Leopards under the pines: An account of continuity and change in the integration of forest land-uses in Landes de Gascogne, France

B. Hautdidier, Vincent Banos, Philippe Deuffic, Arnaud Sergent

'Leopards' under the pines

an account of continuity and change in the integration of forest land-uses in Landes de Gascogne, France

Hautdidier, Baptiste ,; Banos, Vincent ; Deuffic, Philippe & Arnaud Sergent
Inrae, UR ETTIS (ETBX), 50, Avenue de Verdun, Gazinet F-33612 Cestas Cedex, France
E-mails: baptiste.hautdidier@inrae.fr, vincent.banos@inrae.fr , philippe.deuffic@inrae.fr, arnaud.sergent@inrae.fr

Introduction

On the 24th January of 2009, a storm –soon to be named Klaus- crossed the Atlantic coasts of Europe, killing 31 in Spain, France and Italy, and sweeping an estimate of 42.9 ± 6,1 Mm^3 (Colin et al., 2010) in the Landes de Gascogne forest region, southwestern France. With 25% of the forest area affected and a 42.1% decrease in standing volumes, the storm was a severe blow to the very idea of the long-term maintenance of a forest that was rather unusual for France's standards, dominated by private estates of *Pinus pinaster* industrial plantations.

And indeed, the event provoked a generalized disarray among most regional forest operators, as they had to handle the harvesting and stocking of stormwood, a drop of *P. pinaster* prices in pulpwood markets, subsequent large-scale bark beetle attacks in 2010-2011, and an increased economic pressure on large parts of the regional forestry-wood chain –especially sawmills. As a result, the prospects of massive land-use conversions (be it to maize, miscanthus, solar panels or urban fabric…) loomed for several months amongst regional stakeholders. These prospects did not materialize, mostly due to a large, one-off, public re-afforestation scheme, amounting to a total of 530 M€ committed by the French state until 2017. It was linked in October 2015 to application forms covering respectively 198 805 ha and 157 675 ha for clean-up and replanting, (to be compared with an estimate of 225 000 ha of forests with a damage rate above 40%). The forest owners of this area would acknowledge their increased anxiety about the profitability and vulnerability of an intensive model. But as a matter of fact they have been planting, and in strong continuity with the dominant choices that prevailed before the storm.

The aim of this paper is to provide empirical evidence and a theoretical framing for this apparent paradox. For, as we will contend, both arguments of a lack of silvicultural alternatives and of opportunistic subsidy-seeking behaviors would offer a very partial explanation to the global inertia of the Landes de Gascogne forest operators. We posit instead that if most of the forest owners and managers tend to perpetuate practices they know to be challenged, it is mainly because they adhere (or at least lend credit) to the idea of a forest region that ought to be maintained - and defended as such in Bordeaux, Paris and Brussels- as *cultivated*, *multifunctional* and *integrated*. This model is in no way immutable, in that it was the result of a recent historical construction, subject to various adjustments, post-hoc justifications and re-inventions. But while several of the challenges it faces are of a long-term structural nature, the storm had nevertheless a revealing role.

We understand the Gascony case as addressing a gap in the literature of land-use transitions, more specifically of regional forest transitions (Lambin and Meyfroidt, 2010; Rudel et al., 2010). Considering a developed country having experienced an important multiscale recovery of its forest cover over the past 200 years (Mather et al., 1999), it is particularly relevant to document how large-scale threats (whether potential or real) to a regional forest *cover* may or not trigger evolutions of forest *uses*. As such, the argument will mirror analyses of complex land use/land cover relationships that are functioning in the opposite way. See for example Hauserman's account (2014) on why, during a long-lasting crisis of the coffee sector, Mexican smallholders in central Veracuz strove to maintain a continuous coffee land cover in their plots, as part of an effort seemingly detrimental to their livelihoods.

Several literary analogies have been invoked in scientific writing to grasp the counter-intuitive interplays of agency and structure in accounts of continuity and change. We here borrow our image of 'leopards' to Di Lampedusa's famous novel *Il Gattopardo* (2010 [1958]). Set in the context of the creation of modern Italy in the 1860s, the narrative confronts an ageing Sicilian aristocrat experiencing the coming end of his world with the choice of his ambitious

nephew to side with Garibaldi, in a move that was only at first glance contrary to his interests:

> Unless we ourselves take a hand now, they'll foist a republic on us. If we want things to stay as they are, things will have to change.[1] (Di Lampedusa, 2010 [1958])

The establishment of the Landes de Gascogne forest can mostly be traced back to the same decade, and bears a contentious social history –shortly summarized below- of state building, commons privatization and power asymmetries. Our intended use of an historic literary analogy is yet not to suggest that the current regional debates tend to hide the perpetuation of centuries-old undue privileges. What we retain - see (Swyngedouw, 2013) for a similar use- is a more generic assertion. Discourses and practices emphasizing continuity or change may both be presented as appealing and consensual. What they can also share is a common vagueness on what exactly is to be maintained or replaced, by valuing a focus on ideal future states over current processes. So doing, they may have a leveraging and performative role, but also serve to obscure political and economic imbalances. Hence the metaphorical image of the leopards, that will be equated below with the current major operators of the forest region: the local forest cooperative, the largest private owners and their representatives, the pulp and paper industry.

We introduce in the next section the term of forest *massif* as being the very object of a current discursive emphasis on continuity that is emanating from these operators, while being simultaneously framed as the outcome of a long-term change, one of a regional forest transition. After a short overview of our material and methods, we develop in the reminder of the paper how this global discourse can be understood as interlinked but non-exclusive foci on the Landes *massif* as a cultivated, multifunctional and integrated entity. We analyze how these three streams of discourse have been affected by the Klaus storm, further revealing the interplays of forest land use operators. For each perspective we provide the following structure: (i) an overview of the dominant model; (ii) how it is challenged by the storm; (iii) how it was challenged before and (iv) how it copes. We end by examining current and potential interplays between the associated legitimation logics, linking our results with relational concepts of landscape change.

Conceiving the Landes de Gascogne forest: historical and analytical background

Landes de Gascogne, a case for the integration of conflicting forest stakes

Whatever analytical framework should be privileged to grasp the ontologies and dynamics of the Landes de Gascogne forest (*e.g.* whether it should be seen as a social-ecological system, a socionature, a region or a set of landscapes…), a common prerequisite is the consideration of its active and fast construction. The recent creation of this 'forest' object is also multidimensional in nature, in that it can be understood, following (Robbins and Fraser, 2003), as equally affecting:

(i) material realities (*i.e.* the outcomes of human effort and labor on vegetation dynamics and biophysical processes);
(ii) mental categories (*i.e.* the very ideas of forest, forest types and forest uses, along with labels such as alien/native, natural/cultivated, production/protection) and
(iii) discursive tropes (*i.e.* competing narratives on the 'desired' forests, with specific moral values associated with trees and their users).

Relying on these complementary perspectives helps to reveal the "discursive forces, as well as economic instrumentalities, of landscape change" (Robbins and Fraser, 2003) that are at play in a forest such as Landes de Gascogne. Such an effort relates to the broader political and academic question of the integration of forest stakes- which is associated in recent forest research both to calls for policy coherence as well as to a spatial and thematic broadening of the interest of managers and scientists (Storch and Winkel, 2013; Sotirov and Arts, 2018). A critical approach to the provision of such shared forestry visions is all the more relevant that social claims regarding forest areas may be simultaneously heterogeneous, inconsistent and interdependent, while dominant wood-based activities can themselves be as diverse, competing and complementary.

