Sustainable management of karstic areas in Wallonia

Results and prospects

The CWEPSS White Paper

Executive summary of the Ecokarst 100 - published by the CWEPSS - June 2015.

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The CWEPSS White Paper

Study and Protection of the Walloon Karst: Results and Prospects

The 100th issue of the Eco Karst bulletin details the evolution of the CWEPSS association, its demands and main actions in favor of the karst study and protection over the last 40 years.

Based on this long experience, a set of recommendations is proposed for a more sustainable management and protection of karstic areas today in Wallonia. Some of these recommendations could be transposed and applied in other karstlands in Europe and elsewhere, prompting us to produce this English executive summary.

Municipal dumping site in the Chawresse valley (1978). The site has not been rehabilitated but simply covered with soil.

Once upon a time...

Back in the early 1970's, the situation concerning karst and caves conservation in Belgium was rather gloomy. Local and regional authorities had no interest in about the karst and its vulnerability. Even its existence was sometimes totally neglected.
The CWEPSS was founded in this difficult context, by cavers, scientists and people involved in the management of karst regions, , with the primary aim of responding to threats on local limestone areas.
Initially, the association acted as a pressure group towards the authorities, in order to elicit some changes in the legislation and a better consideration for the karstic sites. The necessity of an accurate cartographic and descriptive inventory of the Walloon karst was soon considered an essential tool in assessing the values and vulnerability of karstic areas.
After having produced a first version of this inventory, the CWEPSS came up with concrete protection and management proposals , positioning itself as a partner of public authorities, while remaining critical. This independence, combined with a good local knowledge and an active network of collaborators, are the main strengths and originality of the association.

A vision for karst management

The underground environment is fascinating, rich in information, fragile but also (by definition) hidden and secret - and therefore largely unknown. To ensure its sustainable protection, the awareness of its importance and fragility must be constantly repeated and reinforced. Within its 350 actions since the 1970s, the CWEPSS has emphasized efficient communication in order to bring together a wide range of stakeholders in cave and karstland management and protection.

Current missions and actions

The CWEPSS coordinates actions and responds to requests concerning karst and groundwater issues. These requests can come from public authorities (municipalities, regional Government), associations (rivers management organisations, cavers clubs, youth organisations) NGO's busy with environmental management and protection or by karsland inhabitants.

Pedagogical animation in Oret (Mettet) during the Karst Discovery Week (June 2014).

Our caves progressively become sewers! (awareness campaign CNPSS - 1986)

CWEPSS actions devoted to karst protection

- **"Karstic depollution"** (cleaning karstic sites), conservation and site management.
- **Advice and recommendations** on land-use planning (flooding areas, waste water, karstic risks), quarry extension plans, catchment area protection, and urbanization...
- **Research projects**: biodiversity, hydrogeological studies, state of the underground environment assessment.
- **Raising public awareness** about the water cycle and particularly its underground section, the karst and the caves (excursions, lectures, exhibitions, animations).
- **Publications**: karst comprehensive survey (published by watershed unit); quarterly bulletin "Eco Karst" providing karst and underground news in Wallonia and Europe.
- **Participation** at public inquiries and impact studies on projects having potential impact on karstic areas.
- Proposals and dossiers to give **protection status** to some outstanding or threatened sites.

A vulnerable environment offering multiple interests

n Wallonia, the limestone areas cover up to 5,000 km², representing a **third of the region's territory.** 7544 phenomena related to the limestone dissolution and 315 karstic groundwater circulations are recognized. Karst is therefore an essential geological feature and an important landscape element. The touristic and ecological development linked to karst and caves is another important issue. The dissolution of limestone may also impose physical constraints on land management and local or regional development plans.

The underground environment provides a **unique environmental archive,** given the stratification of the deposits and the low impact of external disruptive elements. Walloon caves are key sites for archaeological and prehistoric deposits.

The subterranean world is also a **living environment,** containing an astonishing biodiversity symbolized for the public by bat communities. Much more discreet, but at least as interesting, is the underground invertebrate fauna, which remains poorly known. The study of subterranean biodiversity, in which several precursors have been active in Wallonia, still offers much to discover!

