Evaluation of climate changes impact on the hydrological behaviour of the peaty mediums

Application to the Haute Lesse-Ourthe area (Belgium).

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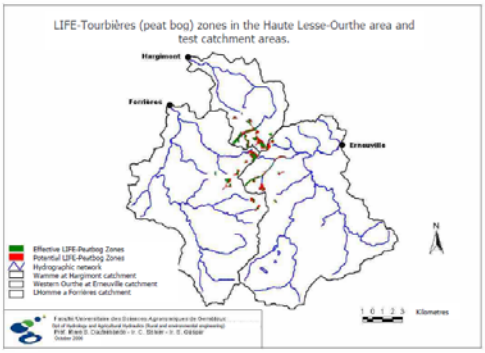
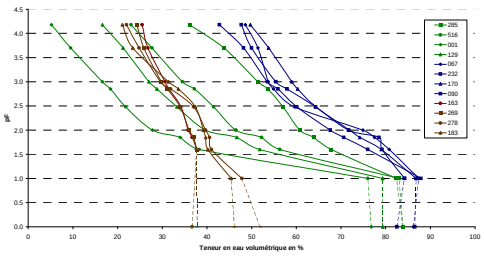
The peaty and wet mediums have a very important role to play in term of bio-diversity conservation, hydrologic pattern regulation, fauna habitat and land-scape value. In the Haute Lesse – Ourthe catchments (Saint-Hubert), num-bers of these mediums were strongly modified by a drainage network. This drainage network was implemented to permit a forestry production focussed on the Spruce. It has severely disturbed the hydrological cycle.

The study consists in modelling the impacts of restoration practices carried out notably within the framework of the LIFE European project on the hydro-logical behaviour of the peat bog. Then we modelled the effect of climate change.

Peat bog in the Haute Lesse-Ourthe sub-basins



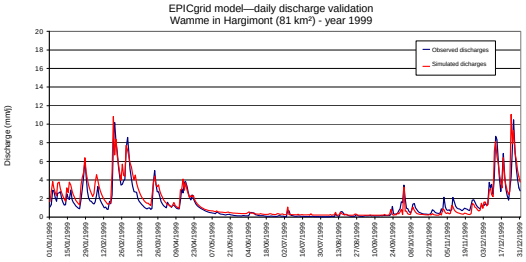
Physical properties and retention curve of peaty materials



Physical properties and retention curve of peaty materials were char-acterized on the basis of undisturbed samples using the Richards'ap-paratus.

Hydrological modelling

Calculations were carried out using the hydrological model EPICgrid (GxABT). EPICgrid is a physically based and distributed hydrological model. It runs at daily time step.
The model was initially validated on several reference catchments of the study zone.



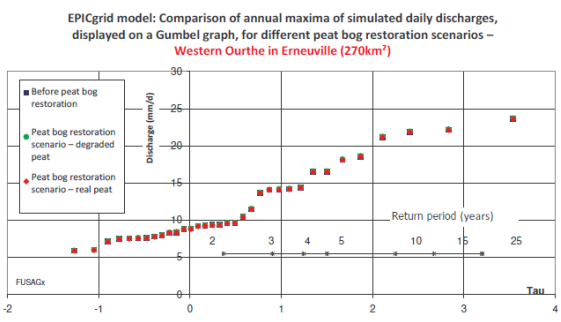
Simulations highlighted the differences in physical and hydrous prop-erties of the different peat types ("true" peat and "degraded" peat). Lo-cal and regional impacts of peat bogs restoration on their hydrological behaviour have been evaluated. Finally, simulations allowed us to evaluate climate change's impact on the hydrological behaviour of the peaty mediums. The model showed notably that future climatic condi-tions could generate severe droughts which can become critical in some situations.

Local impact of restoration measures on peat bog hydro-logy & Climate change effect

	Rain (mm)	Actual evapo-transpiration (mm)	Direct runoff (mm)	interflow (mm)	Deep percolation (mm)
Drained conifers on degraded peat (intense drainage)	1117	625	191	0	301
Echam4 2070-2100	-9%	+12%	-18%		-44%
Non drained wetland on degraded peat	1117	482	86	0	548
Echam4 2070-2100	-9%	+7%	-75%		-13%
Non drained wetland on real peat	1117	541	3	1	571
Echam4 2070-2100	-9%	-4%	-79%		-14%

The positive effect of stoppig artificial drainage of peat bogs can only be achieved if accompagnied by a restoration of the physical proper-ties of the peat and the entire peat bog system (wetland type vegeta-tion—real peat subsoil—underlying clay—topography).

Regional impact of restoration measures: extreme dis-charge analysis



On a regional level, the hydrological impact of the restoration of peat bogs in not worth considering because they covered such a small part of the surface area studied (1% of the catchments). A similar propor-tion applies to the proportion of peat bogs in the Meuse catchment area