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Samuel Challéat, Dany Lapostolle, Johan Milian. L'environnement nocturne dans les territoires de montagne français, ressource et opérateur de transition vers la durabilité. *Revue de Géographie Alpine / Journal of Alpine Research*, 2018, Nuits et montagnes, 106 (1), pp.16. 10.4000/rga.3895 . halshs-01772583

HAL Id: halshs-01772583

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Submitted on 5 Feb 2019

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The Night-Time Environment in French Mountain Areas. A Resource and a Transition Operator Towards Sustainability

Samuel Challéat, Dany Lapostolle and Johan Milian

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EDITOR'S NOTE

Founded in September 2013 and coordinated by Samuel Challéat, the RENOIR Research group (Night-time Environmental Resources & Territories) brings together nine researchers, lecturers and territorial actors from various backgrounds (Toulouse, Dijon, Paris and Pau) and different disciplines (environmental geography, land use planning, conservation biology, economics, political science, information and communication sciences, social psychology), as well as a photographer-videographer. He also accompanies several students in their professional project.

Introduction

- 1 The concept of the night-time environment (NE) refers to nocturnal social-ecological systems (Berkes *et al.*, 2000). Because of damage caused to them by artificial light at night, or light pollution (Challéat, 2009), such systems are now protected. This protection is a holistic social-ecological system approach in which the fight against light pollution, initially confined to astronomers' starry skies, gradually opens up to other issues such as biodiversity protection for ecologists, chronobiology for medical researchers and the consideration of nocturnal territorialities for some public authorities in the areas of planning and lighting (Challéat & Lapostolle, 2017). In France, the *Grenelle Environment*

(2007-2010) put the fight against light pollution on the political agenda – primarily in protected areas but also in areas of “ordinary nature” (Godet, 2010) and around astronomical observation sites.¹ The latter play a specific role in protecting the NE in mountain areas.

- 2 The first astronomical observatories were constructed near major cities, where scientific and educated societies were based, but urbanisation and the development of urban lighting are harmful to conditions for observing the night sky. Observatories were moved to remote mountainous areas, where the turbidity and humidity are lower. During the 20th century, equipment was shifted to the peaks while large international telescopes were being built. This “elevation” movement contributed to imaginaries and practices linking astronomical observation with mountain areas (Hagimont, 2017). This model spread through the stargazer world, where the best spot necessarily depended on the altitude. Astrotourism (Weaver, 2011; Collison & Poe, 2013) has become more and more prevalent and contributes to constructing the night-time environment resource (NER). Scientific activity manages this process by connecting with a larger network in which amateur astronomers bring their data to professional actors. Along with this network, other amateur astronomers perform mobile astronomy, which is more contemplative than technical. And finally, night-time landscape photography is spreading throughout mountain areas and encouraging non-astronomers to pay attention to the quality of both the starry sky and the NE.
- 3 These activities join the renewal of nature experience (Fleury & Prévot, 2017) thanks to user-friendly digital technologies for the general public. Nature experiences and leisure activities intertwine to get a better understanding of the nocturnal landscapes and mountain biodiversity (Charlier & Bourgeois, 2014). These experiences support the trend towards the development of recreational activities “*of the night*” – i.e. activities taking place in a “natural” night context and using nocturnal phenomena (starry sky, celestial phenomena, nocturnal fauna etc.) – on the fringes of other activities that are located “*overnight*” but are not based on darkness and do not have specifically nocturnal attributes (Challéat & Poméon, 2014).
- 4 Regarding the NE as a resource for mountains areas, these activities contribute to post-tourism: “they go beyond the frame and belief systems, the organisation and practice of tourism, both thanks to the global societal evolution and the sectoral evolution of the recreational field” (Bourdeau, 2009, p. 6). This resource can be considered a kind of mountain hypertourism, the touristification of a virginal space-time, which is spreading through environmental protection. Nevertheless, one can consider this resource a shift towards an ecologisation of the mountain areas’ development strategies. In other words, our study mobilises contributions of the “economy of qualities” (Callon *et al.*, 2002) considering territorial resource as a potential for action. As an economic and territorial construct, this resource separates products from services, giving sense to the location while contributing to its attractiveness (Maillat, 1995). An intentional process reveals the resource and births a collective dynamic led by local actors in both economic and non-economic fields (Janin *et al.*, 2015). According to this conceptual framework, the role of qualification controversies is of great significance in the resource-making process. Are we dealing with a specific or a generic resource?
- 5 “Recreational activities *of the night*” are a specific resource (Gumuchian & Pecqueur, 2007) regarding the ecologisation process of the economy (Moody & Nogrady, 2010). The process of resource specification deals with energy transition and biodiversity restoration

