



Treework Environmental Practice

Treework Seminars: Seminar 20 In association with



Tree-lined Routes and the Linear Forest

A new vision of connected landscapes

Wednesday 25th November 2015

Jodrell Laboratory Lecture Theatre, Royal Botanic Gardens, Kew



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Programme of Presentations on 25th November 2015

Tree-lined Routes and the Linear Forest

A new vision of connected landscapes

8.30	REGISTRATION & COFFEE	
9.10	Introduction and welcome	Tony Kirkham Royal Botanical Gardens, Kew
	SESSION 1: CONCEPTS OF LINEAR FORESTS - NATIONAL & INTERNATIONAL PERSPECTIVES CHAIR - NEVILLE FAY , Treework Environmental Practice	
9.15	Setting the Scene <i>The concept and potential of the linear forest</i>	Neville Fay Treework Environmental Practice
9.25	Tree-lined Routes as Natural Assets <i>European conservation initiatives</i>	Piotr Tyszko-Chmielowiec Roads for Nature, Poland
9.50	UK Tree-lined Roads <i>Biodiversity and green infrastructure</i>	Tony Sangwine Highways England
10.15	The Big Linear Forest Infrastructure <i>The UK rail contribution to health and wellbeing</i>	Dr Neil Strong Network Rail
10.35	Questions	
10.50	REFRESHMENTS	
11.20	SESSION 2: UNINTENDED CONSEQUENCES OF PROTECTING CARS CHAIR – ROBERT HUXFORD , Director, Urban Design Group,	
11.25	Forgiving Roads <i>Regulations Threatening Tree-lined Routes</i>	Chantal Pradines Cabinet All(i)ée
11.45	Forgiving Roads and Linear Deserts <i>A European dichotomy: saving cars, scrapping trees</i>	Katharina Brückmann BUND (Friends of the Earth), Germany
12.10	Issues at the Coal-face of Urban Street Trees <i>The Sheffield experience</i>	Prof Ian Rotherham Sheffield University
12.20	The Risks of Risk Managing Everything <i>Road Safety Audits, a road to nowhere?</i>	Prof David Ball DARM, Middlesex University
12.45	Questions	
1.00	LUNCH	
	SESSION 3: CASE STUDIES CHAIR - RUSSELL HORSEY , Deputy Director, ICF	
2.00	<i>The Significance and Potential of the Linear Forest</i>	Russell Horsey Institute of Chartered Foresters (ICF)
2.10	<i>Tree-lined Route Creation Utilising Established Trees: Sustaining the rooting environment beneath new hard surfacing and increased levels</i>	Owen Hutchison Geosynthetics LTD
2.20	<i>A Pilot Study to Value the Natural Capital of the Area 1 Highways Network</i>	Kenton Rogers Treeconomics
2.30	<i>Highways Engineering Poetry</i>	Stephen O'Malley Civic Engineers
2.40	<i>The Art of the Possible: Revisiting the use of highway trees with Lyon, Bristol, Hackney and Auckland</i>	Anne Jaluzot Trees and Design Action Group (TDAG)
2.50	<i>The Biomass Potential of the Road and Rail Soft Estate</i>	Clare Warburton Natural England
3.00	<i>Linear Infrastructure Networkd (LINet)</i>	Nick White Natural England
3.10	SHORT COMFORT BREAK	
3.30	SESSION 4: POLICY POTENTIAL CHAIR – DR GEMMA HARPER , Chief Social Scientist, DEFRA	
3.40	Integrating Tree-lined Routes into Local Economies Linear forests, alley cropping and tourism potential	Kamil Witkoś-Gnach Roads for Nature, Poland
4.05	Edge of Existence <i>The vulnerability of trees outside woods</i>	Dr Nick Atkinson The Woodland Trust
4.30	Recognising the Linear Forest <i>Quantifying its extent and services</i>	Dr Mark Broadmeadow Forestry Commission
4.55	Forum	Discussion on policy implications
5.20	Summing Up - Where next?	Neville Fay
5.30	DEPART	



Chantal Pradines

Expert to the Council of Europe
Cabinet All(i)ée



Chantal Pradines is a graduate engineer of the Ecole Centrale de Paris. She has worked as a consultant in soil mechanics and on road projects. As an Expert to the Council of Europe, she delivered the report 'Road Infrastructures: Tree Avenues in the Landscape', which was published in 2012 by the Council of Europe in 'Landscape Facets. Reflections and Proposals for the Implementation of the European Landscape Convention'. The report makes important recommendations for the preservation of tree avenues based on best practice identified across Europe. She has contributed to several publications and delivered conferences about the advantages of avenues as a cultural, natural and landscape asset. She has compared the road safety risk in different French 'départements' and showed that there is no correlation with the number of avenue trees. The results of this study were published and presented at the Belgian Road Congress in 2013. She supports actors around Europe to foster positive policies regarding tree avenues, a common cultural heritage.