[1] [*Se non siamo anche noi, quelli ti combinano la republicca. Se vogliamo che tutto rimanga come è, bisogna che tutto cambi.*]

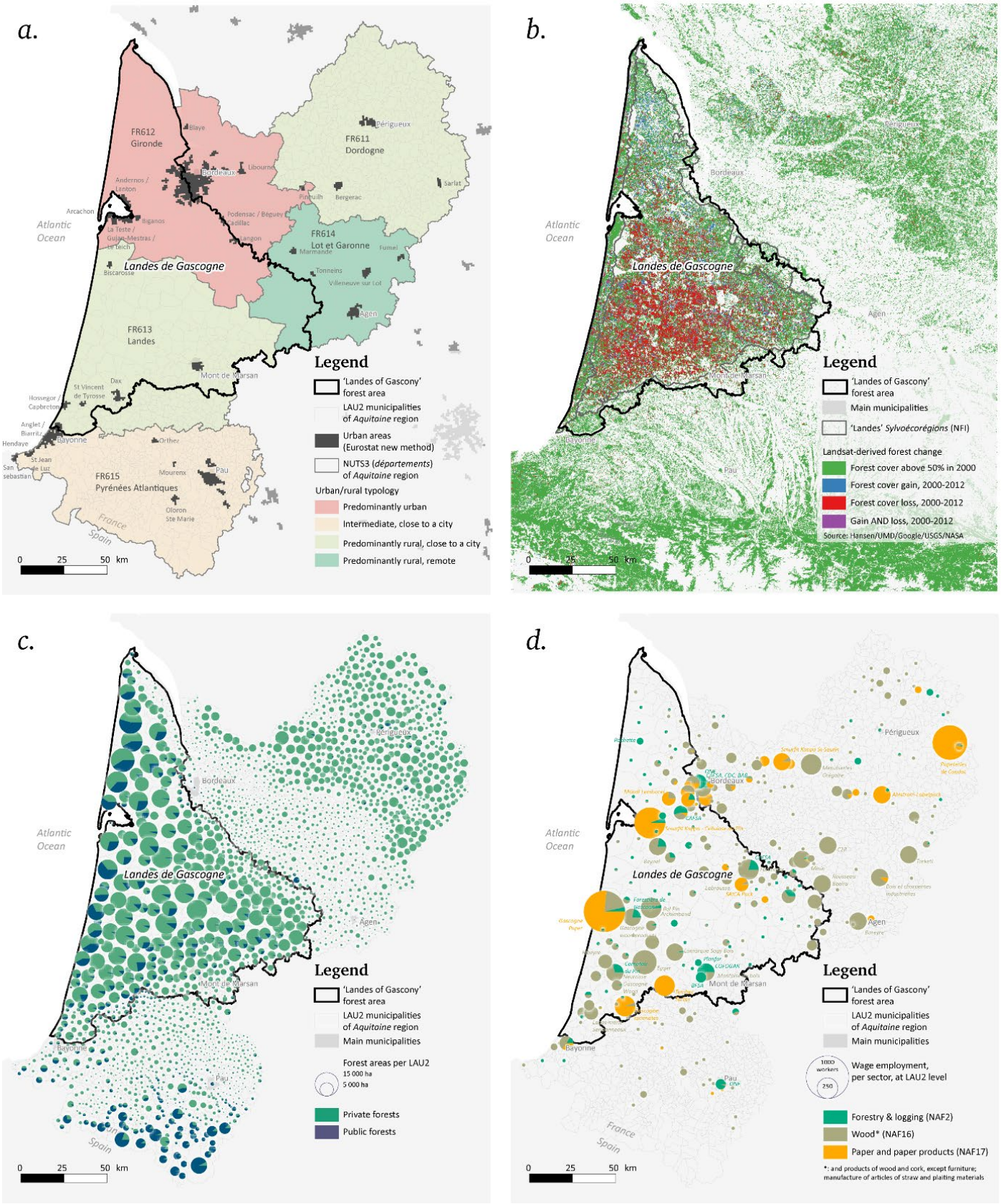

Fig. 1. Different cartographic renditions of the 'Landes de Gascogne' forest *massif* in its regional context: a. Forest as a land planning stake: urban areas and lower-level urban/rural typology of the Aquitaine *région* (source: Eurostat, DG Regio); b. Forest as an endangered land cover: satellite-based estimates of forest cover changes between 2000 & 2012, source: (Hansen et al., 2013); c. Forest as tenure: summed areas of cadastered forest at municipal scale, under private and public ownership (source: Pigma Géocatalogue, CRPF analysis on DGFIP 2009 land registry data, here restricted to parcels classified as 'woods'); d. Forest as working landscapes: wage employment in the Forestry-Wood sector in municipalities of the Aquitaine *région*, 31st dec. 2010. (source: INSEE, CLAP 2010 survey)

Landes de Gascogne and the idea of a forest 'massif'

This context is especially exacerbated in the 'Landes de Gascogne' region, a 1.5 Mha forest area of southwestern France. Usually defined as the union of three *sylvoecorégions* by the French national forest inventory (*Plateau Landais*, *Dunes Littorales* -coastal dunes- and *Bazadais*. *Double & Landais*. See fig. 1.b), it stretches over three NUTS-3 regions (Gironde, Landes and Lot-et-Garonne) of the Aquitaine *région* (see fig 1.a). Dominated by an intensive, planted, maritime pine (*Pinus pinaster*) forested landscape, it is often described as the largest cultivated private forest in Europe (the total rate of private ownership pictured in fig 1.c. amounts to 92%). Here, forest-related activities have a significant economic weight throughout a strong regional forestry-wood chain, with wood processing stages almost entirely connected to the local maritime pine wood resource (see fig. 1.d). These dense relationships have led the Landes forest to be qualified, in an industry-minded way, as 'integrated', with the associated label of a *massif forestier*.

The term of *massif* itself deserves further explanation. Applied to forests in analogy with the now-dominant geological meaning of a continuous mountain range, its use is attested in XIXth century forestry literature, with a subsequent mainstreaming – see (Vidal de La Blache, 1908) for a later example in classic regional geography. The word suggests *a minima* a dominant land cover and a continuous landscape structure, able to constitute a massive and cohesive entity. Supporting somehow ideas of solidarity and collective force, the *massif forestier* has an enrolling effect that *la forêt* may not have by default. It can indeed convey more than the trees, including the owners, managers and the whole forestry-wood chain depending on them, in an hybridization that is heightened in the Landes de Gascogne, as will be developed below. [2]

Landes de Gascogne as a regional forest transition

The upholding of a legitimate *massif* has been worked on a tension between nation-wide debates and what may be perceived as regional specificities: the defense of intensive silvicultural practices, the accommodation of various understandings of multifunctional forest management, the consideration of industrial logics. But the apparent stability, over the past four decades, of this Landes model in these cultivated, multidimensional and integrated dimensions should not hide how tortuous its creation had been. A short historical background helps assessing how it fits the longer-term narrative of a regional forest transition, as evoked explicitly in (Mather et al., 1999) remarkably documented account of France's forest transitions. Following broader earlier reforms of the national forestry policy such as the 1827 forest code, the afforestation of Landes during the XIXth century was cast in a then-new urban-industrial paradigm centered on timber production and environmental protection. For the Landes, marine erosion control was a key argument, as pine-sowing techniques were first developed on the coastal dunes to stabilize the "drifting sands". Such practices were extended to the neighboring heathlands of the Landes triangular sandy plateau. Forested areas rose sharply after a 1857 decree generalizing the mandatory "improvement of wasteland through afforestation". While privatization of commons had been well underway since the 1790s, many municipalities sold then their lands to large landowners, in a move perceived by some as one of the original sins of the *massif* (Dupuy, 1996; Ribereau-Gayon, 1993, 2011). Even if the transition had not been as swift as advocated by its proponents[3], its determinants were mainly of a political and technological nature. As it would be put in (Lambin and Meyfroidt, 2010; Rudel et al., 2005), this transition was built on the pathways of 'state forest policy' and 'economic development'. Following (Mather et al., 1999): "Factors such as trends in population and agriculture were less significant as drivers of change than individuals and climate of thought", referring to the commitment of dune-fixing engineers Brémontier and Chambrelent- and the subsequent interest of the emperor Napoléon III.

A shortage of resin and turpentine imports, due to the American civil war, acted as a strong catalyst to the development of a local resin-tapping economy, leading to what has been qualified, *e.g.* in (Sargos, 1997; Sargos, 1949), as a 'Gilded Age' of the region. From 1 Mha at its heyday, the

[2] A most telling example in this respect would come from one of our interviewees, feeling, entitled - as a member of the regional forest cooperative- to consider the following personification: "we have a *massif* that has been able to optimize its costs in an exceptional manner." (Interview S14, see § 3 for methodological references)

[3] The initial Pine and Oaks forest cover rate may have been up to 20%, and the afforestation was partly a bottom-up process started in the XVIIIth century, see Arnould, P., Marty, P., Simon, L., 2002. Deux siècles d'aménagements forestiers : trois situations aux marges méridionales de la France. Ería 58, 251-267, Bouisset, C., Pottier, A., 2009. Les Landes de Gascogne : de la forêt cultivée au patrimoine naturel ?, in: Lazlaz, L. (Ed.), Espaces protégés et territoires. Conflits et acceptation. Belin, Paris, pp. 35-47.-

massif was yet progressively eroded during the 1940s, reaching a new historic low of 400 000 ha after dramatic fires in 1949.The *de facto* uses of Pines had then partly switched to pulpwood, before a full industrial mutation led in the 1960s to the current dominant practices.