issues, especially with the inclusion of development and territorial planning policies in the paradigm of global environmental change (Ciss/Unesco, 2013). Scientifically, this entails pairing up traditional social sciences methods with those from experimental ecosystems approaches (Buclet *et al.*, 2015; Barreteau *et al.*, 2016). Following this train of thought, specifying a resource amounts to moving production and transformation methods towards preserving it, i.e. making its use as reversible and parsimonious as possible (Vivien *et al.*, 2013). The objective is to consider the scarcity of a resource and its interdependence with other local socio-ecosystems as guiding principles to exploit it. This approach is part and parcel of the process of shaping a transition operator, i.e. “an external/internal interface of the territory that involves the processes of construction and valuation of the resources” (François *et al.*, 2013). Inside, the operator organises the local production; outside, it markets the resource. In this way, it shapes the territory’s socio-economic path.

- 6 By contrast, “*overnight* recreational activities” form a generic-like resource oriented towards commodifying the environment and embedded in the scope of the night-time economy (Hollands, 2002; Bianchini, 2010). This way of thinking links the attractiveness of areas to the production, consumption and different forms of control regarding night-time life. It focuses on practicalities regarding catering, culture and entertainment services. The night lighting of numerous ski runs is also part of exploiting Fordian mountain resorts (Hatt, 2012), which spreads to the lighting of natural monuments (e.g. the Meije summit in the Écrins (Laslaz, 2016) and the Pénitents des Mées in the Alpes-de-Haute-Provence). This type of mountain area urbanisation (Bourgeois, 2002) contributes to the commodification process of the night-time environment.
- 7 From there, the aim of our work is to determine whether the NE is merely another Fordian resource developed for greater production and consumption or whether it acts as a transition operator that allows a different consideration of the development of mountain territories.

Fieldworks and methods

- 8 Our interdisciplinary approach, influenced by political ecology (Gautier & Benjaminsen, 2012), posits that sustainability is a political issue and “needs to recognise sustainability as political, requiring inclusive debate and multiple voices. Seen in this way, science and knowledge-making become integral to wider conceptions of society and democracy” (Leach *et al.*, 2013). The elaboration of this process of collective reflexivity involves specifying the goals and values that underpin the action. This approach is critical: a framework that allows a multiplicity of reality enunciation devices (Cefaï, 2013) and goes beyond a utilitarian and economic analysis of the resource – without neglecting it – to include it in a global approach for environmental change. Thus, it looks at other spatially situated ways to consider the resource in its various cultural, ecological, social and political dimensions (Oiry-Varacca & Tricoire, 2016).
- 9 Deconstructing the resource makes it possible to understand the historical and institutional context in which it emerges and develops and on which values and representations of reality and spatial scale(s). Following this “reflexive imperative”, uncovering the conditions for the resource to be produced means giving the actors the ability to situate themselves along a continuum oriented on the one hand towards environmental economics and, on the other hand, towards the greening of the resource.

We seek to know how the NE operates as a transition tool towards sustainability in mountain areas. This leads us to analyse the NER as a social process unfolding in time and space (Raffestin, 1986; Sacareau, 2011).

- 10 Our analysis compares this process in different areas from 2013 to the present (Challéat & Lapostolle, 2014; Lapostolle *et al.*, 2015); see Table 1. It uses various sources and is inspired by anthropological methods of data collection. The long immersion allowed us to join the steering and scientific committees of the Pic du Midi International Dark Sky Reserve (IDSR) and the Regional Natural Park of the Baronnies Provençales (RNP-BP), providing access not only to participant observation, formal interviews and informal discussions with the dominant actors but also with the minority actors of the territorial resource-making system. The immersion also includes bivouacs, overnight shelters, astronomical observation evenings with different audiences and a presence on marketplaces in some villages to film discussions with regular customers from there and elsewhere.
- 11 The NE making is also observed in the circulation of ideas, labels, maps and scientific studies via the analysis of interactive Internet portals that create transnational spaces and networks. The study of the connections between the spaces and the actors and of the mediation logic contributes to understanding how the NE in its relational dimension can move towards sustainability. At the same time, the monitoring of national and European normative developments informs us about the constitution of this environmental problem as a political problem.

