

Integrating the principle of ecological connectivity in SCOTs (local development plans in France) Analysis of 21 SCOTs

What conclusions may be drawn from the establishment of the National ecological network? Analysis of SCOTs, one of the primary tools in setting up ecological networks, reveals a number of the major, current developments.

One of the major causes of biodiversity loss is the destruction of habitats due to development work and the resulting ecosystem fragmentation (Millennium Ecosystem Assessment, 2005). One of the main measures approved by the Grenelle environmental agreement is a project to set up ecological networks on local, regional and national scales and spanning the entire country. The goal is to preserve and restore ecological connectivity required for species movement. The project comprises two key components, core areas (the main habitat of species) and ecological corridors (passage zones allowing species movement between core areas).

The Grenelle II law establishes a three-level system. The national guidelines for the preservation and restoration of ecological connectivity (level 1) will be binding for the regional ecological-connectivity plans (SRCE) (level 2), which lay out and map the ecological network on the regional scale. Towns and intercommunal structures (level 3) will have to integrate the SRCE in their zoning documents.

Established by the SRU (urban renewal and solidarity) law voted on 13 December 2000 to replace the previous urbanisation and development plans (SDAU), SCOTs are land-planning documents covering several towns or established groups of towns. They set public policy governing land planning in a balance between urban, industrial, tourism, agricultural and natural zones (articles L. 110 and L. 121-1 of the Urban code). SCOT regulations are laid out by the Urban code in article L. 122-1 and following. A SCOT comprises three documents:

- the introductory report, itself made up of three parts, a general territorial diagnosis, the initial environmental status report (EIE) and an environmental assessment;
- the planning and sustainable-development project (PADD), a document presenting the main guidelines for

territorial development, in compliance with the principles of sustainable development;

- the general guidelines document (DOG) which contains all the necessary regulations and recommendations to achieve the PADD goals. The PADD is the only binding document for local urbanisation plans (PLU), older urbanisation documents (POS) and communal maps.

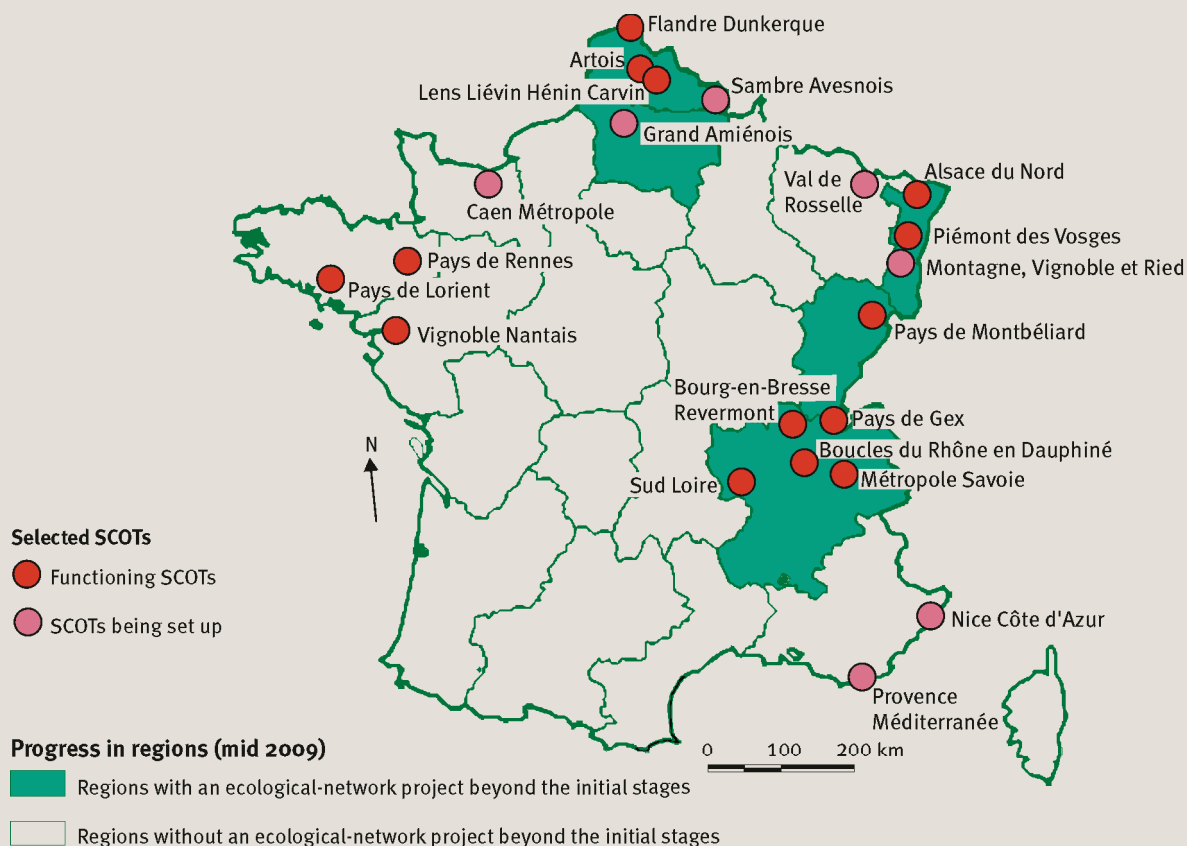
SCOTs represent an intermediate level between regions and towns, and play an important role in setting up the ecological network. The Grenelle II law modified the Urban code in that it sets new goals for SCOTs. Article L. 122-1-12 states that "SCOTs, when they exist, shall take into account¹ the SRCE" and article L. 122-1-5 stipulates that the DOG of a SCOT "indicates the areas and natural, agricultural, forest and urban zones to be protected. It may indicate a location or set limits to an area. It indicates the protection measures for zones required to maintain biodiversity and preserve or restore the good status of ecological continuities."