On the surface, calcareous soils provide interesting habitats for remarkable fauna and flora. Calcareous grasslands and rocky massifs are well represented in the protected areas (like Natura 2000), illustrating their ecological value.

The **supply of 75% of the drinking water** in Wallonia depends on karst aquifers. 370 million m3 are collected each year in these particular reservoirs, part of this water being also distributed to neighbouring regions. .

Some caves also have strong economic weight, thanks to tourism. Wallonia counts ten **show caves,** including the famous cave of Han-sur-Lesse near Rochefort: the main touristic attraction in the south of the country, attracting 200,000 visitors each year. Limestone areas also offer an interesting environment for trekking, and for a "qualitative ecotourism" based on the discovery and understanding of typical landscapes.

Finally, the **speleological interest** of the Walloon caves goes well beyond mere sport. Cave exploring in Belgium is hard and patient work... But in practice, it unfortunately happens that speleologists,

Lesser Horseshoe Bat (picture JL Gathoye).

Instead of being included in the management and protection of underground sites they have often discovered, are simply excluded and / or discredited by some scientists or institutions.

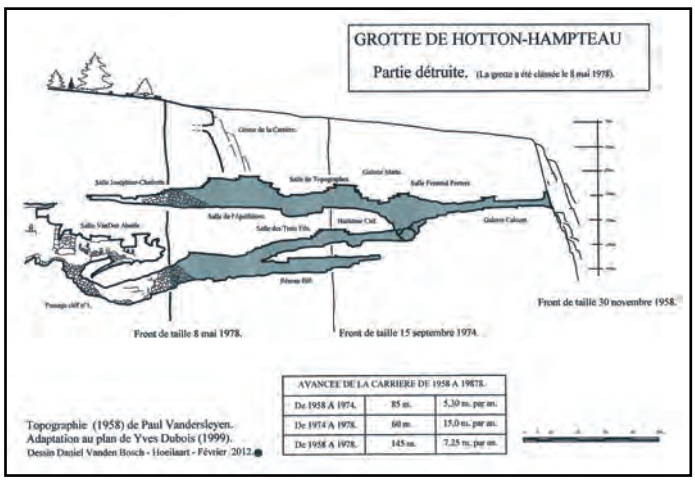
Quarry exploiting the carboniferous limestone over 7 succesive layers (Antoing -Tournai).

Some Key Actions in favour of Karst

Based on CWEPSS' campaigns and actions carried out over the last 40 years, a set of recommendations and best practices regarding the karstic areas management is detailed below, grouped according to type of activity or risk.

Karst & Quarries

- To take into consideration the presence of karstic sites prior to the delivery of mining permit. Where appropriate, specific constraints - including the limitation of exploitable areas or even refusal of the license- should be imposed by the competent authorities.
- To impose reporting of any cave discovery in their quarries by the quarrymen, to enable examination and scientific evaluation and a potential protective excavation in a reasonable time frame.



Topography of the destroyed parts of the Hotton Cave due to the progression of the quarry between 1971 and 1986.

- To include the whole watershed of remarkable karstic sites when assessing the possible impact of the creation or extension of a quarry.
- To predefine and integrate the post-mining rehabilitation program in the granting of mining licenses (with financial guarantees). Old quarries are potentially rich habitats for plants and animals

Management of Show Caves

- The management and exploitation of show caves must respect the heritage value of the site and, in particular, comply with the requirements of their protection statutes..
- To respect and apply the international recommendations for show caves for improvements, security, lighting, choice of materials, impact, monitoring visits (see specific guidelines from UIS, IUCN, International Show Cave Association).
- For a large majority of people, show caves are the only access points to the underground environment. Therefore, a high quality pedagogical project is an additional asset to strengthen the attractiveness of the site, above and beyond simple profitability concerns.
- To allow and promote caving explorations and scientific research in show caves; the results of both activities can usefully be included within the guided tour proposed to the visitors.

On a vault of the cave, important development of "Lampflora" vegetation in wthe most illuminated areas of the Remouchamps Shocave (mosses, algae and ferns).