Forgiving Roads: Regulations Threatening Tree-lined Routes¹

Original text in French. Translation by Treework Environmental Practice.

Summary

Road safety, with its all too human dramas, is a major social issue that affects everybody.

Like ditches, embankments, rock faces, signposts, structures etc., roadside trees constitute obstacles that can prove fatal when struck by vehicles veering off the carriageway. For many years, engineers across the world have imposed the concept of the 'forgiving road', and have considered trees as obstacles that must be removed, shielded from the road or at the very least planted beyond a so-called 'safety zone'. Since the 1960s, this approach has led to the gradual disappearance of many tree avenues.

The positive effects of tree avenues on road safety and their compatibility with a 'Safe System' have been demonstrated in various studies. This must be taken into account in a systemic way; only then will we be able to maximise welfare by preserving the important cultural, natural and intrinsically European landscape features that are tree avenues. A report published by the Council

of Europe in the framework document 'Reflections and Proposals for the Implementation of the European Landscape Convention' has already made similar recommendations.

The concept of 'forgiving roads' (or 'forgiving roadsides') may be suitable for manmade objects such as signposts, but a different approach that excludes trees from its scope is required. Public opinion on this issue is strong, and it is important that it is considered in national and European policies on road safety.

Forgiving Roads: The Dominant Concept in the Treatment of Roadside Obstacles

Since 1967, the problem of roadside obstacles has led the American Society of State Highway and Transportation Officials (AASHTO) to standardise 'clear zones' (or 'safety zones'), i.e., areas next to the carriageway that should be kept free of obstacles. In 1988, following a study by the National Transportation Safety Board on trees, such zones were adopted as standard in the AASHTO roadside design guide. Similar work was carried out at the same time in France: Circular 84-81 on tree avenues defines a minimum distance of 4 m between the pavement edge and trees. The circular also provides for the possibility of keeping existing trees close to roads if shielded from the carriageway by the installation of crash barriers. These two measures aim to give drivers a 'right of error' and lessen the consequences of a vehicle running off the carriageway: the principle of the 'forgiving road'.

In Europe, road safety is a European Community competence. Between 2002 and 2007, the European Union (EU) funded a great number of research projects. Many of these projects – iASP, RISER, RIPCORD, SUPREME, RANKERS – dealt with roadside obstacles directly and indirectly, through safety ratings and Road Safety Inspections (RSI). Road Safety Inspections (also called Road Safety Audits of existing roads) stem from the Road Assessment Programmes (RAP) developed in 2001 with the launch of EuroRAP by the European automobile clubs and associations. These inspections and safety ratings of road infrastructure normally cover both the road itself and the surrounding environment. In fact, following the logic of 'forgiving roads', they focus on roadside obstacles being likely to aggravate the consequences of any accident².

The principle of the forgiving road is further enshrined in the Safe System approach, also known as Vision Zero, which was introduced by Sweden and the Netherlands. In addition to allowing for a right of error, Vision Zero holds that the responsibility for ensuring that road accidents do not lead to serious or fatal injury is shared by all stakeholders. The adoption of the Safe System approach by all countries was first promoted at an international level in 2008 with the publication of the ITF/OECD report 'Towards Zero: Ambitious Road Safety Targets and the Safe System Approach'. The approach was included in the Action Plan for the United Nations 2011-2020 Decade of Action for Road Safety.