Table 1. The RENOIR research group's main fields, programmes and methodologies in mountain territories since 2013

Fieldwork	Fieldwork period	Research funding	Integration In governance	Dominant actors methodologies	Minority actors methodologies
Pic du Midi International Dark Sky Reserve (IDSR)	2013 - present	CEPYMAC *	Steering Committee	Semi-directive interviews	Immersion, intensive weeks of field work, sound recordings, filmed interviews on the fly (markets, schools, inhabitants, tourist offices, mountain refuges), night photographic missions, bivouacs
		RENOIR **	Working Groups		
Pyrenees National Park	2013 - present	CEPYMAC *	AdapTer Research Programme Technical Committee	Semi-directive interviews	Immersion, intensive weeks of field work, sound recordings, filmed interviews on the fly (markets, schools, inhabitants, tourist offices, mountain refuges), night photographic missions, bivouacs
		RENOIR **		Participant observation, Technical Committee of the AdapTer Research Programme	
Pyrénées Ariégeoises Regional Natural Park	2013 - present	CEPYMAC *	AdapTer Research Programme Technical Committee	Semi-structured interviews	Immersion, night photographic missions, bivouacs
		RENOIR **		Participant observation, Technical Committee of the AdapTer Research Programme	
Baronnies Provençales Regional Natural Park	2015 - present	--	Scientific, Ethical and Prospective Council	Semi-structured interviews	Immersion, informal discussions (tourist offices, amateurs astronomers on mission at the Baronnies Provençales Observatory), night photographic missions, bivouacs
Cevennes National Park (International Dark Sky Reserve project)	2016 - present	RENOIR **	"Public lighting" working group	Semi-structured interviews	--
Mont Mégantic International Dark Sky Reserve (Quebec)	2015	RENOIR **	--	Semi-structured interviews	Immersion, informal discussions (tourist offices, professional astronomers & students on mission at the the Mont Mégantic Observatory)
Saint-Véran Observatory, Queyras Regional Natural Park	2015	RENOIR **	Technical exchanges with the commune of Saint-Véran on valorisation and labelling projects	Semi-structured interviews	Immersion, intensive weeks of field work, sound recordings, filmed interviews on the fly (markets, schools, inhabitants, tourist offices, mountain refuges), night photographic missions, bivouacs
Causse du Quercy Regional Natural Park	2016	RENOIR **	--	Semi-structured interviews	During "La Fête de la Nuit" (08/2016): immersion, sound recordings
Vercors Regional Natural Park	2017	RENOIR **	--	Vocational training (for the French Biodiversity Agency) about Dark Ecological Networks; Informal discussions	--
Massif des Bauges Regional Natural Park	2017	RENOIR **	--	Intervention "Dark Ecological Networks and night-time environment protection" for the NRP elected; Informal discussions	--

* CEPYMAC (2014): research programme funded by the *Maison des Sciences de l'Homme et de la Société de Toulouse* (France), 12 months: *The starry sky of the Pyrenees and the Massif Central: a new environmental resource for the mountain territories.*

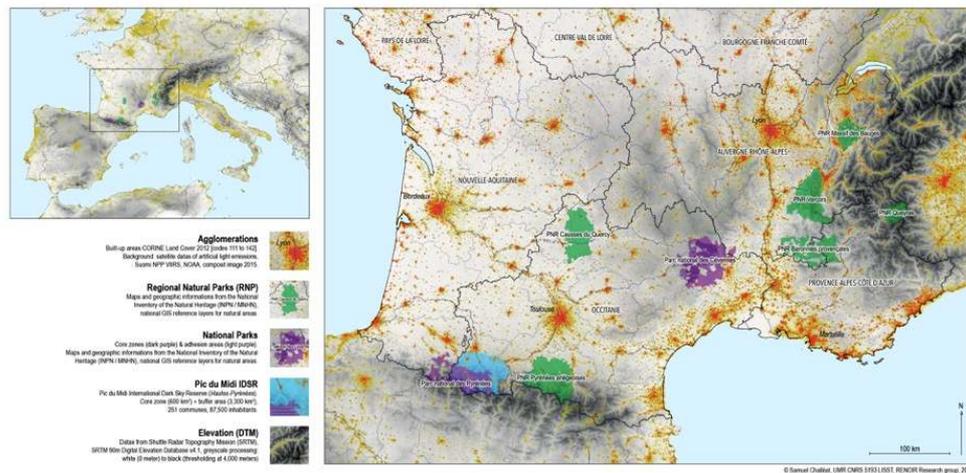
** RENOIR (2015-2017): research programme funded by the Occitanie Region and the Toulouse 2 University (France), 24 months: *Night-time Environmental Resources, Tourism, Territories: innovation through the night in the Midi-Pyrenees territories.* The research programme presentation is available at: <http://renoir.hypotheses.org/1111>.

- 12 We have implemented this methodological framework in territories that use the NER, including in some mountain areas (Bénois *et al.*, 2016). It is in this type of environment that the factors favourable to the development of NE resources are *a priori* combined: voluntarist astronomical observation sites, low population densities, pressures to increase nature screenwriting, protected areas that are sensitive to the proliferation of

conservation issues, and collectives and local institutions involved in ecological transition processes. Map 1 shows the RENOIR research group's different fieldwork areas in the French mountains and highlights the role and importance of these different factors, which vary from one configuration to the next.