In studying the 21 SCOTs², the Cemagref team in Montpellier focussed on the methods used to map an ecological network on the SCOT scale. It also studied how the topic was integrated in the PADDs and DOGs, as well as the participative processes set up to encourage support for the project by local socio-economic stakeholders.

1. The obligation to "take into account" is not very precise, but it is certain, having been confirmed by legal decisions and administrative doctrine. The instructions dated 25 October 1984 concerning checks on the legality of zoning documents indicate that non compliance with the obligation may be considered a clear error. The notion was clarified in 2004 by the highest administrative court when it wrote that "the obligation to take into account means compliance, unless a waiver is granted for clear reasons, subject to an in-depth check by the judge" (Jacquot, 2005).

2. This study was carried out for the Ecology ministry in the framework of the ecological-network operational committee.

❶ The 21 selected SCOTs and regions with ecological-network projects beyond the initial stages.



Gathering feedback from SCOTs on the topic of ecological connectivity

Selection and analysis of relevant SCOTs

The team contacted regional environmental, planning and housing agencies (DREAL) and regional councils to identify SCOTs that had already worked on ecological networks.

The analysed SCOTs included some recently established and others still in the process. A rapid scan of the documents looking for key words (biodiversity, corridors, ecological connectivity, green links, ecological network, etc.) served to select 21 SCOTs that had adopted an ecological-network project and for which the environmental assessment was sufficiently complete and contained maps (see figure ❶).

It became clear that the territorial context of the SCOT and its land use had a major influence on environmental issues. The problems of ecological connectivity were perceived as much more pressing in areas heavily impacted by human activities than in primarily rural, less fragmented areas. In order to integrate diverse territorial contexts, land use and demographic factors were also taken into account in selecting the SCOTs.

In-depth analysis of the 21 SCOTs served to detect how ecological connectivity was taken into account. Follow-up interviews (meetings or by telephone) with local boards, design offices or urban agencies in charge of drafting the SCOTs dealt with the methods used to map out ecological networks, the participative efforts and implementation conditions.

