

Low flows' regionalization in Walloon Region

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Aims and approach of research

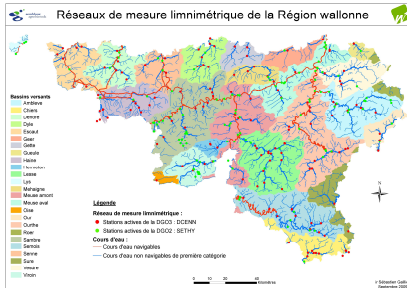
- Time-space knowledge of rivers hydrology during low flow periods based on existing monitoring network,
- Computation of low flow discharge at any point of an ungauged river.

Low flow's regionalization in Walloon Region

Data

Data come from the two public service of Wallonia's monitoring networks (DG03 - AQUALIM et DG02 - SETHY)

→ **244 potential monitoring sites**, the oldest were implanted at the beginning of the years 1960



⇒ **70 %** of the monitoring sites has a watershed area below 200 km².

Selection of the parametre defining the low flow

The **percentile 95 (Q95)** has been chosen because it allows to avoid the influence of :

- extrapolation of discharge rating curve,
- ponctual perturbations (fill up of a pond, ...),
- discharge perturbations from hydroelectric power plants.

Selection criterion of monitoring sites

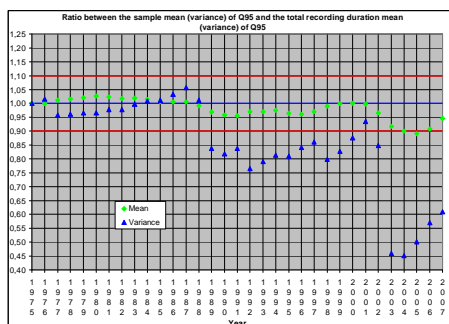
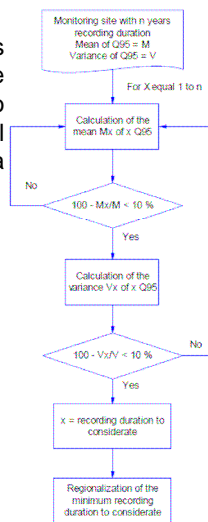
→ Recommended recording length : minimum 20 years

↳ However, in Wallonia, **more or less 60 %** of the monitoring sites has an recording duration below 20 years.

- **Low** discharge rating curve extrapolation for the low flow,
- **Any** aquatic algae development during summertime,
- **Homogeneous** data : all the low flow discharge coming from only one population in statistical terms.

Optimization of monitoring networks

The minimal number of measurement years is reached when the ratio between the sample mean and the total mean and also the ratio between the sample variance and the total variance, are both below (in absolute value) a predefined tolerance.



Low flow's frequency analysis

Low flow's frequency analysis consists of adjusting a statistical law to a sample of observations characterizing the low flow. The aim is to determine a relation between the discharge (Q) of the given return period (T) and the associated not-exceeding probability, defined by the ratio $p = 1/T$.

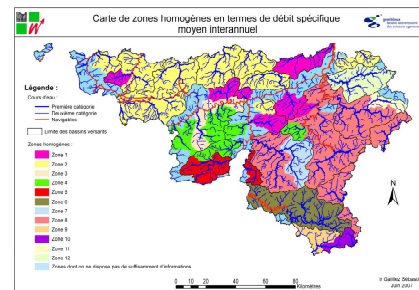
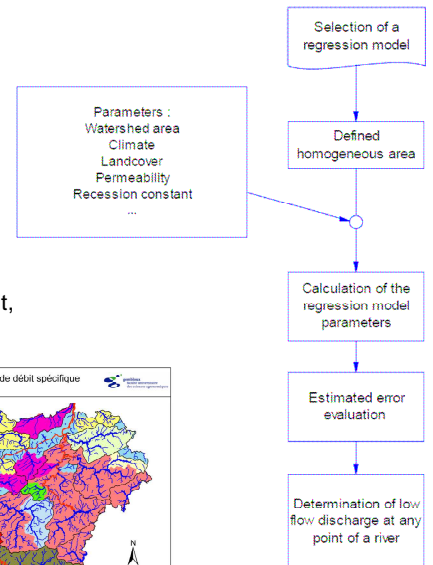
↳ The possibility of using **only one law for the whole Walloon Region** will be considered.

Low flow's Regionalization

Aim : To define homogeneous regions in discharge terms in order to manage both ungauged and gauged rivers.

Parameters used :

- Watershed mean slope,
- River mean slope,
- Drainage density,
- Previous year moisture deficit,
- ...



Use of the results

⇒ Charaterization of low flow discharge of Walloon rivers :

- Help to define instream flow at any point of a river.
- Help to manage the river :
 - Design hydroelectric power plants,
 - Conservation of aquatic habitat,
 - Abstraction of underground water,
 - Waste water rejections,
 - Swimming areas.

↳ Help to **integrated management** of rivers

⇒ Perspectives : context of **climate change**

Meteorological models forecast more important drought periods in our region for 2100.

Conclusion

Low flow characterization allows the adaptation of the delivered authorizations by the Walloon administration and so the limitation of the environmental, economical and social consequences.