- 13 Some of these initiatives, like the IDSR, are pioneering. Others, like the RNP-BP, follow suit while building their own path. Under the effects of legislation changing and the institutions' mobilisation, the reduction of light pollution and the objective of protecting the NE components are gradually spreading to different protected areas networks. In turn, other territories are engaging in this movement with different postures and goals. For example, the Cevennes National Park, guided by the desire to gain additional international distinction for this "iconic" protected area, is vying for IDSR labelling. The Pyrenees National Park (PNP) is part of a more technical process and restricted to the professional biodiversity protection sector.

Map 1. Mapping of fields mobilised in this article.



RENOIR research group, 2017.

Results

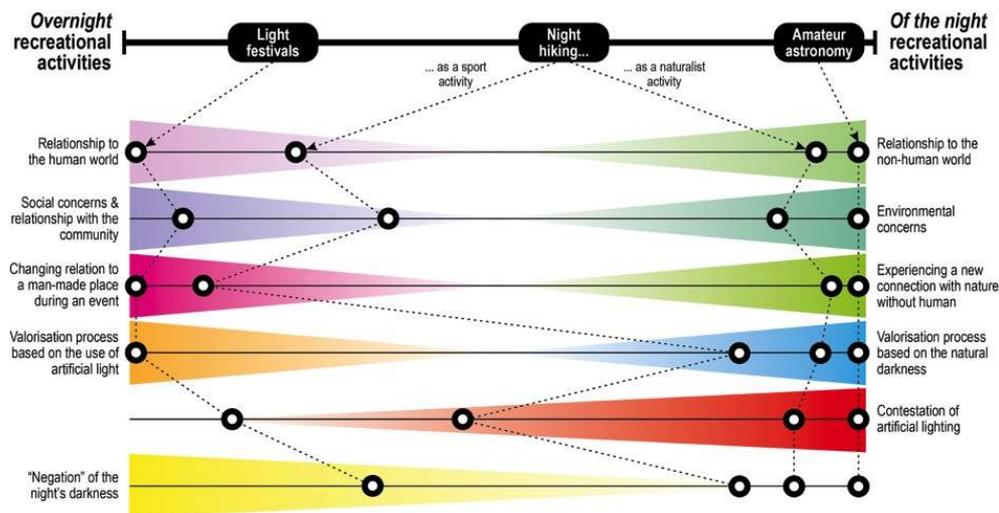
- 14 To answer our question, we analyse the NER qualification controversies. A nuanced reading of what is happening in these mountain territories is necessary. It requires a cautious increase in generality in three stages: i) deepen the distinction between recreational activities that are *of the night* and those that take place *overnight*; ii) clarify the process of specifying those recreational activities "*of the night*" that shape the NER; iii) and trace the territorial pathways of NER valorisation.

"Overnight" and "of the night" recreational activities

- 15 "*Overnight*" recreational activities are the nocturnal transposition of ones that usually take place during the day: markets, festive events, sports activities etc. (Fig. 1). The "natural" attributes of night or darkness are not a central part of them (Challéat &

Poméon, 2014). The “planned” night becomes an artefact, and obscurity stands for the theatre stage.

Figure 1. Conceptual diagram situating different activities in the continuum between *overnight* and *of the night* activities.



RENOIR research group, 2014.

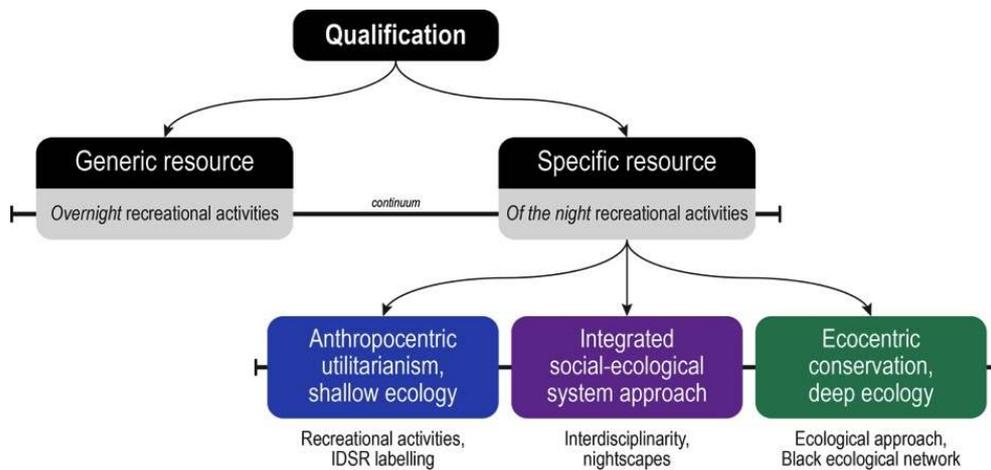
- 16 At the opposite end of the spectrum, “recreational activities of the night” are nature experiences. Observing the sky and celestial phenomena, listening to the sounds of nocturnal fauna and contemplating and photographing non-artificially enlightened nocturnal landscapes also go beyond the shifting baseline syndrome (Pauly, 1995) to natural night. Stargazing in a poorly developed and/or isolated mountain space makes it possible not only to become aware of light pollution but also to apprehend the emotional (Video 1) and hedonistic dimensions of the nature experience:
- 17 “Regardless of the professional issues, I was very sensitive to the issue of returning visibility to the starry sky. I grew up in a very small mountain village where there was no visible public lighting from my home. I remember very well often contemplating the beauty of the starry sky with my parents (I am perfectly uneducated in the matter); on clear nights, when it was freezing, with the snowy landscape, it was even more beautiful. [...] Sorry for this sentimental parenthesis, but it is actually the first real feeling that I had while discovering the project of protecting the starry sky. The feeling won out before any thought!” [Extract from an e-mail sent by the General Secretary of a commune that forms part of the IDSR, February 2014].