Material and methods

We mainly rely on a conceptual interdisciplinary framework aimed at the identification of the agent-based and structural factors having the greatest influence on the decisions of forest managers in specific areas, see (Kleinschmidt, Arts & Sotirov, this volume) for an overview. Developed in the course of the European research project INTEGRAL, the thematic perspectives embedded in the framework enable horizontal comparisons between Europe-wide case studies but also, as in the case of this paper, a thick, vertical, understanding of the factors at play in a given case study. The empirical material is based on ancillary data (based on grey literature and official online databases) and face-to-face interviews with stakeholders and forest owners (Sergent et al., 2013).

Among key documents dealing with the post-Klaus re-afforestation were reports commissioned by the ministries of agriculture (Laffite and Lerat, 2009) and environment (Peyron and Yvon, 2012) as well as a subsequent technical appraisal of the resource (Colin et al., 2010). Other important references were a regional land planning directive and a land-use forecasting study (Mora and Banos, 2014; Mora et al., 2012; Mora et al., 2014).[4]

The surveys were carried out between September 2012 and February 2013. Qualitative in nature, they consisted of semi-structured, tape-recorded and face-to-face interviews. 16 forest regional 'stakeholders' (quoted hereafter as 'SXX') were interviewed, including elected politicians, representatives of the forestry-wood industry and the administration. The sampled individuals were chosen on the basis of their overview of the main issues concerning the forestry sector, as well as their active involvement (as decision-makers and lobbyists) into public forestry-related debates: the objective being here to get a comprehensive understanding of the current decision-making of the forest owners of the area, and its potential evolutions. 26 forest owners and managers (quoted as 'FXX') were interviewed, including 16 owners *stricto sensu* and a mix of advisors and operators. We also relied on an earlier set of interviews made in 2008 and 2010, which enabled us to distinguish 'normal', innovation-framed changes in forestry practices from those induced by the storm itself.

In order to help understand how the forest-related stakes at the center of our analysis fit in a broader picture of regional land-use/land-cover transitions, we also processed CORINE Land Cover data over the forest region (Feranec et al., 2007). Available for the 1990, 2000, 2006 and 2012 years, it provides both static and dynamic insights on broad land cover compartments, visualized in the adapted layout of a Sankey diagram (Weiner, 2015) (See the appendix A for the commented R code).

[4] Commissioned by the Aquitaine regional council (the NUTS-2 level executive body), the latter involved three authors of the present paper, some of which had previous research experience on the area Candau, J., Deuffic, P., 2009. Une concertation restreinte pour définir l'intérêt général des espaces forestiers. Regard sur un paradoxe. *VertigO-la revue électronique en sciences de l'environnement*, Cazals, C., Deuffic, P., Sergent, A., Ginelli, L., 2013. La forêt, un patrimoine au prisme de l'écologisation: le cas des Landes de Gascogne. *Ibid*., Deuffic, P., Moustié, J., 2010. Pins et feuillus, entre doutes et incertitudes. Les forestiers des Landes de Gascogne et la question de la multifonctionnalité des boisements feuillus après la tempête de 2009. *Rapport réalisé avec le soutien du Conseil régional d'Aquitaine*, CCRRDT 2007, convention n°20071204003, Cemagref, Cestas, p. 113, Sergent, A., 2014. Sector-based political analysis of energy transition: Green shift in the forest policy regime in France. *Energy Policy* 73, 491-500.

Results

The amount of land cover changes over the Landes de Gascogne area remains low *between* the five high-order CORINE land cover categories (1, 2, 3, 4 & 5xx). A recurring pattern seems to be the sprawl of a low-density urban fabric (associated with various infrastructures) over a dominant matrix of agricultural and forest landscapes. But most of the signal is to be found *within* the 'forest' categories: it should be attributed to the transitions between 'coniferous forest' (312) and 'transitional woodland-shrub' (324), with a doubling of the area of the latter category between 1990 and 2012. Partly due to management (with local clearfelling practices large enough to be detected in the CORINE framework) these transitions are overwhelmingly caused by the storm events Martin (27th Dec. 1999) and Klaus (24th Jan. 2009). These broad figures are no insurance against subsequent large land-use disruptive changes (the largest solar farm in Europe -300 MW over 240 ha- opened in 2015 in the area) but they help yet to understand that the processes of the post-Klaus recovery have yet been predominantly confined so far as a 'forest' issue for the owners (*i.e.* 'Do I change my practices with the re-afforestation of my property?' instead of 'Do I consider other uses than forestry for this land?').

The main processes identified as potential drivers of the evolution of the practices of forest owners and managers are summed up in Fig. 3, modified from (Sergent et al., 2013). The matrix layout of the diagram allows exploring these processes along the two scalar logics of sector and space/territory relationships. The ambition of the mapping remains heuristic, in that the unambiguous attribution of causalities to purely agent-based or structural factors may be ultimately elusive, reflecting stakeholder's preferences and disciplinary standpoints[5].

Some of the trends we identify extend well beyond the short-term dynamics of the forest-based sector: the emergence of energy issues and the broadening of economic activities in rural areas, the rise of environmental concerns and the increasing role of forest certification, demographic trends marked by urbanization and a renewed regional attractiveness. In addition to the storm, these key drivers lead toward a multiplication of -potentially contradictory- socioeconomic representations and uses regarding the Landes *massif* (Mora et Banos, 2014).

Fig. 2. Sankey diagram of CORINE land cover transitions, between 1990, 2000, 2006 & 2012, (source: EEA) over the Landes de Gascogne forest region (source: IGN)

[5] The diverse academic backgrounds of the authors (political science, sociology and human geography) helped in this respect to balance the potential shortcomings of fitting sociospatial relations in strict hierarchical ontologies – *e.g.* what are qualified as traps of 'methodological territorialism' and 'scale-centrism' in Jessop, B., Brenner, N., Jones, M., 2008. Theorizing sociospatial relations. *Environment and Planning D: Society and Space* 26, 389-401., see also Brown, J.C., Purcell, M., 2005. There's nothing inherent about scale: political ecology, the local trap, and the politics of development in the Brazilian Amazon. *Geoforum* 36, 607-624.

Fig. 3. Summary of the research findings: main processes influencing forest management in Landes de Gascogne.

"The massif should remain a cultivated forest…"

After the Second World War, the advent of the cheap oil era doomed turpentine and the local resin-tapping economy. The 1960s saw a normative alignment of regulatory texts and forest policies reforms: the Gascony forest – as other forests in France – had to participate to the mitigation of the chronic deficit of forest products at national level. Under the influence of paper mills, most efforts were put on the improvement of an intensive silvicultural 'package', often qualified of 'ligniculture' (Maugé and Léonard, 1969), composed of the following operations: drainage, soil tilling, phosphate fertilization, mechanical and chemical scrub cleaning, plantation of improved genetic material, four thinnings and a clearcut. Impressive figures are retained by most members of our sample, such as an average yield now claimed to be above 10 $m^3.ha^{-1}.yr^{-1}$, a rotation shortened to 35-40 yrs, and a multiplication of production by 2.5 in 40 years. The achievements of this intensive model have yet come at odds with usual silvicultural practices in France, a situation perhaps best illustrated by the gap one of our interviewees (F07) felt as a forestry consultant [*expert forestier*] when meeting his counterparts in nation-wide arenas:

> the forest they were managing in the rest of France was absolutely weird to me, and their concerns were none of mine… We have a very very peculiar forest.