With the publication of guidelines for road safety inspections in EU Directive 2008/96/EC in 2008, the application of the 'forgiving road' concept became mandatory at the EU level across the Trans-European Road Network (TERN), which comprises a network of 70,000 km of motorway and high quality roads. In fact, its application is gradually being extended to the low traffic road network in various EU countries, with, again, a strong emphasis



on the treatment of roadside obstacles³. In 2013, the Conference of European Directors of Roads (CEDR) published a Forging Roadsides Design Guide based on the findings of the EU RISER research project. This followed the Strategic Plan 2009-2013, which set the design of forgiving roads as one of its top priorities. In 2015, the Student Essay Competition of the International Road Federation (IRF) stated that 'the concept of the Road Safety Audits is becoming more popular in many countries, and it is very likely that it will become mandatory in the future' (International Road Federation 2015).

Although Road Safety Audits (RSAs) strictly speaking only apply to new road projects, the boundary between RSAs and RSIs is not clear, and it is likely that we will see, in the various guidelines and regulations, the compulsory application of Road Safety Inspections to all types of roads, with the resulting widespread compulsory 'treatment' of roadside obstacles.

The Forging Road – A Concept that Raises Questions

The desire to reduce the consequences of road accidents is a justified aim, and one that is naturally very meaningful for the victims of such accidents and their families. However, as it is known that driving error is more likely to lead to impact with another road user than with a tree⁴, is it satisfactory that the Safe System, by nature, focuses on fatal and serious injury prevention rather than crash prevention in general, and accepts driver error as inevitable⁵?

Changing the behaviour of road users is crucial in improving road safety. Does the message that is sent by constructing and publicising⁶ road environments from which trees have been removed completely or distanced really encourage cautious and responsible driving? Does it not, on the contrary, encourage drivers to take more risks?

As a parallel example, how else can we explain, other than by a decrease in vigilance by parents, why young children in France continue to drown in the family swimming pool despite the presence of mandatory barriers? Aside from the greater risk-taking that the concept of the forgiving road might encourage, does it not lull us, as with all safety measures that fail to address education and sense of personal responsibility, into a false sense of security that puts us, and the other road users with whom we must interact⁷, in danger?

Can we develop a sense of prudence, indispensable when driving, without being acquainted with danger? In one French county (département), childminders were obliged to remove all poisonous plants from their grounds. How will children learn to avoid such plants if they are unable to recognise them when they encounter them in the wider world where they are left to grow?

In 1970, the then French president Pompidou wrote: 'Safeguarding the trees planted along our roads [...] is essential for the beauty of our country, to protect nature and to safeguard a human environment' (Pradines, 2012). Is lack of safety on the roads not a form of the violence that makes our societies sick? Will we really cure our societies by removing beauty?

Ultimately, does Vision Zero not put us collectively in danger by depriving us of a sense of responsibility for ourselves, of the

ability to reflect and of the ability to make decisions for ourselves, opening the door to submission and exploitation by the excesses of totalitarianism in all its forms?

The Consequences of Forging Roads for Roadside Trees

Over the last 30 years or more, measures for the treatment of roadside obstacles inspired by the principle of forgiving roads have principally been applied to roadside trees⁸, and have led to the disappearance of many tree avenues. The explanations are simple: the installation of recommended crash barriers in front of existing trees is usually impossible (for example, due to insufficient working width for the barriers or large numbers of closely spaced driveways and resident accesses), which leads to wholesale felling. Due to problems with road profiles and level variation next to the carriageway but mostly due to a lack of space, the felled trees cannot be replaced by new planting further away. Finally, the recommended safety distances alter the intrinsic character of tree avenues by breaking the close link between the trees and the carriageway, reducing the 'colonnade' effect and preventing a canopy 'vault' from forming over the road.

The Seine-et-Marne county offers a telling illustration of the problem. Following the publication of Circular 84-81 in 1984, it was a pilot county in establishing an effective management policy for its avenue heritage, supported by a competent technical service dedicated to the management of its roadside trees. It went from possessing 28,000 roadside trees planted along 360 km of road in 1987 to having just 16,846 roadside trees along 200 km of road in 2012, a loss of 40% in number and 44% in linear distance. Circular 84-81, later complemented by Circular 89/64, which set a target to double the number of roadside trees by 2010, was developed with the aim of reconciling road safety with preserving the heritage of tree avenues. Thirty years on, we can only note its failure.

The situation is repeated elsewhere in France and Europe. The problems of available space have led the government of Mecklembourg-Vorpommern to retain planting distances determined by volume of traffic (1.5 m from the road edge for roads carrying up to 2,500 vehicles per day, for example), and reduce the planting distance for roads with an annual average daily traffic of more than 5,000 vehicles per day from the original 4.5 m to 3.5 m.