- 18 This media file cannot be displayed. Please refer to the online document <http://journals.openedition.org/rga/3947>

Specifying recreational activities “of the night” to create an NER

- 19 We present the natural night valorisation process to create an NER. In other words, we uncover the terms of the specification controversy. Three night activity specifications can be distinguished (Fig. 2).

Figure 2. The different *continuums* observed in the processes of qualifying and specifying night-time recreational activities



RENOIR research group, 2017.

Anthropocentric utilitarianism

- 20 The first type of NE specification is environment commodification, in line with *shallow ecology* (Naess, 1973). As reflected in the notions of green growth and ecosystem services management (Ekins, 2002), it follows an anthropocentric and utilitarian rationale of resource conservation. In the IDSR, stary sky protection completes the tourism offer of this hot spot. IDSR labelling acts as a territorial resource operator. But if the concern is NE protection by fighting against light pollution, the mandatory application of the law (Article R 583-4 of the Decree of 2011/07/12) does not require a territorial label. However, the state's inertia with regard to enforcing the law seems to encourage these initiatives of environment commodification to the detriment of the economy's ecologisation. We find the rationale of commodification in the technical renewal of public lighting, which represents a new market for green technologies (LEDs,² lighting systems on demand, smart grids, etc.).
- 21 A lexicometric analysis of the IDSR digital media coverage (Bénois *et al.*, 2016) shows that street lighting conversion issues are the main arguments being publicised. However, our interviews demonstrate that the tourism dimension is important for appropriating the project at the local level. Expectations are particularly expressed in terms of diversifying the Pic du Midi's attractiveness to tourists and its derivative products.

Ecocentric conservation

- 22 The second type of NE specification is the ecocentric conservation of biodiversity. The ecocentric approach aims to protect all living beings and the environment for itself. The ecocentric approach considers that the anthropocentric approach is the cause of environmental problems, human considering nature as a simple resource to exploit. It take shape in the greening of the economy, re-embedding the sociosphere and the econosphere in the biosphere. The preservation of nocturnal ecosystems determines the territorial conditions of their valorisation, whether commercial or not. In other words, within the territory, biodiversity preservation balances the logics of socio-economic

development. Specifically, in NE, darkness is the asset needed to achieve basic ecosystem services (Gallaway, 2015; Lyytimaki, 2013) such as pollinating plants with foraging insects (Knop *et al.*, 2017).

- 23 Its specification involves the non-use of artificial lighting: Switching off lights when fruit trees are being pollinated, species sensitive to light are reproducing, or migratory birds are travelling. For this, there is no need to label or get any distinctive sign to enhance the NER in the mountain areas or elsewhere. In the ecocentric specification, the resource operator intertwines specification and normalisation. It means that the resource valorisation can be reproduced in all types of territories without any differentiation mechanism. For us, this is the condition whereby the resource operator becomes a transition operator. It makes ecosystem preservation commonplace, and these ecosystems then become a normal type of development, including in mountain territories, which are considered ordinary conservation areas.
- 24 The NE ecocentric specification is at work within the PNP. In 2015 and 2016, this park, in collaboration with the National Museum of Natural History (MNHN) in Paris, the Midi-Pyrenees Conservatory of Natural Areas (CEN), the *Régie du Pic du Midi* and DarkSkyLab, worked to define a “black ecological network” (Challéat, 2010; Sordello, 2017) in its territory. The aim was to identify, for some target species of bats, the light sensitivity threshold above which their life cycle is disturbed. However, this approach results from a methodological prototype that cannot be considered a transition operator because, on the one hand, it is based on a purely expert protocol and, on the other hand, it appears in a preservation territory, the PNP, which serves as an incubator, whereas in our opinion the transition operator can make the preservation of ecosystems commonplace in all types of territories.