The study also looked at the consistency between the assessment in the introductory report on the one hand and the PADD guidelines and DOG regulations and recommendations on the other.

Ecological-connectivity mapping methods in the studied SCOTs

The most recent SCOTs anticipated on the new guidelines set by the law. Other SCOTs, not yet approved, are now modifying their DOG to include preservation of ecological connectivity.

Ecological-network issues in SCOTs

SCOTs identify (map) ecological continuities above all in view of preserving biodiversity. However, the actual goals are quite varied, ranging from vague and imprecise objectives to strong preservation efforts for certain types of habitat or species.

► In most of the SCOTs studied, acknowledgement of biodiversity loss via the ecological network is coupled with issues much more directly related to the population and its activities, for which local stakeholders and elected officials generally show greater concern. This combination of issues makes clear the multifunctionality of ecological-network zones (flood protection, amenities, core areas, etc.), which in turn makes it easier to propose restrictions on urbanisation than by simply invoking biodiversity preservation.

The most commonly mentioned issues linked to ecological networks in SCOTs are the following:

- preservation of biodiversity and of land;
- recreational issues, areas for freetime activities, amenities;
- landscapes, quality of living conditions;
- green travel (bicycle paths, walking trails);
- agricultural production, preservation of agricultural land;
- limits to urbanisation, green zones in cities, green breaks and undeveloped zones between cities;
- environmental services, management of natural hazards (e.g. floodable zones).

The participative process and the stakeholders included

The success of truly integrating ecological connectivity in a SCOT depends a great deal on the stakeholders included and when they are brought into the project.

There are many stakeholders in ecological networks because they interact with an array of issues and involve different territorial scales. The first step is to identify the stakeholders that should be brought into the procedure. In the analysed SCOTs, the environmental assessment was carried out during the initial phase of the territorial diagnosis and the EIE. Subsequently, it was very rare that the environmental experts were called in to assist in drafting the PADD and the DOG. Socio-economic stakeholders participate more in defining development rules, i.e. during the drafting of the DOG. Such late involvement is not ideal to ensure a good balance in the territorial project and can lead to inconsistencies between the issues and important zones identified in the EIE and those effectively included in the DOG. Because the general public is not particularly aware of the topic, the participative process is often limited to information meetings presenting the issues and the method used to identify ecological continuities. These informational efforts should be continued, but launched at the very beginning of the project.

Data brought into play

The ecological-network diagnosis requires all the knowledge available on habitats, species, rivers and factors causing fragmentation in natural areas.

Even though significant amounts of data³ are available, the data actually used are often limited to the ZNIEFF (zone of floristic, faunal and ecological value) inventories and mandatory protection zones for remarkable sites. Six of the 21 SCOTs added specific inventories (e.g. wetlands) or made efforts to homogenise data sources for the entire territory. The inventories served

to identify new core areas. Otherwise, the SCOTs take "ordinary" nature, for which little information is available, into account primarily via land-use data, in an indirect and fairly imprecise manner.

Integration of the ecological networks in SCOTs consists of identifying ecological continuities more precisely than on the regional level, either through more complete use of naturalist data, use of more precise land-use data or selection of target species⁴ that move over limited distances. For future SCOTs, it will be essential to improve use of existing data and, where necessary, to plan suitable data-acquisition protocols for new data. Early discussions between all stakeholders may be a means to better mobilise the available naturalist data, either in databases or in the form of expert knowledge and diagnostic capabilities.

Methods used to identify and map corridors

Three methods were used by the 21 SCOTs to identify corridors.

- **Visual interpretation method**, selected by 13 of the 21 SCOTs. This method identifies subnetwork corridors using photo-interpretation techniques on aerial photos and the most precise and recent land-use data available. It is occasionally used in conjunction with checks in the field or expert advice.

