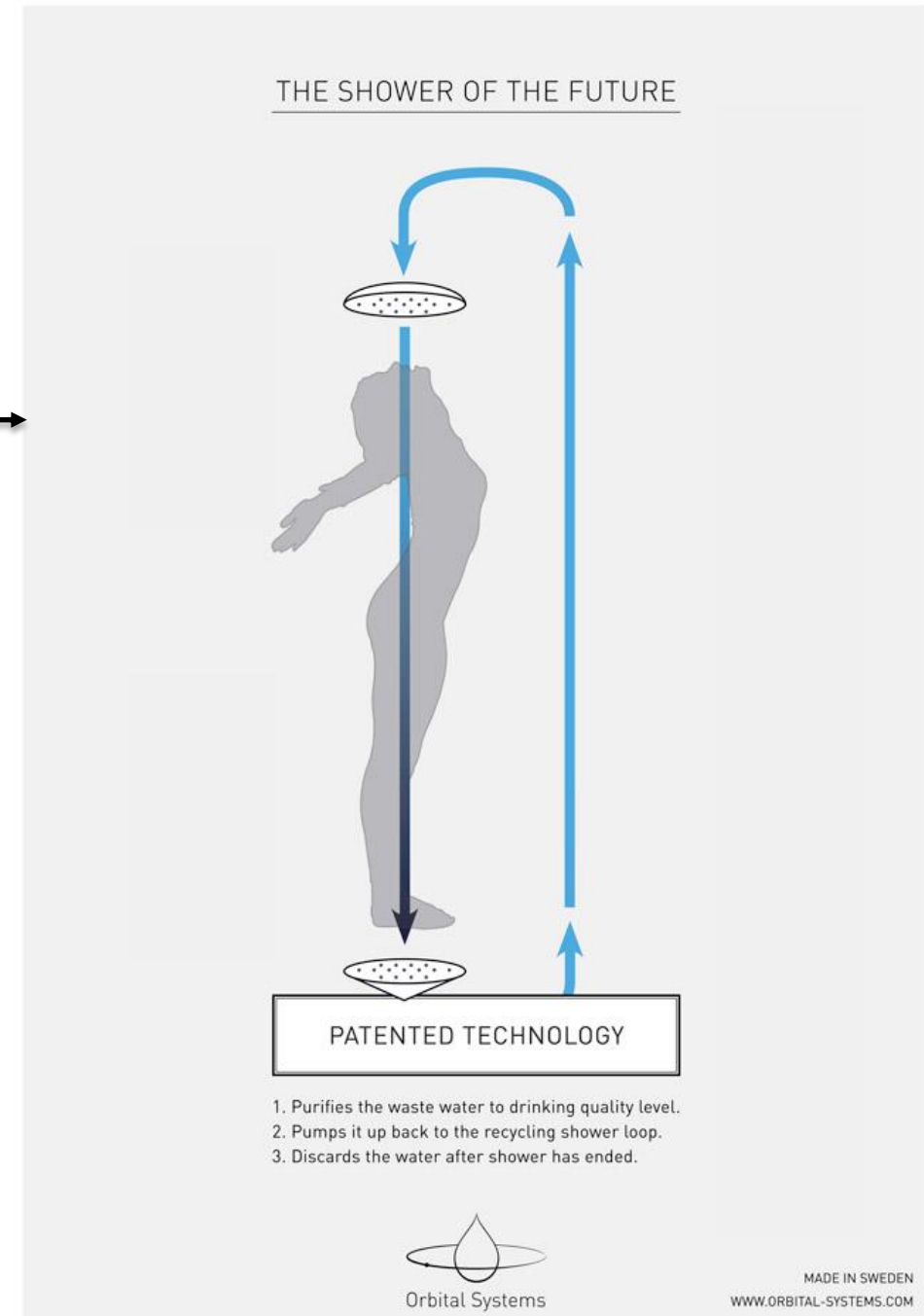


Résultat : potential decrease from 72.1 m³/meter to 64.2 m³/meter, other things being equal.
→ -10%.

This potential fall can be reinforced by the increase in alternative water resources.

Yes... but there will be a bottom level ...

- ▶ Not sure. **Example of shower under development :**
- Water is treated directly and repumped to the shower.
- The developing company considers water savings can reach 90% in water and 80% in energy.
- Already used in public baths of Malmö, Sweden.
- A lot of other examples.



Some reflexions

- The decrease potential is determined by technological evolution.
- Absence of relationship between socio-economic level has to be confirmed by a survey.
- Negative effects will have to be mitigated.
- On a longer term, water public service will have to adapt.