Social-ecological system

- 25 The integrated socio-ecosystem-based approach is the third type of NE specification. In contrast to the anthropocentric and ecocentric approaches, that both exclude each other and pose a principle of hierarchisation and subordination from one sphere to another (bio/socio/econosphere), this one is an holistic approach. It implies the coordination without hierarchy of the social, economic and ecological components in reciprocal interactions. Located, it devotes the interdependence between development, land use planning, preservation of biodiversity and energy sobriety. The specification’s integrated socio-ecosystem-based approach links territorial development with the preservation of biodiversity and with energy saving. It reflects a willingness to better integrate the interactional dynamics (positive or negative feedback) between ecological and social systems.
- 26 For example, in the RNP-BP, the protection of the NE is coupled with the territorialisation of a national plan to protect bat species. The state has tasked two local associations, the *Ligue de Protection des Oiseaux* and the *Groupe Chiroptères de Provence*, with facilitating this plan. By producing data on the evolution of bat populations in the park, they help to define and valorise the NER from an ecosystem perspective. Aimed at a wide range of conservation professionals and amateurs, it takes the shape of environmental education actions, a participatory science programme and technical days on managing of riparian forests for bats.

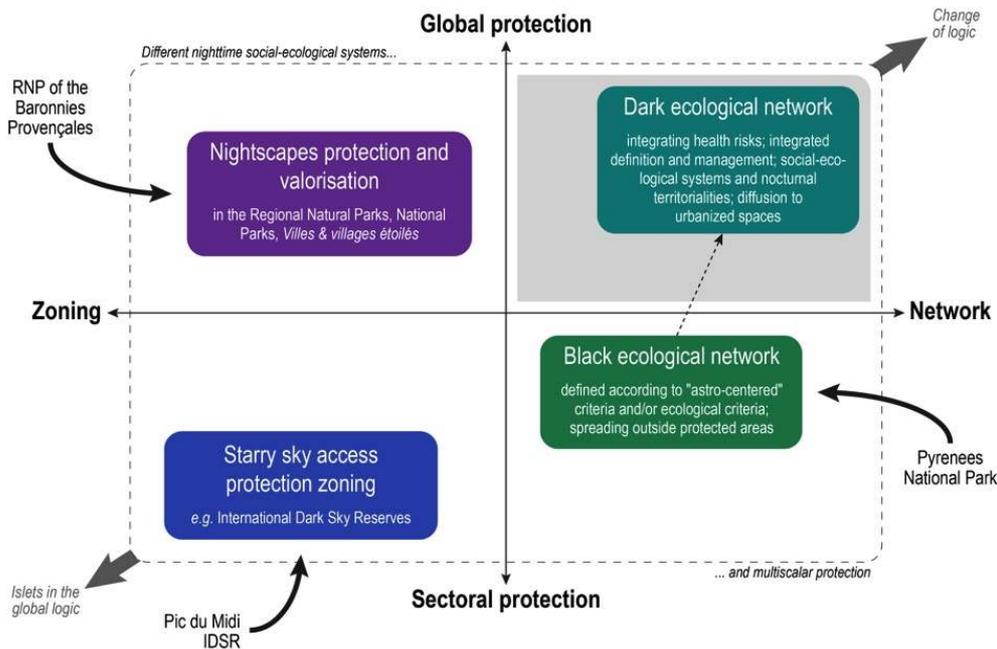
- 27 In addition, the park is managed with a focus on developing a form of naturalistic tourism for its residents and visitors: Thus, the NE conveys an experiential relationship with nature. But stacking scattered initiatives does not a development policy make. The park seeks to make everything coherent. It might appear to be withdrawing from its initial goal of placing itself under the IDSR label, which is too “astrocentric”, but it is investing in the fuzzy notion of the nightscape. It thus links landscape as an analysis unit for the ecologists with the landscape as a public action instrument. Landscapes become “portions of infra-regional spaces where many services or resources are provided by spatial assemblages of different ecosystems” (Lepart & Marty, 2013, p. 114). The underlying idea is that the landscape as a framework through which to analyse the interactions between humans and nonhumans can reorganise them towards the development of sustainability.
- 28 It can be added that the specification of the resource according to the integrated socio-ecosystem-based approach emphasizes a neglected form of valorisation among proponents of the Resource Economics, a non-quantified but objectifiable dimension of well-being that refers to the ethics of deep ecology (Naess, 1973). According to Naess, impoverishing the nature experience reduces one of the conditions of a non-egocentric self-realisation. In this perspective, economic growth is not the ultimate goal of the development of mountain territories, since deep ecology posits that self-realisation depends of the connection to humans and non-humans, a connection not always taken into account in territory projects.

