PROGRESS
Interreg Europe

European Union
European Regional
Development Fund

PROmoting the Governance of Regional Ecosystem ServiceS

SECOND HANDBOOK OF GOOD PRACTICES

Policy theme:

Support the horizontal integration of the ecosystem concerns into the sectoral policies and plans at regional and/or national level.

04/012/2021

anci toscana

1862 RIGA TECHNICAL UNIVERSITY
Institute of the Civil Engineering and Real Estate Economics
Faculty of Engineering Economics and Management

TOLNA COUNTY Development Agency

UNIVERSITATEA DIN CRAIOVA

CREAF

SEVERO OCHOA EXCELLENCE

Tionól Reigiúnach Oirthir agus Lár-Tíre
Eastern and Midland Regional Assembly

Contents

I. Introduction

The objective of the PROGRESS project Second Handbook of Good Practices (GPs) is to present 8 good practices of project partners presented during the 2nd Interregional Thematic Seminar (ITS) that was supposed to take place online from Dublin, Ireland on 27-28 October 2020. The policy theme of the 2nd ITS was "Support the horizontal integration of the ecosystem concerns into the sectoral policies and plans at regional and/or national level." And it particularly targets forest ecosystems.

The eight selected PROGRESS good practices:

1. Dublin Mountains Makeover (DMM) – Ireland;
2. Forest Ecosystem Services Mapping and Assessment Methodology – Latvia;
3. Definition and indicators for the characterization of the Agricultural Areas – Catalonia, Spain;
4. Catalonian Forest Laboratory – Catalonia, Spain;
5. Citizen Council for Sustainability, Catalonia, Spain;
6. Conservative management of habitats ROSCI0129 4070 and 9260 in the North West of Gorj - Gorj County, Romania;
7. Protecting of the English oak in the cross-border area – Hungary;
8. Introducing airborne imaging technologies in forest management near the Drava River – Hungary.

The IE definition of a good practice (GP) provides that *"The good practice is defined as an initiative (e.g. methodology, projects, processes, techniques) undertaken in one of the programmes thematic priorities[1] which has already proved successful and which has the potential to be transferred to a different geographic area. Proved successful is where the good practice has already provided tangible and measurable results in achieving a specific objective."*

Therefore, identification, analysis and sharing of good practices is a part of the PROGRESS mutual policy learning process to achieve the improvement of policy capacity or capitalization of its partners and regions. In addition, transferring of good practices from one partner region to another can be included in the regional action plan if it can result in a policy change.

In line with the above capitalisation objective, the PROGRESS project aims to: "*initiate a process of policy change in the partners' regions improving the implementation of the policy instruments under Structural Funds programmes and other regional strategies dedicated to the conservation of biodiversity and the maintaining nature's capacity to deliver the goods and services that we all need, through policy learning and capacity building activities*".

The idea of the Handbook of Good Practices is to further extend the capitalization and achieve spill-over effects outside the PROGRESS partners' territories to those interested parties, which might wish to transfer and implement good practices developed by other regions in their own area. In addition, information on the selected good practices will also be shared on the Interreg Europe Policy Learning Platform.

This Second Handbook of Good Practices is one of four handbooks describing the best good practices of PROGRESS partners under the four policy themes:

1. Promote the measurement of the costs and benefits of ecosystem services derived from land use.
2. Support the horizontal integration of the ecosystem concerns into the sectoral policies and plans at regional and/or national level.
3. Explore innovative financial and marketing mechanisms for payment for ecosystem services.
4. Improve landscape governance for economic and environmental sustainability.

The Third Handbook of Good Practices on the policy theme "Explore innovative financial and marketing mechanisms for payment for ecosystem services." is expected during 2021.

[1] In the case of the IE program, the thematic priorities are four policy topics related to the regional development:

- Research, technological development and innovation
- Competitiveness of SMEs
- Low-carbon economy
- Environment and resource efficiency.

II. Descriptions of Good Practices

1. Dublin Mountains Makeover (DMM)

Summary: The Dublin Mountains Makeover (DMM) involves the implementation of a multi-generational forest management model across an area of over 900 hectares of forest at the southern edge of Dublin City. The practice is being implemented across nine Coillte forests in the Dublin Mountains. The DMM involves a transition away from a traditional clearfell and replanting cycle, with 'Continuous Cover Forestry' (CCF) principles[2] being applied to maintain the green canopy on a permanent basis. In areas where the CCF technique is not suitable, non-native Sitka spruce and lodgepole pine trees are being removed and replanted with native species such as Scots pine, birch, rowan, oak, holly and willow to provide habitat for nature. The adoption of this model improves biodiversity, enhances the recreation appeal and, as such, horizontally integrates ecosystem services considerations into the forest management practices of a commercial entity. Over the last ten years, the "Dublin Mountains Partnership" - which is a partnership between Coillte and wide-ranging stakeholders - has been managing and improving recreation facilities in the Dublin Mountains. The Dublin Mountains Makeover is an initiative born of this partnership with the improvement of forest resources for nature and people at its core.