In the context of the post-Klaus recovery (Mora et al., 2012), it is on the basis of storm vulnerabilities that the legitimacy of the large monocultural industrial *massif* has been further called into question, with most debates occurring among forest owners and managers. While some considered the exceptional nature of the gust wind (172 $km.h^{-1}$ at Biscarrosse), other identified ploughing techniques, fertilization and plantation as key determinants of storm vulnerabilities (interviews S01, S11). It is not the first contestation experienced by the monocultural model: in 1999, the hurricane Martin had damaged the northern part of the Gascony forest, windthrowing 23 Mm^3. Despite this first warning, most of the forest owners had chosen to consider this storm as centennial, voicing down internal critics. A later general inflexion had been the rise of environmental concerns and the increasing role of forest certification (75% of Gascony forest properties were PEFC-certified in 2011), yet with no major influence on the steering of regional silvicultural practices. A key argument in favor of the plantation model is that the poorness of the sandy soils of the Landes plateau and the high levels of its watertable leave few contenders to maritime Pine's frugality and versatility. The conclusions raised by the aforementioned state-commissioned assessments (Laffite and Lerat, 2009; Peyron and Yvon, 2012) were telling in this respect. Yet both argued indeed for the integral restoration of the forest, it was on very different principles: while the 'environment' report stressed environmental concerns and the need for a diversification to broadleaved species, the 'agriculture' report put the economic support of the forestry sector as an absolute prerequisite, lending thus a clear support to the dominant plantation model.

There is yet a strongly mitigating factor to this increasing intensification of the Landes *massif*, in the underestimated agency of forest owners in the application of the silvicultural models. The most important divergence[6] to the theoretical model is the lengthening of rotation ages by forest owners with dominant 'traditionalist' and 'passive' profiles, reaching 60 or 70 years - well above the 50 years ceiling usually practiced by advisors and the dominant forest cooperative. This reluctance of owners to early clearcuttings is variously understood by our interviewees. Some consider indeed the practice as an "harvest before benefits", such as a forest consultant (interview F07: "an earlier harvest is like cutting the wheat on the blade") and a sawmill industrialist (interview S12). For another industrialist closer to the pulp & paper industry (interview S15), it is on the contrary the proof of a lack of professionalism:

> cutting a forest at 25-30 years, it is more or less showing oneself as an impecunious person towards his/her pairs […] but this thinking is not based on a real economic estimation of returns on investment.

According to a forest state administration representative (interview S08), the convergence of risks should act as a driver for the diversification of maritime pine plantations. Black Locust (*Robinia pseudoacacia*) and cork Oak (*Quercus suber*), whose natural dynamics had been favoured since the 1999 storm, have been promoted respectively in the northern (Médoc) and southern (Maransin) marches of the

[6] The two other major sources of dissent were: (i) alternatives to plantation -the dominant regional reforestation technique since the 90s- in the form of sowing or natural regeneration; (ii) a general reluctance to artificial pruning, which is yet a recurring demand from the local paneling industries.

massif. But it appears increasingly clear that these tree species will remain marginal in the final afforested areas. Oaks are mostly associated in the program to 'biodiversity' clauses, that were standing respectively in 2013 and 2015 for only 1,31% and 1% of the application forms (with 30% of them targeted on parcels already dominated by broadleaved species before the storm).[7]

Innovation and technological development on maritime Pine silviculture have thus been sustained as the main adaptation path for the *massif*, the storm accelerating for example a massive shift to a technical package relying on plantation and improved genetic material. This move has not been without ambiguities, as the case of mechanized harvesting illustrates. Felling machines have been prevalent among the forest contractors operating on the *massif* since the early 2000s, due to the public subsidies of the post-storm Martin recovery plan. Some operators (Interview F02) have adverse feelings about this nearly-saturated equipment rate. Acknowledging that it was clearly an asset for the quick handling of Klaus storm damages, they also identify a strong path dependence, in that a continuous use of harvesters (justified by employment and the redemption of the equipment) is now an explicit part of the equation for the medium-term prospects of the *massif*.

The key figure emerging in this silvicultural-technical perspective of the 'cultivated forest' is the forest cooperative 'Alliance Forêt-Bois', a large regional operator proposing to private forest owners the whole range of aforementioned activities: mechanized silvicultural work and harvesting, planning and consultancy, tree nursery… Its diversification is considered by some of our interviewees as leading necessarily to vested interest:

> The discourse is steered by those [*i.e.* the forest cooperative] who produce and sell the seedlings, who plow, who plant and who want more mechanization. (Interview S06).

Some are even more vocal in their critic, suggesting that the cooperative could have actually benefited from Klaus:

> With this storm, they've not been straight; they've wanted to make money. (interview F07)

An executive of Alliance Forêt-Bois we have interviewed defends instead the coherence of their approach, implying notably that they are not advocating a one-size-fits-all silvicultural strategy: "Our main advice to landowners is diversification." (Interview S14) The same interviewee acknowledges yet clearly the highly specific nature of their model, with consequences in the regional debates on the multifunctionality of forestry:

> With plantation forestry, we want to promote a distinctive approach to forest stakes, instead of asking for everything everywhere. (Interview S14)

"*The massif is multifunctional… in its own way*"

In France, the State (*i.e.* the national political authority and its administration) has for long kept a leading role in the regulation and integration of the forestry issues, sustaining a depoliticized and technicist understanding of the social or economic collective problems associated with forest land-use practices. As a result, the paradigms of "sustainable forest management" and "multifunctional forestry" were key components of the French forestry framework in 2001. But breaches later altered this consensus, such as the 'harvesting turn' of the forest policy (Sergent, 2014) that was called for as part of a national biomass strategy (*Cf.* below), coming at odds with the environmental goals of the national biodiversity conservation strategy.

In this context, the recognition of the 'Landes de Gascogne' practices in the national frame of multifunctional forestry has raised similar tensions. This move was yet successful, due notably to the relentless efforts of an influent lobbyist: SSSO [*Syndicat des Sylviculteurs du Sud-Ouest*]. This 'union of foresters' is defending the sole interests of ~6000 private owners of the 'Landes de Gascogne' area, and has been a key player in debates ranging from forest certification to the post-Klaus afforestation. In our interviews, a 'multifunctional forest' model is consensually endorsed by owners, in that production should be associated with – and be able to pay for- diverse joint environmental and social services (such as hiking, mushroom picking or climate mitigation…). But this general stance is in fact instrumentalized by operators such as SSSO or Alliance (Cf. the above quote, interview S14) to advance a much more

[7] The uptake on other intensive species has also been weak. Locust plantation trials were disappointing in the heart of the *massif*, while frost resistance was a strong impediment for the adoption of Eucalypts. Meanwhile, bark beetles (mostly *Ips sexdentatus*) had virtually wiped out the scattered adult stands of *Pinus taeda*, which had behaved well in the storm and were considered for a time as serious alternatives to *P. pinaster*.

segregative logic, favoring inner zonings and specializations.

This notwithstanding, *de facto* differences between the production-oriented Pine forest landscapes and other woodlands of the region (riparian, coastal and mountain…) appear in the preferences expressed by inhabitants in a quantitative survey (Dehez, 2012). They are also explicit in the most dissenting of our interviews, such as S06:

> For me, [the Pine matrix] is often no more than a potato field.

This 'repulsiveness' is somehow buffered by: (i) the predominance of a proximity logic in the recreational use of forests by tourists and dwellers (Dehez, 2012); (ii) the open-canopy structure of mature Pine stands, allowing the development of an understorey dominated by Oak, Broom and Calluna. These features help to understand why the operators do not seem to expect the dwellers, old and new, to call into question the whole massif on the basis of its intensive management. Sustaining the ambiguity, they attribute social and shadow values to the dominant forest mosaic, in line with the following assumption:

> Forest is the green jewel box [*écrin vert*] of Aquitaine. It benefits the forestry-wood chain indeed, but many activities/amenities depend on this green matrix, e.g. the value of housing estates, the daily life of local inhabitants or tourism. It contributes to the overall image of the Aquitaine region" (Interview S07).

Such discourse has been able to percolate in the general population, leading to an appropriation of the dominant narrative of the creation of the *massif*. In spite of its contentious history (Cf. § 2.c), the *massif* has been increasingly cast as a cultural heritage and a source of pride for having taken part, even by proxy, in a pioneering adventure (Nougarède, 1995; Ribereau-Gayon, 2011). For people equating the hypothesis of a forest loss with the threat of a possible return to 'unhealthy' marshes[8], the storm reinforces a general attachment to forest, beyond their own reservations on its management practices.