Discussion: the territorial paths of night-time environment valorisation

- 29 The specification controversies of NER are embodied in different territorial paths – a notion that stresses the diversity of local configurations and territorial dynamics (François *et al.*, 2013, p. 276). Path dependence has a significant effect on orientation; nevertheless, changes are still possible. Between changes and continuities, the multiscale methodology allows us to understand territorial anchoring and the local capacity to manage socio-ecosystems’ evolution. This requires the implementation of a political project, i.e. the invention of a new future (Miller, 2013) that allows some harsh change in the development and planning methodology.
- 30 This process of political project building corresponds to its integration in the paradigm of global environmental change. Its implementation requires the transition operator: The transition operator facilitates a generalisation of ecosystem preservation practicalities, more specifically the NE. In matching the social-ecological system management analysis (Ostrom, 2009; Olsson, 2005) with the territorial resource operator (Pecqueur, 2008; François *et al.*, 2013), one can identify the conditions for shifting from resource operator to transition operator, which allows the modification of a territorial path with a large diffusion of preservation objectives.
- 31 Regarding the analysing process, we shift from the concept of a territory to that of the socio-ecosystem, which makes it possible to integrate other notions, such as sustainability, which the territorial resource operator does not consider enough because of its focus on anthropocentric utilitarianism. Fig. 3 underlines the main driving actions occurring in the territorial paths of NE valorisation. Taking the examples of the black

ecological network and the nightscape seen as transition operators, this point is discussed in more detail below.

Figure 3. Modelling of the territorial trajectories of the NE valorisation



RENOIR research group, 2017.

Pyrenean context: the black ecological network as a transition operator

- 32 The IDSR of the Pic du Midi has been implemented in a radiocentric centre-periphery model and is currently used in the creation processes of major protected areas. Its contacts with the Toulouse metropolitan area are limited, and the two sides are not joining forces to reduce the city's glowing halo. Meanwhile, it gets closer to the Pyrenees National Park to switch from a restriction-based protection model – the starry night above the observatory – to a global scope protection expanded to the whole territory. In this process, the corridor tool acts as the cornerstone that allows associating different funds and actors with each other. However, in so doing, two sorts of resource specifications that could seem to be *a priori* incompatible come into contact with each other: for the IDSR, the anthropocentric utilitarianism anchored in shallow ecology, and for the PNP, night labelling and the ecocentric conservation related to deep ecology.
- 33 The kind of tourism development the IDSR is looking for requires an increase in the number of hiking tours and overnight stays at the summit. This practice follows a historical process. The Pic du Midi is no longer a wild area, since many works have been carried out here that have rendered the place more artificial, and many buildings have been built for the observatory and the sake of tourism activity. Round trips and numerous flows of people generate significant human pressure, but such a situation can contradict the PNP's ambition to ensure the preservation of its global biodiversity. The compromise solution lies in the hue of the ecological network colour: black or dark. According to us, the black ecological network is the one privileging the ecocentric approach of

biodiversity protection and considering it more important than developing touristic infrastructures. On the contrary, the dark ecological network would endorse a role of socio-ecosystem compromise, dealing with both the needs of touristic development and the ecocentric conservation.

- 34 In light of the points above, the ecological network is the transition operator that can make preserving the NER commonplace. This can be done if three conditions are met that stem from a mind shift regarding the night/lighting pair.
- 35 When the IDSR was created, the *Syndicat Départemental d'Énergie des Hautes-Pyrénées* (SDE 65), as well as a majority of elected officials, was more concerned with the economic dimension of public lighting (i.e. a reduction in public spending) than with the fight against light pollution, which is the issue for astronomers. However, a new dynamic is emerging. The SDE 65 has agreed with the *Syndicat Mixte du Pic du Midi* to improve its night-friendly lighting techniques. Villages' initiatives at the cutting edge of the energy transition and biodiversity preservation combination serve as demonstrative examples when visited by other elected officials.

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- 37 The second condition depends on coordination between the actors' networks, as well as their intricate embodiments in proximity relations. For example, at the international scale, a group of Pyrenean actors initiated a dialogue with the promoters of Mont Mégantic IDSR in Quebec. They tried to tackle tourism with both biodiversity conservation and energy transition, which could have produced some contradictory positions. Taking advantage of this exchange of experiences, the Pyrenean actors ranked the issues by importance and focused on replacing the lighting. At the operative level, several million euros are invested annually to modify street lighting. This highlights the commitment of the local public authorities. PNP, in turn, brings a biodiversity conservation dimension with, for example, the Adap'Ter research programme, which is a major part of the dark ecological network. Geographic proximity fosters organisational proximity. One can see the shaping of a new common overview about conservation issues regarding the NE in a larger territorial scope. Now the NE acts scientifically and politically as a conservation goal. This trend stresses these proximities' institutional character (Rallet & Torre, 2004).
- 38 This third condition sanctions the modification of the institutional arrangement. The ecological network can be seen as a governance tool based on an ecosystem analysis element and a politically backed territorial project. It stresses institutional proximity that highlights the social-ecological system approach of territory adopted by its various stakeholders. However, it depends on an expert protocol that is valuable but not sufficient to transform it into a transition operator. It is built without taking into account the ambition of normalising protection, a process that should encourage various pluralities of representations and interests about the territory. Nevertheless, in the medium term, functional lighting has been taken into account in medium-size cities in the IDSR, as Lourdes, Lannemezan and Bagnères can finally act to strengthen the social-ecological system used in network building.