- **Dilation-erosion method**. This technique calls on GIS (geographic-information system) tools to "automate" analysis of the distances between two natural areas and thus reveal the most direct paths linking the areas. The core areas are dilated and then eroded (see figure 2). This technique reveals potential corridors between the closest core areas. Land-use data are then employed to more precisely adjust the position of the corridor.

- **Environmental-permeability method**, selected by five of the 21 SCOTs. Environmental permeability is the facility with which target species can move, which depends on the species and the environment. Calculations using GIS data define, for each subnetwork, the potential movement zone of the target species, called the "continuum". The GIS uses the available geographic databases (the most common for land use is Corine Land Cover). In the potential movement zone for the target species, different zones are generally distinguished according to their permeability. The most permeable zones are often considered core areas. Practically speaking, a continuum is often made up of several subunits linked by corridors. Other techniques are occasionally used. For example, areas highly impacted by human activities often link ecological corridors with green travel (bicycle paths, walking trails) to comply with increasing demands for nature and

3. Data from various inventories, carried out on different territorial scales, available from the DREALs and environmental associations; data in planning documents for water management, produced for river-basin management plans, sub-basin management plans, river contracts; data on transport infrastructure, isolated urban areas, territorial topography used to identify obstacles.

4. Target species are those selected for use in setting up the ecological network. The areas covered by the network are those most favourable for movement by those species.

raise awareness of the issue. In the highly urbanised area of the Lens-Liévin-Hénin-Carvin SCOT, the only corridors are the hiking trails. In other cases, areas set aside as limits to urbanisation are designated as corridors, e.g. the green breaks and undeveloped zones between cities in the Métropole Savoie SCOT.

Whatever the method, map precision generally depends on that of the data used. Maps may zoom in on the most sensitive zones. A SCOT may be precise down to individual plots of land on the condition that solid arguments are provided and that the local context is taken into account.

Table 1 presents the advantages and disadvantages of the three methods used to identify ecological corridors.

Integration of ecological networks in territorial projects

Integration in the PADD

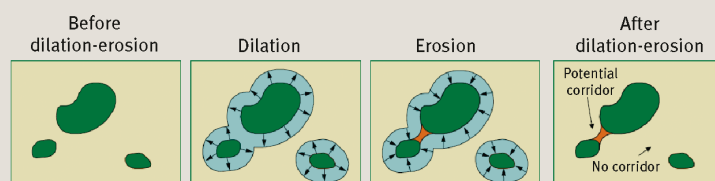
The PADD sets the general guidelines for spatial organisation and restructuring of urban areas, and determines the overall balances between zones already urbanised and to be developed, and natural, agricultural and forest zones.

Three issues for ecological networks are clearly expressed in most of the PADD documents in SCOTs:

- biodiversity preservation by creating a network of natural areas;
- protection of landscapes and improvements in living conditions;
- efforts against urban sprawl.

These three major issues often include other goals addressing efforts to develop high-quality agriculture, capitalise on landscapes for tourism, enhance nature in cities and accessibility to nature, or support efforts against the risk of fire, flooding or landslides. Some SCOTs highlight attempts to combine ecological, landscape and economic (tourism and agriculture) aspects

2 Detection of potential corridors using the dilation-erosion technique.



in the areas allocated for their ecological networks and thus create synergies between issues. For example, the Pays de Rennes SCOT avoided creating zones for future urbanisation in areas identified as permeable for movement by target species. The ecological network thus constituted the basic building block on which all other SCOT policies were based. The guidelines stipulate the available means and methods to preserve the ecological-network zones.

Depending on the guidelines laid out in the PADD, the DOG stipulates the regulatory framework by providing more precise development instructions.

DOG regulations and recommendations set different preservation levels for ecological-network zones

The DOG is the implementation document for the PADD. It defines the development rules used to effectively implement the guidelines.

The regulations set the protection level for ecological-network zones. They are different for the core areas and the ecological corridors. They also indicate ecological-network application and implementation conditions for the PLU (local urbanisation plan). Regulations dealing with other SCOT policy sectors may also impact on the zones of the ecological network.