The enduring paradox between a prevailing private ownership and the idea of a collective heritage is also expressed in the accessibility of forest spaces. The private tenure has indeed not led to a view of the *massif* where fenced areas would be legitimate - but rather as an 'open space' where a tolerance of owners should allow an access to everyone, especially hunters (Ribereau-Gayon, 2001). This status quo remains highly prevalent in our sample, with only a few interviewees foreseeing disruptive changes such as the development of large private enclosures with a hunting orientation (F08). While the most common worries were expressed on the fire risks associated with new uses (motorized practices, diffuse urban sprawl), open access seems widely held as an essential component of the compromise between Gascony foresters and society. A representative from a regional ENGO considers that:

> Free access to woodlands should be considered as an integral part of forest multifunctionality […] Should these services be acknowledged and valued and it would be the renewal of Aquitaine's forests. (Interview S11)

But the same, in a much less consensual way, adjusts his judgement to the actual ecosystem services delivered by a given woodland: "Public access is part of the multiple use of forests, inasmuch as forests are interesting to visit. Production forests, I don't see the point for the visitor, there's not much to see." (Interview S11)

The storm has had ambiguous effects on the relationships of forest owners with their environmentalist critics. For a few, feeling trapped in a reciprocal misunderstanding, the resentment dominates, leading to a stiffening of their position:

> After our storms, the greens, [*les écolos*] we haven't seen them, we haven't heard them. Not even a kind word […] or a level of compassion towards those fools who keep growing forests [*qui font de la forêt*]. (Interview F07)

For the SSSO union, the discourse was as vehement but focused on a different level, aiming to secure the best possible support from the State (for the harvest, storage and sale of the storm damages, and the subsequent afforestation), while trying to enroll the other forest regions in a possible upheaval of the national forest policy. In such a rescaling, the specificities of the Gascony case with

[8] In line with the florid prose of Sargos, J., 1997. *Histoire de la forêt landaise. Du désert à l'âge d'or*. L'Horizon chimérique, Bordeaux.: "the desert is still stalking nowadays, hidden beneath the tree cover. The fight is ongoing between watchful foresters and a mesmerizing yet unforgiving nature"

regards to the multifunctionality of forestry could not be heralded so openly:

> Klaus is not a regional disaster. It concerns all foresters who are bound by their traditions and their love of nature. Should a beneficial – and clever- gesture [from the State] have been made in a region, no matter how eccentric, and a contagion would have occurred, waking up the others. (Martres, 2010)

This complex affair with the State[9] is also exhibited in the strong duality of the *massif* between the plateau and the coastal dunes. The latter, under State ownership, are home to a specific management of the public forest manager (*Office National des Forêts*), addressing stakes of protection (wind erosion, habitats) and high public attendance[10]. Ambiguous relationships have been sustained on these distinctions, with ONF accusing the other forest operators of freeriding on the specificities of its coastal model, the latter downplaying their influence as a technical and business leader (see also (Pottier, 2014) for an account of the views of these public managers). The coastal dunes were hardly affected by storm damages, leading to a relative turnaround of these debates:

> The dune was the least interesting part, the least productive, the costliest to develop. But now it is really profitable [*ça crache*], it is a real showcase for multifunctionality. (Interview S06)

The State is not the only public entity to be handled by the representative of foresters, as many local land planners have come to endorse a 'territorial' approach to forestry stakes that may come at odds with the understanding *massif*. As elsewhere in France, a process of rural resettlement has been observable since the late 1990s in 'Landes of Gascony' (Mora et al., 2012), along with a general reversal in the values and representations associated with rurality, now positively associated with cultural heritages, pleasant landscapes and living environment (Mora, 2008; Mormont, 2009). While the contribution of forest-related activities to the rural economy and to social well-being may change as a result of these trends (Slee et al., 2004), they seem to be often recast by forest operators as mere constraints: the positive net migration occurring in most municipalities of the *massif* is identified by a only a small share of our interviewees as an opportunity for the development of new regional markets (such as timber or the retribution of recreational and environmental services). Well aware of the relative share of forest jobs in their own economy, some mayors and local executive bodies seem nevertheless to bet on these residential dynamics, adapting their urban planning documents with a specific handling of broadleaved species and coastal dunes (Sybarval, 2009 in (Pottier, 2010)), as well as non-productive uses (Candau and Deuffic, 2009).

For an operator such as SSSO aiming to position itself as a node between the industry and society, there are thus various arenas where the minimizing of the contradictions of the *massif* had to be pushed. Pleading for a greater specialization of uses while simultaneously defending the multifunctionality of the Gascony model to a wider audience, the union somehow gained an argument with the storm: better this forest than none.
This is not to say that this political work led to a total concealment of the tensions in the sector, as the imbalances within the private owners were also linked to varying industrial interests:

> [The SSSO] have a responsibility in the current management of the forest because they got caught in the trap of productivism. You've got people there who were both large landowners and wood industrialists, so with potentially diverging interests…, who as industrialists had not necessarily a bad view on a rise of yields at plot level and a lower price tag for wood. (Interview S11)

Here, the storm clearly broke the consensus. The prices of Pine roundwood had reached such a low level in 2010 that the situation sparked strong attacks of the SSSO towards wood industrialists -and notably their joint-trade organization (FIBA, *Fédération des Industries du Bois*

[9] Used as vehicles for territory and identity building, the narratives of the Landes forest transition have also been reinterpreted by some in a fully bottom-up way, erasing the influence of the central State. This can be illustrated by proposals as blatantly provocative as: "to conclude, what is the Pine? Everything. What is the State? Nothing" Manciet, B., 1981. *Le triangle des Landes* Éditions de l'Atelier, Pau.

[10] To meet these objectives of sustainable forest management, the maritime pine model is strongly adapted, with a focus on natural regrowth and sowing, and a possible reliance on smaller management stands and longer rotation ages (ranging from a recommended optimal of 50 years to a *de facto* maximum of 120-130 years) ONF, 2006. *Schéma Régional d'Aménagement. Sud-Ouest Aquitaine. Dunes littorales de Gascogne.* ONF Sud-Ouest, Toulouse, p. 118.

d'Aquitaine). This move is perhaps best illustrated by a sarcastic statement from the SSSO president:

> The foresters are broke, the industrialists enriched themselves (at least for a a while), Aquitaine and France are in order. (Martres, 2010)

"*…and this is so because the massif is also an integrated chain*"

The Landes *massif* carries indeed a significant economic weight throughout a regional forestry-wood chain, based on a large number of SMEs (logging, sawing, furnishing and packaging) co-existing with major international industries (pulp and paper, panel). The specificity of this forest-based sector is that the two processing stages are almost entirely connected to the local wood resource of maritime pine and localized in close proximity to the *massif* (Cf. Fig 1.d), hereby justifying an extended use of the 'integrated' term. In this respect, the dominant discourse has for long been that increasingly standardized wood products would benefit to the industrialists, due to a maintained range of qualities and dimensions, and a re-use of various by-products.

But the massive amount of cheap stormwood, the efforts linked to the re-afforestation and the upcoming scarcity of large and medium-sized standing trees have had differentiated impacts among regional forest operators: several interviewees (S08, S09…), partly backed by regional statistics on employment and volumes, identify a shift in the influence of paneling industries and sawmills, in favor of paper mills (and the aforementioned forest cooperative). We develop here the example of sawmill operators, which are particularly under pressure, due to shorter rotations, quality and competitiveness concerns, that are partly the result of long-term national evolutions. Spruce and Fir woods have indeed gradually superseded pine wood in the French sawlog industry over the last 50 years. As a result, the stakeholders interviewed in Aquitaine seem to share grim prospects for the future of regional sawmills. Scattered in the 'Landes of Gascony' area, they still are large suppliers of wage employment. But restricted to low added-value products (some by choice but most by necessity), they take a heavy toll from the consequences of Klaus:

> In the commercial balance of the Aquitaine *région*, the forestry-wood chain is in trade surplus. But if we look in detail, we have a surplus for industrial wood and paper but a deficit for pallets and other wood products. (Interview S08).