Protection Status and Conservation of the Underground Heritage

The granting of protection status (theoretically) protects any remarkable area from depredation. In fact, as strict as they are, these statutes when applied to karst are not sufficient to ensure long term conservation of the karstic heritage. They often lack specific and appropriate management measures, taking into consideration the karst intrinsic vulnerability . Therefore we advocate :

- The classification of the most remarkable sites not yet protected (Han-sur-Lesse, the "Noû Bleû" in Sprimont, the "Grotte de l'Isbelle" in Hotton, the "Fosse aux Ours" in Rochefort, the "Grotte-mine de Vaulx-sous-Olne"…).
- The enforcement of specific measures of the underground sites and their hydrogeological basins that are comprised within vast areas under protection (Natura 2000, natural reserves, natural parks, Geopark...).
- The inclusion in the classification decrees of items appropriate to the particularity and vulnerability of karstic sites.
- The establishment of effective and multidisciplinary management of CSIS (Caves of Scientific Interest, a specific protection status dedicated to Walloon caves), as initially planned, including the promotion of research, systematic monitoring and integration of local cavers within the management teams.
- The proposal of a protection mode for caves, not being systematically accompanied by gating and denial of access;
- The gradual bridging of the lack of data on underground ecosystems through specific studies, accompanied by a continuous monitoring in order to characterize underground habitats

Path in the Nou Bleu cave delimitated by a markup to protect the speleothems (photo G. Rochez).

Protection of Minerals and Speleothems

- To prohibit any trade, sale or barter of speleothems. This flourishing market (especially in mineral fairs) increases the risk of looting minerals in cave and quarries.
- In ornamented and concretion-rich galleries, to delineate paths with adequate marking, not only to protect the crystallisations, but also the clay formations and different types of filling.
- To favour prevention to curative solutions: cleaning operations can restore sites contaminated by overcrowding , but are difficult and expensive methods compared to a suitable initial protection.

Pollution and contaminated Sites in Karstic Areas

- To keep up-to-date the pollution inventories within karstic areas (Pollukarst).
- To maintain the good condition of cleaned-up sites; even small amounts of rubbish (dumped at the roadside for example) invariably lead to futher illegal dumping.
- To stop direct pollutant discharges into sink points within karstic areas (mainly sewers and drains from major roads).
- To give priority to waste water treatment in karstic areas, taking into consideration the drinking water catchment.

The former quarry of Sources Castle (Onhaye) was used as a municipal dump ... it illegal dumping of waste continues in 2011.

- To select the sites to be rehabilitated as a priority, depending on the pollution impact on the (upstream or downstream) environment.
- To include the cleaning up of the karst phenomena in "clean rivers" operations, coordinated by the “river contracts” with the help of the population (strong educational impact)

Sensibilisation & Information

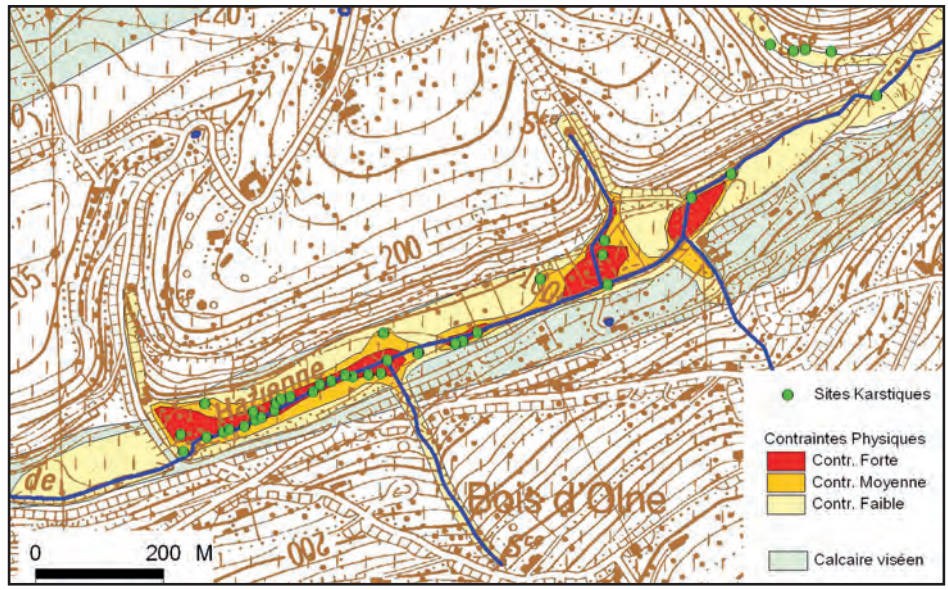
- To extend the "karstic weeks" initiatives, with the creation of karst discovery modules adapted to the municipalities located in limestone areas.