View from Ticknock Forest over Dublin City and Bay, © Coillte Nature, May 2020

Continuous Cover Forestry (CCF) thinning at Cruagh Forest, Dublin Mountains © Coillte Nature, October 2020

Dublin Mountains Makeover - Map © Coillte

Good practice general information	
Title of the practice	**Dublin Mountains Makeover (DMM)**
Organisation in charge of the good practice	**Coillte** (meaning "forests" in Irish) is a commercial forestry business owned by the Irish state, managing 7% of Ireland's land[3]. The Dublin Mountains Makeover is an initiative of **Coillte Nature**, the not-for-profit branch of Coillte that is dedicated to the restoration, regeneration and rehabilitation of nature across Ireland. Coillte forests are open for public access with an

[2] https://www.coillte.ie/a-beginners-guide-to-continuous-cover-forestry/

[3] Mc Guinness, S.K. & Bullock, C. (2020). Mobilising Finance for Biodiversity: A policy and institutional review of finance arrangements for biodiversity conservation in Ireland. Report prepared for the National Parks and Wildlife Service and the Irish Research Council. University College Dublin, Dublin.

	estimated 18 million visitors annually. 20% of the Coillte estate is currently managed for biodiversity [4] (managed for the protection of wild species and habitats).
Description	
Short summary of the practice	The Dublin Mountains Makeover (DMM) involves the implementation of a multi-generational forest management model across an area of over 900 hectares of forest at the southern edge of Dublin City. The practice is being implemented across nine Coillte forests in the Dublin Mountains. The DMM involves a transition away from a traditional clearfell and replanting cycle, with 'Continuous Cover Forestry' (CCF) principles[5] being applied to maintain the green canopy on a permanent basis. In areas where the CCF technique is not suitable, non-native Sitka spruce and lodgepole pine trees are being removed and replanted with native species such as Scots pine, birch, rowan, oak, holly and willow to provide habitat for nature. The adoption of this model improves biodiversity, enhances the recreation appeal and, as such, horizontally integrates ecosystem services considerations into the forest management practices of a commercial entity. Over the last ten years, the "Dublin Mountains Partnership" - which is a partnership between Coillte and wide-ranging stakeholders - has been managing and improving recreation facilities in the Dublin Mountains. The Dublin Mountains Makeover is an initiative born of this partnership with the improvement of forest resources for nature and people at its core.
Category of the good practice	Enabling environment
Resources needed	Coillte Group turnover in 2019 was €327.4 million with an operating profit of €63.3 million[2]. The DMM is a project of Coillte Nature, the not-for-profit branch of Coillte which was launched in June 2019. A new diverse team of four people (with internal and external expertise) was appointed to Coillte Nature in October 2019. This includes a director, a specialist in environmental communications & partnerships, an ecologist and a forestry operations expert (professional forester). In January 2020, work commenced on four key projects, including the DMM. Coillte intends to continue growing Coillte Nature into a successful not-for-profit business and is investigating a range of external funding sources to help scale up activity in the near term[2] (see www.coillte.ie/introducing-the-nature-trust/ for example).

[4] Coillte (2019) *Annual Report 2019.* Newtownmountkennedy, Wicklow: Coillte.
[5] https://www.coillte.ie/a-beginners-guide-to-continuous-cover-forestry/