1 Summary of the advantages and disadvantages of the main methods used to identify ecological corridors.

Method	Details	Advantages and disadvantages
Visual interpretation	<ul style="list-style-type: none"> • Analysis of aerial photos. • Method based on existing situation and expert knowledge, identification of the most probable potential corridors. • Produces a finalised corridor map. • Checks in the field are advised. 	<ul style="list-style-type: none"> • Advantages: <ul style="list-style-type: none"> – easiest method technically speaking; – reduced risk of error compared to use of land-use data alone; – maps easily understandable by all participants.
Dilation-erosion	<ul style="list-style-type: none"> • Identification of potential ecological continuities. • Two (potential) verification steps: <ul style="list-style-type: none"> – analysis of result compatibility with actual land use; – checks in the field or calling on expert advice. 	<ul style="list-style-type: none"> • Advantages: <ul style="list-style-type: none"> – a simple GIS technique; – reproducible, can be automated; – rapidly observable results.
Environmental permeability	<ul style="list-style-type: none"> • Analysis of land use for an overall vision of the ecological functions in the territory. • Identification of potential land uses. Requires checks in the field or expert advice. 	<ul style="list-style-type: none"> • Advantages: <ul style="list-style-type: none"> – reproducible GIS technique, can be automated; – takes into account all environments in a territory (remarkable and ordinary); – takes species into account early in the procedure. • Disadvantages: <ul style="list-style-type: none"> – requires initial setting of many parameters, potential for long debates on species to be selected; – difficult method technically speaking.

► The studied SCOTs did not opt for strict protection of the ecological-network zones. Ecological networks include zones comprising ordinary nature where human activities, e.g. agriculture, take place. Certain development work related to the activity is allowed in zones that also serve as ecological corridors. The permissible development work can vary and is set during negotiations with stakeholders. There are also recommendations on preferred practices to assist in maintaining and restoring ecological-network zones. Examples are efforts to manage site visits or to encourage the development of environmentally friendly agriculture. However, a SCOT is not legally vested with responsibility for zone management. The recommendations are thus not binding, they simply serve as indications for implementation of the guidelines on the local level. In many SCOTs, preservation and restoration goals for ecological-network zones are assigned to the towns which must include them when drafting or revising their PLU.

Maps lay out the regulations more or less precisely. Maps may zoom in on zones where particular issues come into play. Some maps use the ecological network as a planning tool by combining it with other SCOT policies, notably efforts to limit urban sprawl and to reduce vulnerability to natural hazards.

Conclusion

The creation of the National ecological network lies at the heart of the debates in the Grenelle agreements. Following the vote of the Grenelle II law in July 2010, SCOTs will soon have to take into account the future regional ecological-connectivity plans (SRCE). However, few regions have already set up an ecological network. The planned modifications in the Urban code stipulate that SCOTs must indicate "the protection measures for zones required to maintain biodiversity and preserve or restore the good status of ecological continuities."

SCOTs would appear to be the prime means to implement ecological networks because they impose compliance by PLUs and local development projects, provide an overall view of the territory, can be sufficiently precise spatially and are capable of combining ecological connectivity with other public development policies.

Analysis of the 21 SCOTs served to draw up an inventory of the methods employed, to determine the various regulatory levels set for the territories and to gain an initial glimpse of how the ecological networks are effectively implemented. The diversity of the situations analysed is due to the differences in land use of the territories.

The recommendations mentioned in this study are drawn from the experience gained in the studied SCOTs and comply with current national guidelines.

Finally, this study did not address the property and fiscal issues involved in setting up an ecological network. Preparation of management plans for ecological-network zones or of territorial contracts will require funding that, for the time being, depends on decisions by the State and local governments. SCOTs are not responsible for setting guidelines for the management of ecological-network zones. However, effective establishment of ecological networks will depend significantly on the dynamics of the situations created by the SCOTs. ■

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Landscape in Vosges (France).