School activities illustrating the path followed by water in the basement.

- To continue spreading information and raising awareness concerning karst with local authorities (particularly the "Plan Communal de Développement de la Nature").
- To create karst discovery trails (with maps and description), allowing people to visit the area on their own. These "Karstoguides" could be distributed through tourist offices and any local structure promoting ecotourism, leading to a better understanding of landscape and geology.
- To increase the scientific and educational level of the visits and explanations given during show cave tours. Upgrading discourse, with the help of scientists and specialists, globally improves the understanding of karst-linked issues.

Land-use Development

- To enforce the requirements of flood zones and constraint zones when issuing land-use planning permits. To prohibit filling cave entrances or sinkholes without explicit license.
- To update mapping of karst constraint areas, taking into account the karst dynamics and newly discovered sites (periodic updates).
- To pursue the continuous updating of the “Atlas du Karst Wallon”, to promote its dissemination and a more systematic use when granting land-use permits.



Review of physical stress areas (karst and floods) including recent observations in the Hazienne Valley (Olne) - CWEPSS, 2012.

Groundwater Studies and Understanding

- To accelerate the designation of protection zones in calcareous groundwater catchments areas.
- To promote collective water treatment in sensitive limestone areas (rather than individual treatment).
- To continue and expand long-term monitoring of certain important resurgences in Wallonia

Sewer pipe flowing just meters from Xhendelesse swallowhole, in a private property (photo F. Polrot, 2014).

- To better understand and measure the karstic sites impact on the quality and vulnerability of groundwater aquifers (direct links between surface / groundwater).
- To monitor and maintain the water pipes network, their leakage being one of the main causes of sag risks.
- To protect in the most effective way the karstic aquifers, taking into account the specifi nature of their recharge
- To adopt a sustainable and lasting strategy for groundwater exploitation, which must be qualitatively and quantitatively sound even in the long term.
- To intensify contacts and agreements between neighbouring local, regional or even cross-border entities, in order to manage the groundwater resources at the scale of aquifers and their recharge zone.

Plecotus oritus *in flight in the Picot cave (photo G. Deflandre).*

Bat Protection

- To continue the bat population survey in order to understand its dynamics and confirm the slight increase observed in recent years. Their protection should not only focus on underground sites, but on all important natural and artificial habitats for the conservation of these mammals.
- To enhance the use of new detection techniques to assess the passages between the caves and the outside in order to gain insights into the underground sites importance for bat conservation and ethological information.
- Bat protectors should keep other subterranean stakeholders better informed of the aim of their studies in order to justify some gating and access restrictions.
- To more systematically include cavers in the bat population survey and monitoring initiatives (as is now the case in a growing number of sites).

Groundwater Biodiversity and Conservation

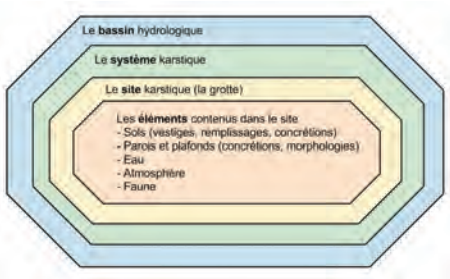
- To enforce the recommendations for groundwater biodiversity conservation formulated after the European study Pascalis (2001-2004), in order to contribute effectively to a better understanding and protection of this specific biodiversity.
- To integrate the groundwater ecosystems and biodiversity conservation in the different European legislations and policies.
- To establish a list of priority species and habitats for conservation at European, national and regional levels.
- To develop and maintain an European network of groundwater nature reserves.
- To introduce biodiversity concern and “good ecological status” of groundwater in the Water Framework Directive, as is the case for surface water..
- To increase scientific knowledge of the groundwater ecosystems, biodiversity nature and distribution, and the ecofunctional services (self-purification) it provides