For several actors, the regional wood market has thus been increasingly monopsonistic, due to the dominance of paper mills:

> 50% of the harvest goes into the pulp & paper industry. So they are setting the market price. (Interview S01)

The stakes associated with wood energy were raised well before 2009, and acknowledged by the vast majority of stakeholders such as "an opportunity to be considered" (Interview S07). Yet, the emergence of a regional wood-energy market (with an explicit regional target of 2,000 kT of wood harvest for 2015) has been increasingly perceived as a threat by existing industries in the post-Klaus context, as it would increase the concurrence for roundwood and woodchips. The national invitations to tender that were issued since 2003 by the 'CRE' [*Commission de Regulation de l'Énergie*] institution (focusing on biomass-based combined heat and power systems, as part of a national objective to increase by 2020 the production of electricity obtained from biomass on a + 1.4 Mtoe/year basis) added further to these tensions between regional users of the woody resource. This led in 2010 to a decision of the Aquitaine 'biomass' committee (a regional coordination of the environment and agriculture administrations) to curb the reliance on Pine for wood energy uses – by cutting the associated subsidies. A member of the administration -with a knowledge of the industrial boilers that were already operating in the region at that time- sums up the worries of a noticeable part of local-level stakeholders and landowners:

> The industrialists have had a doublespeak: they have always claimed that there were opposed [to the development of wood-energy] as it would represent too much of a toll on the resource… but who did apply for the 'CRE' projects? You bet it, the large paper mills. (Interview S01)

As a possible answer to these concurrence problems, the idea of a 'hierarchy of uses' had been reaffirmed at both national (in the 'Grenelle' concertation and the national sustainable development strategy (Alexandre et al., 2012)) and regional levels, leading to the following preferences on the uses of biomass:

> food > biofertilisers > raw materials > molecules > biofuel > gas > electricity.

The view from the representative of the regional 'competitiveness cluster' is illustrative of such thinking:

> Incineration should be the very last resort […] We would like to prevent people from putting roundwood in boilers. (Interview S10)

Such a perspective is yet considered by a stakeholder close to the pulp and paper industry as being too much of a wishful thinking on the real behavior of regional markets:

> A hierarchy of uses? This is bulls**t. What will lead a given piece of wood to a plant or another is the price that the industrialists will be able to pay, no matter whether this is for a boiler or not. (Interview S15)

But he also acknowledges the paradox:

> with the [biomass tenders], wood energy could become more profitable than industrial wood. So yes, it may turn the problem upside down. (Interview S15)

While members of the administration, well aware of these difficulties, would like to reconcile contradictory interests: "by checking whether it is possible to regulate uses so that everybody can keep their margins" (Interview S09), local stakeholders mostly adopt wait-and-see policies. Some are suspicious of a general orientation of markets and technical choices that they disapprove:

> The factory would like to get the resource for nothing, here lies the problem. Biomass, for what? For whom? For factories? There won't be many left soon. We have a 25-30 years gap. We have to plant before thinking to harvest biomass. And as they have planted exactly as it was before, it's too late. (Interview F09)

Others have fewer concerns, if only for the volatility of the market:

> Wood energy, we cannot tell what it will be worth in 5-10 years, because for now we have no real price. We are happy to have another market opportunity, but it doesn't exist yet, it is only hope. (Interview F20)

In order to secure a non-conflicting and secured supply of biomass, pulp and paper industries have considered the broadening of the harvest to Pine stumps, fostering recent R&D efforts and debates. This interest has been sparked by current operational needs, as the cogeneration plant of a paper mill (Dalkia, at Smurfit Kappa/Cellulose du Pin) mainly based its supply plan on this resource. A few actors remain dubious of the development of stump harvesting as a viable market (Interview F20). Others, echoing previous scientific concerns about the medium-term soil fertilities of Landes of Gascony's forest ecosystems (Trichet et al., 1999; Trichet et al., 2008), question the very relevance of technical scenarios relying increasingly on the harvesting and processing of Pine non-timber wood products:

> The coarse wood debris should be left. We should stop here, fertility is maintained by leaves. For the harvesting of stumps, why not… but after the storm! Right now, it is a bit silly *but* profitable. But later, will it be the case? (Interview F02)

Answering to these critics, the interviewee S15 deflects the responsibilities to new entrants, for having knowingly chosen to compete with existing players on the main resource, while benefitting *unfairly* –at least in his view- from public subsidies.

The extension of the resource is also debated in geographical terms, as another related behavior of industrialists is the *de facto* enlargement of their supply basins over neighboring areas, as part of what could be described as a two-tiered spatial fix– see (Gautier et al., 2011) for a similar account of aggressive territorialities. Forest regions in Dordogne and Pyrenees (see the northeastern and southern tips of fig 1.c) are indeed discussed as new marches for the *massif* –both as sites for immediate harvest as well as for the further extension of *P. pinaster* afforestation, with climate change arguments. Opponents do not here cast their arguments so much as a question of structural overcapacity – see (Pirard and Irland, 2007) for an extreme example- but instead of fairness:

> To protect their project, they need us to protect their resource, this is unfair. (Interview S01)

Discussion and conclusion

This shared reference to fairness is illustrative of the contested and multi-faceted nature of the Landes de Gascogne forest. For this *massif*, we aimed to highlight how, on which basis and by whom a discourse on forest integration had been sustained over decades, albeit being in fact reinvented on very different grounds. Assuming a critical forest policy science perspective informed by sociology and geography helped us to reveal how three competing but interlinked legitimation logics of discourses on the integration of forest stakes are associated with sustained overlaps and tensions between different drivers of forest-related policies and land-uses practices.

Understood as a *cultivated* forest, the Gascony *massif* is now explicitly defended – see for example its dedicated 'manifesto' (Alliance Forêts Bois, 2012)- as a specific intensive model, legitimated by economic competiveness constraints and genetic promises, as well as by a perceived lack of credible silvicultural alternatives. Among the noticeable amendments to the monocultural model, species diversification appears in trompe-l'œil. While the relevance of broadleaved-dominated stands is somehow taken as granted (Fuller, 2013; Pawson et al., 2013), the explanation to their development in marginal areas affected by the storms is much more to be found in spontaneous ecological dynamics than to an active promotion by landowners. The greatest divergences may in fact come from the growing hiatus between the offer of a *P. pinaster* technical-silvicultural package and the agency of landowners, with regards to the shortening of rotations. A further illustration of this latter point is provided in the most recent figures of the afforestation program, confirming a general aversion of owners for semi-dedicated plantation[11], a mixed silvicultural scheme that had been hailed as a highly-relevant innovation by the forest cooperative.

The *multifunctional* forest is under tension as well: privately-owned, industry-oriented and visually monotonous, the production landscapes of the Landes de Gascogne *massif* are nevertheless consensually associated with open access, emotional attachment and collective heritage. May this apparent paradox hold, and the unicity of the *massif* would be sustained over medium term. But in current debates over zonings and/or market-based instruments, a few breaches are discernible: they could lead to a swift 'redistricting' between areas dominated by peri-urban stakes and exclusive enclosures, themselves defined over carbon, ecosystem services or recreational hunting.

From the *integrated* chain perspective, the main challenge is clearly the rise of energy stakes, as exerting a pressure on a contested and recovering resource. Much effort has been put in response on asserting the industrial roundwood provided by Pine plantations as the key defining socio-natural commodity (Peluso, 2012) of the *massif*. Such a consensual discourse tends to minor unbalances such as the marginalization of sawmills. It also downplays the increasing versatilities between industrial and energy uses. But it does not prevent the major operators of the *massif* from actively pushing for an ontological and spatial extension of the resource, as expressed by the inclusion of tree stumps in the harvest and the territorial behaviors on the marches of their supply basins.

By relying on the metaphorical image of di Lampedusa's *Leopard*, we have striven to reveal the processes underlying the lack of change and the conservatism at play in the *massif* of *Landes de Gascogne*. Identifying the commonalities of its major operators, we have also shown that these 'leopards' were neither fully aligned in their interests, nor omnipotent in their discursive strategies. Silvicultural orientations appears neither steered towards fully intensive, segregated, biomass-oriented practices (eg. the refusal of semi-dedicated plantation), nor towards diversified, multifunctional, timber production (see the fate of species specification). They illustrate that, although different visions of the future of the massif emerged during the crisis, a preference for a model in continuity with 'prestorm' conditions has come to prevail, in a consensus that, albeit not optimal, is still in favor of the dominant operators.