Landscape as transition operator in the 'Baronnies provençales'

- 39 The development of the RNP-BP is based on a residential economy, attracting revenues under its purview (public employments, pensions, commuters, tourists). They feed a proximity economy, local shops and craftsmen, services to individuals, accommodation and catering. Tourism and agriculture are the main part of the local basket of goods and services (Mollard & Pecqueur, 2007). They strengthen each other. Tourism acts as an opportunity for business; for its part, tourism takes advantage of a large variety of farming goods and landscape scenery. Shops, markets and outlets network coverage fills this grid, simultaneously meeting the needs of local inhabitants, too. Climate, way of life, diversity and quality of landscape, local goods and heritage contribute to this "territorial quality annuity" (Pecqueur, 2001).
- 40 In order to guarantee this profit in time, one must maintain and renew the goods and service offers. This is a fragile balancing act that concerns the various protagonists in the system of territorial actors. Coordination is the main challenge. In that sense, the certification of the RNP at the beginning of 2015 was a key moment in that process of collective action. Since then, this organisation has encouraged stakeholders to reflect on the development strategy. The landscape approach is a structural component of the development path. Park management favours a network conception of their relationships with other RNP in the neighbourhood. In so doing, they bring a new orientation to the local project-building process.
- 41 Here, the experience of nature in general (and of the landscape in particular) is one of the elements redefining the mode of inhabiting the territory. It tends towards promoting an environmental citizenship that supersedes the visitor/visited divide. The valorisation of the NE arises from this political purpose. It reflects the change in perception of the night/lighting pairing for a few key actors in the territory and the authorities of the RNP-BP. Beyond the NE, two apparently disjointed observations are emblematic of a new territorial trajectory and highlight the rebalancing of the territorial system and of the logics of proximities. One of the key indicators of the territorial project is the number of visitors settling in the territory to become inhabitants. Moreover, in the park, eco-meters quantify the human pressure on the environments visited. This dual management of visitor flows reveals the desire to redefine the way of inhabiting the territory, which is oriented towards creating an environmental citizenship. It is in the day-to-day life of this factory of environmental citizenship – a path dotted with pitfalls because of the representations, habits and interests that it disrupts – that the non-labelled nightscape becomes a transition operator. It acts as a vector of learning and a sensitive experience of a territory regarded as a social-ecological system. This conception of the territory is an implementation of political ecology; without it, the greening of the economy seems to be a long way into the future.

For a transdisciplinary approach

- 42 Considering the preservation of the night-time environment as somehow indicative of the way in which mountain areas are developing might seem to be a very narrow focus. Apprehending the slight change of which the NE might be an indicator encourages a cautious increase in generality. In this regard, we identified three types of NER

specifications and two transition paths that are tools the development actors can use for reflection. In fact, this is the aim of this work: To lay the foundations for a transdisciplinary analysis defined as an active research project combining interdisciplinarity and a participative approach. All the parties concerned, whether academic or not, are called upon to define and jointly develop research objectives and methods in order to achieve a common goal (Evely *et al.*, 2010). Addressing global environmental change requires decision making at the level or scale of organisation that will have real consequences. “This implies the need to inform the actors and to make them responsible by associating them with the management of the natural heritage whose future depends on their behaviour” (Mathevet *et al.*, 2012).

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NOTES

1. Article R 583-4 of the Decree of 12/07/2011 lists the protected areas subject to measures to prevent, reduce and limit light pollution and energy consumption.
 2. While LED (light-emitting diode) lighting technologies can be positive in terms of financial and energy savings, they are currently subject to controversies regarding their potentially negative effects on ecosystems and health.
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ABSTRACTS

This article presents our approach to construct the night-time environment (NE) as an interdisciplinary research subject. Understood within the framework of various French mountain areas, we show that the NE is highly indicative of different development trajectories. We analyse them by combining traditional social science research into territory with the ecosystem approaches of the experimental sciences. We show how the NE resource (NER) is transformed into an operator that facilitates the transition towards sustainability. By highlighting three of the NE's specifications, this work lays the groundwork for a transdisciplinary approach.

INDEX

Keywords: light pollution, night-time environment, territorial resources, transition operator, social-ecological systems

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