Niphargus schellenbergi. *This amphipod is fairly widely distributed in Europe (photo F. Fiers).*

Perspectives and Recommandations

A delicate equilibrium

The underground environment is often described as stable, without seasonal or daily variations and unchanging physical conditions. Yet, far from being isolated, this ecosystem is in continuous interaction with the outside. Any major change in the exchanges between surface, soil and underground, can upset this balance and modify a cave environment, sometimes irreversibly.



The karst system represented as rushian dolls

A wide range of human actors, with multiple objectives, sometimes antithetic (cavers, scientists, quarry operators, tourism managers, conservationists ...), can have a more or less direct incidence on the "health" of a grotto.

Other activities with more diffuse influence should not be neglected; when applied at the scale of catchment areas, they can induce significant cumulative effects.

These diffuse impacts are difficult to quantify and to control. Therefore, conservation policies are often limited to local very restrictive measures, such as forbidding any access. The sustainable management of karst areas should however include recommendations in terms of land management, good agricultural practices, sewage water purification or soil waterproofing . The Natura 2000 network or the Geopark projects covering vast territories might contribute to the achievement of such integrated management.

Managing karst at different scales

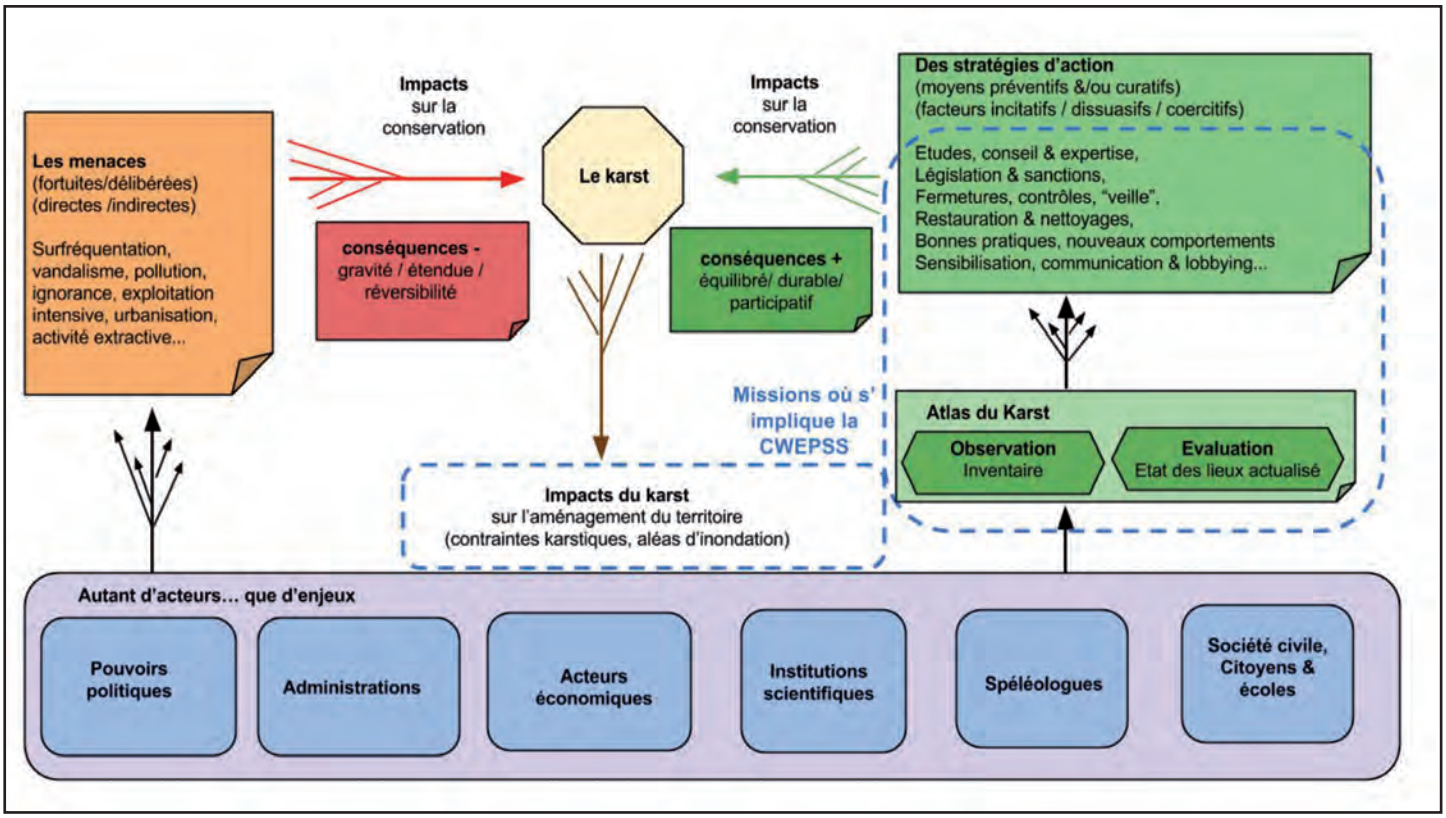
The karstic environment operates as a series of nested levels, from the smallest filling materials to a wide groundwater basin. Protecting one feature in a cave, a species or even a waterpool, iinvolves a knowledge and respect of the balances, exchanges and interactions between these different levels.