Figure 1. The Swedish government had to adapt to the particular features of the local terrain (embankment, forest, stone walls) in replanting this avenue.



Trees Make Roads Safer

The aesthetic character of roads has a positive effect on driving, as demonstrated by Dottenborg (2002). Road users, whether in an urban or rural environment, associate this aesthetic character with the landscape quality and the presence of vegetation, particularly trees in rows (Ellinghaus and Steinbrecher, 2003), and show a preference for large mature trees (Dottenborg, 2002). Both observation and simulator studies have reported a significant decrease in driving speeds in the presence of trees (Naderi, Kweon and Maghelal, 2008), with reductions of up to 5% in one study (Dottenborg, 2002). It has also been shown that driving in an environment with trees increases drivers' tolerance of frustration (Cackowski and Nasar, 2003). Thus, it can be surmised that the presence of trees leads to calmer and safer driving. In France, markedly more cautious driving behaviour was observed on a long avenue of plane trees (Boudong, Ronchin and Teule, 2005).

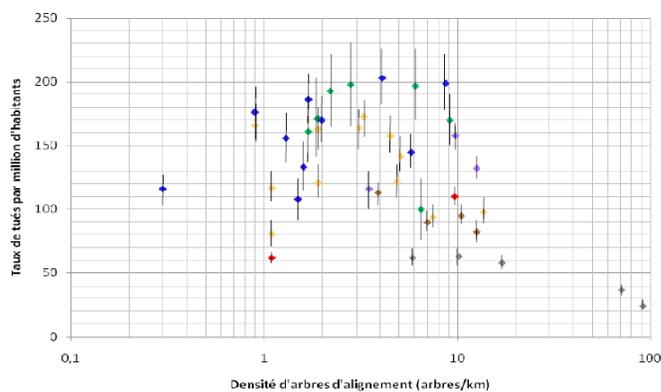


Figure 2. Fatality rates per million inhabitants versus density of avenue trees across counties (average rate over the 2001-2005 period, with 95% confidence interval indicated) (Pradines and Marmier, 2011)⁹.

The positive effect of trees cannot be quantified in terms of 'victims saved'. Looking only at the number of victims of accidents involving trees (or their proportion of total road accident victims), as is customary, is insufficient. Looking at the risk of being killed or injured at the county scale, however, identified that, even if one cannot directly show their positive impact, roadside trees are not incompatible with a safe road system. There is no correlation between the risk to which road users are exposed in a given area and that area's population of roadside trees. A density of trees that is 20 times greater is not incompatible with a risk that is three times lower. Taking into account the presence of crash barriers or greater distances between trees and the carriageway does not change the overall picture (Pradines and Marmier, 2011). The results reflect the overall balance between the positive and negative influencing factors, and highlight the complexity of the socio-technical system that roads and their users constitute.

This very complexity justifies the systemic approach promised by the Safe System. However, the forgiving roads approach and its treatment of roadside obstacles, and chiefly trees, does not offer the systemic and detailed method that one might expect for such a complex system. It merely comprises a catalogue of broad-brush measures for trees – removal, shielding with crash barriers, planting beyond the so-called 'safety zone' – that have been applied since the 1960s. These measures consider trees solely as obstacles that aggravate the consequences of a run-off-road accident, without considering their proven positive effect on road safety¹⁰ or at least

questioning the results of institutional research programmes¹¹ or simple accidents statistics¹².

A forgiving road is not just a road that avoids or mitigates the negative consequences of driving errors; it should actively counteract or prevent such errors (International Transport Forum, 2015). This is the case with 'self-explaining roads', that is, roads that elicit safe driving behaviour simply by their design, and thereby reduce the likelihood of driving error (International Transport Forum, 2015). Roadside trees, and in particular avenues of trees, play an important role in the 'explanation', signalling bends, crossroads and approaches to built-up areas more efficiently than road signs. This ability derives from their size and planting arrangement, particularly when it is linear, which makes them more easily and more permanently visible. A procession of roadside trees moderates perceptions of speed. The results of the aforementioned studies confirm these assertions.