Sofar, the unique interwoven argument backing their views may be expected to hold: "the *massif* should remain a cultivated forest, it is multifunctional in its own way, and it ought to be so because it is the support to an integrated wood chain". But this entanglement of the integration, multifunctionality and cultivation discourses may also unfold in contrasted directions in a near future. Preliminary works on a spatial planning and sustainable

[11] Combining biomass production, with a first felling at nine years, and regular timber, with a final harvest at 35 years. The reluctance of owners was hinted by one of our interviewees (S08): "We considered the semi dedicated for a while, but it is marginal (1-2%) and will remain so".

development directive (*Directive Territoriale d'Aménagement et de Développement Durable*) confirms via the statement of common 'values and objectives for the Landes de Gascogne massif' the strong appeal of the current status quo. Yet, for the three streams of discourses articulating continuity and change that we identified, a strategic use may function in one way –*i.e.* how in spite of discourses the evolutions of the cultivated *massif* could remain minor - or the other – possible dramatic changes could happen in the 'multifunctional' and 'integrated' perspectives. Both contrasted trajectories may serve the interests of major operators but in any case they would require a strong discursive effort to be kept within the enduring figure of the *massif*. Concealing confusions and ambiguities, the *massif* would then be maintained in the form of a lowest common denominator. But potential fissiparous dynamics should also be considered, depending on the ability of operators with various tropes (*e.g.* environmentalist, urban, agrarian…) to impose alternative planning conceptions, with a self-assumed fragmentation logic.

While we adopted a deliberately empirical and under-theorized view of the *massif* throughout this paper, we acknowledge its fluid and relational nature to be redolent in the Anglophone literature of concepts of regions, assemblages and landscapes (Brace and Geoghegan, 2011; Jones et al., 2013). Applied to Landes of Gascony, the latter term would convey a constructed dimension, enabling and suggesting the following distinctive qualifications: of landscapes in need of intervention, landscapes that have to be tended for.

Shadow landscapes, introduced by (Bryant et al., 2011) as marked by marginality, scale, socio-nature and cultures of depopulation, may be relevant here, considering how Landes of Gascony had been for long defined as underdeveloped and depopulated[12]. The point being here not so much how a weight of history is experienced by landowners and managers, but instead how they share the mere interiorization of an anterior state of the forest: a desert, whose comeback should be avoided at any cost. A closely related feature of the Gascony case would be the strong agreement, even among environmentalist smallholders and urbanite newcomers, to recognize the *massif* as a set of *working* landscapes (Walker and Fortmann, 2003), entailing in a labor-intensive view both ideas of production and stewardship[13].

The Landes of Gascony *massif* is thus more than ever a paper forest (Robbins, 1998): beyond the material dimension, a set of future states and uses, desired or not, entwining diverse human standpoints on *identity*, *adversity* and *labor*. An enduring idea purposely shaped by private operators, it will henceforth evolve in new settings, including a *de facto* diminished and uncertain role of the State (Buijs et al., 2014; Sergent et al., 2018).

Acknowledgments

This work, carried out as part of the research project 'Integral' (www.integral-project.eu), received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 282887.

The authors address their warm thanks to Marc Maindrault, who undertook a large share of the survey.

[12] It was the very marginalization of the Landes landscapes and their inhabitants that was key to the justification of the afforestation – as a form of interior colonization (Aldhuy, J., 2010. La transformation des Landes de Gascogne (18e-19e), de la mise en valeur comme colonisation intérieure? C*onfins. Revue franco-brésilienne de géographie/Revista franco-brasilera de geografia* 2010.)- by state engineers. A parallel could easily be drawn with the case of mountains, where both the places (*i.e.* mountain massifs such as the Alps or Pyrenees) and their dwellers had to be painted as backwards Debarbieux, B., 2008. Construits identitaires et imaginaires de la territorialité : variations autour de la figure du « montagnard ». *Annales de géographie* 2008/2, 90-115. before coming to bear high stakes of planning and development for the central State.

[13] An illustration could be provided from a later stage of our research, aiming in a dedicated workshop at the identification of desired levels of ecosystem services. We were indeed faced with repeated demands from our attendees to keep the provision of jobs as a service provided by 'their' forest landscapes.

References

Aldhuy, J., 2010. La transformation des Landes de Gascogne (18e-19e), de la mise en valeur comme colonisation intérieure? *Confins. Revue franco-brésilienne de géographie/Revista franco-brasilera de geografia* 2010.

Alexandre, S., Gault, J., Guerin, A.-J., Lefebvre, E., De Menthiere, C., Rathouis, P., Texier, P.-H., Thibault, H.-L., Toussaint, X., Attali, C., Roy, C., 2012. *Les usages non alimentaires de la biomasse*. Ministère de l'écologie, du développement durable et de l'énergie; Ministère de l'agriculture, de l'agroalimentaire et de la forêt; Ministère du redressement productif, Paris.

Alliance Forêts Bois, 2012. *Manifeste en faveur des forêts de plantation en France*. CAFSA, COFOGAR, FORESTARN, Cestas.

Arnould, P., Marty, P., Simon, L., 2002. Deux siècles d'aménagements forestiers : trois situations aux marges méridionales de la France. *Ería* 58, 251-267.

Bouisset, C., Pottier, A., 2009. Les Landes de Gascogne : de la forêt cultivée au patrimoine naturel ?, in: Lazlaz, L. (Ed.), *Espaces protégés et territoires. Conflits et acceptation*. Belin, Paris, pp. 35-47.

Brace, C., Geoghegan, H., 2011. Human geographies of climate change: Landscape, temporality, and lay knowledges. *Progress in Human Geography* 35, 284-302.

Brown, J.C., Purcell, M., 2005. There's nothing inherent about scale: political ecology, the local trap, and the politics of development in the Brazilian Amazon. *Geoforum* 36, 607-624.

Bryant, R.L., Paniagua, A., Kizos, T., 2011. Conceptualising 'shadow landscape' in political ecology and rural studies. *Land Use Policy* 28, 460-471.

Buijs, A., Mattijssen, T., Arts, B., 2014. "The man, the administration and the counter-discourse": An analysis of the sudden turn in Dutch nature conservation policy. *Land Use Policy* 38, 676-684.

Candau, J., Deuffic, P., 2009. Une concertation restreinte pour définir l'intérêt général des espaces forestiers. Regard sur un paradoxe. *VertigO-la revue électronique en sciences de l'environnement*.

Cazals, C., Deuffic, P., Sergent, A., Ginelli, L., 2013. La forêt, un patrimoine au prisme de l'écologisation: le cas des Landes de Gascogne. *VertigO-la revue électronique en sciences de l'environnement*.

Colin, A., Meredieu, C., Labbé, T., Bélouard, T., 2010. *Étude rétrospective et mise à jour de la ressource pin maritime du massif des Landes de Gascogne après la tempête Klaus*. Convention MAAP / IFN n° E18 p. 39.

Debarbieux, B., 2008. Construits identitaires et imaginaires de la territorialité : variations autour de la figure du « montagnard ». *Annales de géographie* 2008/2, 90-115.

Dehez, J., 2012. *L'ouverture des forêts au public: Un service récréatif*, Update, Science & Technologie. Editions Quae, Paris, p. 165.

Deuffic, P., Moustié, J., 2010. *Pins et feuillus, entre doutes et incertitudes. Les forestiers des Landes de Gascogne et la question de la multifonctionnalité des boisements feuillus après la tempête de 2009*. Report for Conseil régional d'Aquitaine, CCRRDT 2007, convention n°20071204003, Cemagref, Cestas, p. 113.

Di Lampedusa, G.T., 2010. *The Leopard*. Random House.

Dupuy, F., 1996. *Le pin de la discorde. Les rapports de métayage dans la Grande Lande*. Éditions de la Maison des sciences de l'homme, Paris.

Feranec, J., Hazeu, G., Christensen, S., Jaffrain, G., 2007. Corine land cover change detection in Europe (case studies of the Netherlands and Slovakia). *Land Use Policy* 24, 234-247.

Fuller, R.J., 2013. Searching for biodiversity gains through woodfuel and forest management. *Journal of Applied Ecology* 50, 1295-1300.

Gautier, D., Hautdidier, B., Gazull, L., 2011. Woodcutting and territorial claims in Mali. *Geoforum* 42, 28-39.

Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., Tyukavina, A., Thau, D., Stehman, S.V., Goetz, S.J., Loveland, T.R., Kommareddy, A., Egorov, A., Chini, L., Justice, C.O., Townshend, J.R.G., 2013. *High-Resolution Global Maps of 21st-Century Forest Cover Change*. (Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest). Science 342, 850–853.

Hausermann, H., 2014. Maintaining the Coffee Canopy: Understanding Change and Continuity in Central Veracruz. *Human Ecology* 42, 381-394.

Jessop, B., Brenner, N., Jones, M., 2008. Theorizing sociospatial relations. *Environment and Planning D: Society and Space* 26, 389-401.

Jones, L., Mann, R., Heley, J., 2013. Doing space relationally: Exploring the meaningful geographies of local government in Wales. *Geoforum* 45, 190-200.

Laffite, J.-J., Lerat, J.-F., 2009. *Reconstitution des peuplements forestiers détruits par la tempête du 24 janvier 2009 dans le massif forestier des Landes de Gascogne*, Rapport CGAAER n°1928. Conseil général de l'agriculture, de l'alimentation et des espaces ruraux, Paris, p. 96.

Lambin, E.F., Meyfroidt, P., 2010. Land use transitions: Socio-ecological feedback versus socio-economic change. *Land Use Policy* 27, 108-118.

Manciet, B., 1981. *Le triangle des Landes* Éditions de l'Ateliers, Pau.

Martres, J.-L., 2010. La faute politique, *Forêt de Gascogne*. Maison de la forêt, Bordeaux.

Mather, A.S., Fairbairn, J., Needle, C.L., 1999. The course and drivers of the forest transition: The case of France. *Journal of Rural Studies* 15, 65-90.

Maugé, J.-P., Léonard, J., 1969. La ligniculture du pin maritime. *Revue Forestière Française* XXI, 489-498.

Mora, O., 2008. *Les nouvelles ruralités à l'horizon 2030*. QUAE, Versailles.

Mora, O., Banos, V., 2014. La forêt des Landes de Gascogne : vecteur de liens ? *VertigO - la revue électronique en sciences de l'environnement*.

Mora, O., Banos, V., Carnus, J.-M., Regolini, M., 2012. *Le massif des Landes de Gascogne à l'horizon 2050*. Rapport de l'étude prospective. Conseil régional d'Aquitaine-INRA, p. 290.

Mora, O., Banos, V., Regolini, M., Carnus, J.-M., 2014. Using scenarios for forest adaptation to climate change: a foresight study of the Landes de Gascogne Forest 2050. *Annals of Forest Science* 71, 313-324.

Mormont, M., 2009. Globalisations et écologisation des campagnes. *Études Rurales*, pp. 143-159.

Nougarède, O., 1995. *Discours sur la Grande Lande. Archéologie de la constitution et de la transmission d'un patrimoine d'écrits idéologiques sur la mise en valeur des Landes de Gascogne du XVII^e^ au XX^e^ siècle*. INRA, Unité STEPE, Ivry-sur-Seine, p. 287.

ONF, 2006. *Schéma Régional d'Aménagement. Sud-Ouest Aquitaine. Dunes littorales de Gascogne*. ONF Sud-Ouest, Toulouse, p. 118.

Pawson, S.M., Brin, A., Brockerhoff, E.G., Lamb, D., Payn, T.W., Paquette, A., Parrotta, J.A., 2013. Plantation forests, climate change and biodiversity. *Biodiversity and Conservation* 22, 1203-1227.

Peluso, N.L., 2012. What's Nature Got To Do With It? A Situated Historical Perspective on Socio-natural Commodities. *Development and Change* 43, 79-104.

Peyron, J.-L., Yvon, P., 2012. *Pour une gestion forestière et une filière forêt-bois multifonctionnelles, économiquement efficaces, écologiquement viables, socialement acceptables.* MEEDDM / Direction générale de l'aménagement, du logement et de la nature, MAAP / Direction générale des politiques agricole et agroalimentaire et des territoires.

Pirard, R., Irland, L.C., 2007. Missing links between timber scarcity and industrial overcapacity: Lessons from the Indonesian Pulp and Paper expansion. *Forest Policy and Economics* 9, 1056-1070.

Pottier, A., 2010. Quand la forêt est patrimonialisée : les enjeux du cadre forestier du bassin d'Arcachon. *Sud-Ouest européen* 30, 125-138.

Pottier, A., 2014. Le massif forestier des Landes de Gascogne, un patrimoine naturel ? Le regard des gestionnaires. *Annales de géographie* 4/2014, 1016-1038.

Ribereau-Gayon, M.-D., 1993. Re-production identitaire dans les Landes de Gascogne. *Écologie humaine* XI, 71-85.

Ribereau-Gayon, M.-D., 2001. *Chasseurs de traditions - l'imaginaire contemporain des Landes de Gascogne.* Éditions du Comité des Travaux Historiques et Scientifiques, Paris.

Ribereau-Gayon, M.-D., 2011. La légitimité de la forêt des Landes de Gascogne du XIX^{e} siècle à la tempête de 2009, in: PNR Landes de Gascogne, Société de Borda (Eds.), *Tempêtes sur la forêt landaise. Histoires, mémoires*. L'Atelier des Brisants, Mont-de-Marsan, p. 243.

Robbins, P., 1998. Paper Forests: Imagining and deploying exogenous ecologies in arid India. *Geoforum* 29, 69-86.

Robbins, P., Fraser, A., 2003. A Forest of Contradictions: Producing the Landscapes of the Scottish Highlands. *Antipode* 35, 95-118.

Rudel, T.K., Coomes, O.T., Moran, E., Achard, F., Angelsen, A., Xu, J., Lambin, E., 2005. Forest transitions: towards a global understanding of land use change. *Global Environmental Change* 15, 23-31.

Rudel, T.K., Schneider, L., Uriarte, M., 2010. Forest transitions: An introduction. *Land Use Policy* 27, 95-97.

Sargos, J., 1997. *Histoire de la forêt landaise. Du désert à l'âge d'or.* L'Horizon chimérique, Bordeaux.

Sargos, R., 1949. *Contribution à l'Histoire du boisement des Landes de Gascogne*. Editions Delmas, Bordeaux.

Sergent, A., 2014. Sector-based political analysis of energy transition: Green shift in the forest policy regime in France. *Energy Policy* 73, 491-500.

Sergent, A., Arts, B., Edwards, P., 2018. Governance arrangements in the European forest sector: Shifts towards 'new governance' or maintenance of state authority? *Land Use Policy* 79, 968-976.

Sergent, A., Deuffic, P., Banos, V., Hautdidier, B., Maindrault, M., 2013. *Cultivated, multifunctional and integrated forest landscapes? An overview of the factors influencing forest management in the 'Pontenx' case study (Landes de Gascogne, France)*, INTEGRAL WP3.1 Case Study Reports, p. 127.

Slee, B., Roberts, D., Evans, R., 2004. Forestry in the rural economy: a new approach to assessing the impact of forestry on rural development. *Forestry* 77, 441-453.

Sotirov, M., Arts, B., 2018. Integrated Forest Governance in Europe: An introduction to the special issue on forest policy integration and integrated forest management. *Land Use Policy* 79, 960-967.

Storch, S., Winkel, G., 2013. Coupling climate change and forest policy: A multiple streams analysis of two German case studies. *Forest Policy and Economics* 36, 14-26.

Swyngedouw, E., 2013. Into the Sea: Desalination as Hydro-Social Fix in Spain. *Annals of the Association of American Geographers* 103, 261-270.

Trichet, P., Jolivet, C., Arrouays, D., Loustau, D., Bert, D., Ranger, J., 1999. Le maintien de la fertilité des sols forestiers landais dans le cadre de la sylviculture intensive du pin maritime. *Étude et Gestion des Sols* 6, 197-214.

Trichet, P., Loustau, D., Lambrot, C., Linder, S., 2008. Manipulating nutrient and water availability in a maritime pine plantation: effects on growth, production, and biomass allocation at canopy closure. *Annals of Forest Science* 65, 814.

Vidal de La Blache, P., 1908. *Tableau de la géographie de la France.* Hachette.

Walker, P., Fortmann, L., 2003. Whose landscape? A political ecology of the 'exurban' Sierra. *Cultural Geographies* 10, 469-491.

Weiner, J., 2015. *Package 'riverplot'*. CRAN.