The "underground world" is not limited to caves accessible to man: a vast network of cracks extends from the surface to the aquifers. The limestone landscapes include surface phenomena (sinkholes, collapses, resurgences, paleokarsts...), connecting directly the underground network with the surface and with potentially harmful activities outside.

karstic void developed on a geological break and containing clay filling.

Human and Karst interactions

The inherent vulnerability of karst requires appropriate protective measures to limit the possible impact of human activities. In return, karst can induce a series of constraints on man and urbanization, including the threats posed by the karst dynamics on land-use. To study this two-way relationship, mapping associated with a regular update of the karstic sites survey allows the definition of "preventive" strategies (information, awareness, setting protection status...) or "curative" measures (cleaning and remediation activities).



Synthetic diagram showing the different actors and some of the interractions governing the right balance of the underground environment that should be taken into account to define the priorities and means of action for the protection of the karst environment.

Goscinny vision of Human - Karst relation

Hydrogeological studies show how difficult it is to model a karstic aquifer or environment. Each karstic system is shaped by individual variables, that only field surveys, appropriate testing and follow-up time can takle. The same data are needed when it comes to defining the protection measures for the most remarkable cavities.

The "good management practices" must also be accompanied by monitoring, in order to evaluate and eventually adjust the protocols, according to the "reactions" of the cavity to its management plan.

Upcoming Actions

Based on its karst comprehensive survey, its contacts among cavers, scientists, private actors or public authorities, and its experience accumulated over 40 years, the CWEPSS wishes to continue promoting **interaction between stakeholders**, with the vision of a multidisciplinary management for karstic areas and caves. To fulfill this goal, the CWEPSS will develop the following missions in the future:

- To work at the **visibility of this widely unknown environment**. Mentalities, socio-economic context and issues have evolved since the 1970's, but the motto is still valid. New media and technology tools (video, web, WebGIS...) allow the presentation of the karst to a wider public, particularly by (virtually) opening up sites otherwise too fragile or too difficult to access.
- To **update karstic data** to highlight the rapid evolution of karstic landscape and sites. Powerful tools exist to valorize the field data and accurately document the sites.
- To contribute to the **recognition of the key-role played by cavers** and "field partners" in the discovery, study and protection of karst. In a context of economical crisis, in which environmental concerns often take second place, and being aware of the limited public resources, the CWEPSS supports a pragmatic vision that seeks a partial transfer of the karst management to its local stakeholders (in particular, speleologists).
- To facilitate **synergies among researchers** and local associations. Making the most of the specific skills of the various stakeholders and promoting the exchange of practices, in order to propose management methods most suited to sustainably protect karstic features.