In 2007, following an audit of local policies on road safety, the highest levels of the French administration recommended that 'the past policy of the systematic felling of tree avenues . . . must give way to genuine safety policies for the road environment that integrate the new concept of traffic calming¹³ and respect for the natural heritage' (Florenne, Podevin, Liebermann, Ferrier, Thureau, d'Aubreby, Lauro and Lebrun, 2007). This recommendation has unfortunately not been acted upon.

Welfare Maximisation through Roadside Trees

It is now recognised that roadside trees, and in particular tree avenues and ancient trees, form an ecological network of considerable value (Pradines, 2014), are landmarks in the landscape and are a rich source of European cultural heritage. They also support large-scale tourist projects such as the German Avenue Route (Deutsche Alleenstraße; Pradines 2012). Their importance is reflected in the publications of various academics¹⁴, in the regulations to protect them promulgated in various regions and countries of Europe, and in the interest in their heritage shown by the Council of Europe¹⁵.

If we add to these values the fact that tree avenues do not prevent a Safe System, as shown in Pradines and Marmier (2011), then we can talk about their welfare maximisation.

Civil society is well aware of this welfare maximisation. In France, in Germany, in the Czech Republic and in Poland, local groups and NGOs are particularly active in promoting and preserving tree avenues. In France, a survey carried out by the Haut-Rhin county found that 89% of road users found lines of trees next to the roadside 'pleasant' (Conseil Départemental du Haut-Rhin, 2015). In several polls carried out by French newspapers in 2015, the question 'should we fell trees alongside roads?' attracted negative responses of 74% to 78%. These results agree with previous findings in France and Germany, and with the opinion of a citizen's jury convened in 2006 in one French county that voted unanimously in favour of keeping roadside trees and increasing the existing provision.

This cultural attachment to the heritage of roadside trees is not questioned even when it comes to road safety. Following the announcement in early 2015 of the possible roll-out of Road Safety Inspections across the entire road network, a French petition stating that improved road safety should not be achieved at the



expense of roadside trees garnered more than 8,400 signatures¹⁶. Seventeen major French associations with an interest in tree avenues (including nature preservation, countryside preservation and cultural heritage associations as well as associations of arboriculture and landscape professionals) have directly petitioned various French ministers. In Germany in 2010, 16,000 signatures were collected in support of keeping and planting tree avenues in Brandenburg state. Two hundred personalities and authority figures signed a European Manifesto on Tree Avenues 'in view of the fact that road safety can be achieved more effectively by taking action to improve the characteristics of the carriageways, the behaviour of road users and the public transport offer'.

None of this support should come as a surprise: 'human needs and value systems are complex and multi-dimensional; [...] while safety is certainly one of the more basic human needs, it is not the only one' (DaCoTA, 2012). This is why we make choices in which safety is not always at the forefront: we prefer travelling in cars over trains because they are more practical and cheaper; in bicycles over cars because they are more environmentally friendly. However, with each choice, the risk to which we expose ourselves or our children increases 10-fold, ultimately increasing the risk 100-fold.

Despite this basic reality of human nature, Vision Zero, the product of highly specialist engineers, explicitly rules out any tradeoff of the objective of zero deaths or serious injuries against other policy objectives. As a consequence, institutional research is not interested in how a roadside safety treatment affects the environment (Elvik, Vaa, Høy and Sørensen, 2009). Further, in promoting the joint responsibility of drivers and road managers, Vision Zero without fail discourages the latter from concerning themselves with other dimensions of human needs and other value systems. That approach is justified for purely manmade obstacles like signposts, which can be easily moved without interfering with their function, but it is not the same for trees, with their incredible cultural, environmental and landscape value. The controversy that regularly erupts over programmes of tree felling is a sign that this reality has not been taken into account.

When the politician and man of letters President Pompidou examined the question of roadside trees with a global perspective on society, his conclusion was clear: 'France was not made solely to permit French people to travel by car, and whatever the importance of road safety problems, they should not result in the disfigurement of her landscape' (Pradines, 2012). This, of course, applies to all countries, and as has been shown, road safety does not have to suffer.

Conclusion

For more than 30 years, the application of the concept of 'forgiving roads' and the associated Road Safety Inspections and Road Assessment Programmes has failed to preserve our heritage trees.

In 2009, the report 'Road Infrastructures: Tree Avenues in the Landscape' was presented at the conference of the European Landscape Convention of the Council of Europe. It recommended the cessation of all practices stigmatising roadside trees, particularly relating to road safety, instead undertaking measures to encourage responsible behaviour on the part of all road users' (Pradines, 2012).

In light of the studies that show that roadside trees and Safe Systems for all road users are fundamentally not incompatible, this recommendation must, more than ever, guide national and European road safety policies present and future. A more moderate approach to the concept of Forgiving Roads that excludes trees from its scope is required. Civil society has strong expectations on the matter.

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Footnotes

1. I use the terms 'avenues' or 'tree avenues' to indicate a route 'lined with trees that have been deliberately planted at regular intervals on either side of the carriageway, be it a route through a park, an urban thoroughfare or a country road', as recommended in the Council of Europe Report (Pradines, 2012).
2. As demonstrated, for example, by the specific inspections of such



- obstacles carried out in France in 2012.
3. Since 2002, France has applied specific guidelines on roadside trees that incorporate the provisions of Circular 84-81. Luxembourg established a working group on Road Safety Audits for existing roads in 2007. Germany adopted rules covering the installation of crash barriers in 2009 (Richtlinien für passiven Schutz an Straßen durch Fahrzeug-Rückhaltesysteme – RPS). In 2011, the Walloon region of Belgium adopted guidelines on the treatment of roadside obstacles based on the 2002 French guidelines.
 4. In France, 63% of people killed on the roads in 2011 were involved in an accident with a third party.
 5. One could equally question whether the aim is to be more tolerant of the errors of certain users over those of others. Shielding trees from the road by the installation of crash barriers without secondary rails, as is usual practice, raises the level of danger in an accident for motorcyclists, who are already exposed to a higher risk on the roads.
 6. In early 2015, a primetime French television news programme reported the announcement of the government road safety initiative to encourage Road Safety Audits for new roads with an image of an existing avenue of 100-year-old plane trees (*Platanus* sp.) on which large red crosses had been drawn to indicate that they would be felled.
 7. In France in 2014, the proportion of road deaths among the most vulnerable road users (pedestrians and cyclists) increased by 8%, compared with an overall rise in road deaths of 3.7%. Improving the safety of vulnerable road users should be the focus of the planned revision to the relevant EU legislation.
 8. It is noteworthy that the detailed database analysis conducted in the RISER project resulted in trees being assigned a severity index (number of fatal accidents per roadside collision) of 63%, whereas sloping ground had an index of 48% (Roadside Infrastructure for Safer European Roads, 2006).
 9. The density of roadside trees is defined as the number of roadside trees divided by the length of county highways. Similar results are obtained when exposure is travel related.
 10. The lack of precision generally in the data on road accidents involving trees is also noteworthy, which distorts our understanding of the problem. Except in special investigations, the development of an accident is usually not recorded, so it is not possible to find out the real role of trees in aggravating the consequences of the accident. Further, it is generally not possible to identify whether the tree concerned is part of the road 'envelope' (street or roadside tree) or on other land (private land, forest).
 11. The final report of the RISER project, for example, reported the results of a simulator study in which speeds were reduced when trees were introduced and positioned 2 m or less away from the carriageway, whereas there was no effect on speed when they were 4.5 m or more away (Roadside Infrastructure for Safer European Roads, 2006).
 12. In the state of Brandenburg in Germany, fatal road accidents involving an impact with trees were less frequent on roads with continuous tree lines, representing just 9.3% of the total fatal road accidents related to trees (Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg, 2011). In France, the rise in the number of deaths in 2014, following years of decline, occurred without any increase in the number of trees close to the carriageway.
 13. The concept of 'calm roads' was set out in a French White Paper on Road Safety published in 1988, and restated in 2006 by the General Directorate of Highways (Direction Générale des Routes 'La Route Autrement - Pour une Conduite Apaisée'). It aims to encourage drivers to reduce their speed and increase their vigilance through their perception of the road and its surrounding environment. The concept is also associated with the notion of respect and social responsibility.
 14. See the thesis of Olsson (2012).
 15. Which published, in 2012 'Road Infrastructures: Tree Avenues in the Landscape' as a part of 'Reflections and Proposals for the Implementation of the European Landscape Convention'.
 16. https://secure.avaaz.org/fr/petition/Bernard_Cazeneuve_et_Segolene_Royal_Sauver_les_arbres_du_bord_des_routes/?pv=10.