Timescale (start/end date)	January 2020 – long term (possibly decades)
Strategic relevance (long term impact)	The European Green Deal aims to transform the EU from a high- to a low-carbon economy, while improving people's quality of life and the environment, without reducing prosperity. Within the Green Deal it is recognised that forest ecosystems are under increasing pressure as a result of climate change. It states that the EU's forested area needs to improve, both in quality and quantity, for the EU to reach climate neutrality and to secure a healthy environment. A new EU forest strategy is to be prepared by the EU Commission covering the whole forest cycle and promoting many services that forests provide, with respect for ecological principles favourable to biodiversity. Furthermore, the Green Deal states that national strategic plans under the Common Agricultural Policy should incentivise forest managers to preserve, grow and manage forests sustainably. In Ireland, this is the CAP Strategic Plan post 2020 which is currently being prepared by the Department of Agriculture, Food and the Marine. The EU Strategic Environmental Assessment (SEA) Directive (2001/42/EU) approaches environmental concerns from a broad strategic perspective, necessitating sectoral, regional or national planning to include a wider consideration of environmental impacts. This includes consideration of the sustainable development of the forestry sector. According to the Europe-wide Eurobarometer Survey (2019), climate change and biodiversity loss are some of the most important issues for European citizens. For the youth of Europe, the clear-felling of forests is something they don't want to see at all. As such, the ethical and symbolic dimension is clearly as important as the economic aspect. Public policy and public opinion across Europe now clearly recognise the potential environmental and socio-cultural benefits associated with sustainable forest management (SFM) practices. In Ireland, forest policy is improving in this regard, with more requirements on type and location of planting, including a requirement that 15% of the planted area should comprise native broadleaf species[1]. Initiatives such as the DMM demonstrate that the commercial sector is beginning to recognise and adapt to new knowledge and new values. Coillte currently owns 54% of the national forest estate in Ireland[6] with forestry accounting for 11% (770 000 ha) of the total land area of the state. The national forest estate contains a high proportion (68%) of commercial plantation, much of

[6] DAFM (2019) *Forest Statistics - Ireland 2019*. Johnstown Castle, Wexford: Department of Agriculture, Food and the Marine (DAFM).

	which (85%) is comprised of single-age, non-native conifer species, of which 51% is fast-growing Sitka spruce[4] (Picea Sitchensis) which has a low biodiversity value. The strategic aim of the DMM is to improve biodiversity, climate resilience and recreation by regenerating urban forests. The ongoing transition to the multi-generational forest management model at the heart of the DMM is a slow and careful process, conducted in a manner that minimises disruption to local residents and visitors, while locking in benefits for nature and recreation that will be enjoyed by generations to come.
Evidence of success (results achieved)	A key aspect of the DMM is that project activities are continually documented on the dedicated webpage: https://www.coillte.ie/coillte-nature/ourprojects/dublinmountainsmakeover/. This webpage includes news articles, blogs and videos. So far, this approach has allowed stakeholders to keep track of upcoming and completed project actions, while being informed about various SFM methods being used and challenges identified. This approach helps to record measurable outputs, while engaging stakeholders, thereby, contributing to the long-term success of the DMM.
Tangibility	Tangible outcomes of the DMM are carefully documented as implementation continues. By example, works to be carried out in 2020 were divided into three phases, each of which is described in detail in terms of action, location and extent. The implementation of these phases has been documented on the project website, allowing accurate measurement of results. For example, Phase 1 was described as the planting of 14 hectares of "Continuous Cover Forestry" (CCF) and 6 hectares of "Remove & Replant with a mix of native and non-natives" (R&R-mix) in Ballyedmonduff, and 3 hectares of Remove & Replant (R&R) in Ticknock. News items on the project webpage have documented the progress of this phase as follows: • 26/06/2020 - Ballyedmonduff CCF - https://www.coillte.ie/work-begins-on-the-dublin-mountains-makeover/ • 10/07/2020 – Ticknock R&R - https://www.coillte.ie/visitng-ticknock-look-out-for-our-first-rr-site-as-part-of-the-dublin-mountains-makeover/ • 14/08/2020 – Ballyedmonduff R&R-mix - https://www.coillte.ie/the-dublin-mountains-makeover-continues-in-ballyedmonduff/ Furthermore, long-term biodiversity monitoring plots will be installed across each habitat and forest type from 2021 to monitor changes over time.

Durability	In the Dublin mountains, Coillte owns and manages around 50% of the forested area. The remaining area is owned and managed by private forest owners. When the Coillte forests were first planted between the early 1940s and late 1960s, limited environmental criteria were applied. Thus, these areas were deemed to be of limited biodiversity value[1] and the main objective of the tree planting was to provide timber. Back then, Dublin was a much smaller city more remote to the Dublin Mountains, and nobody thought much about outdoor recreation activities in forests. Growing recognition of the biodiversity value of these locations - in addition to changes in grant support structures - has encouraged the set-aside of a proportion of planted areas to biodiversity or open space and native broadleaf planting[1]. Regulations to protect waterways, differential thinning techniques and dedicated grant premium categories for higher biodiversity value species have been introduced[1]. Specific initiatives include the Felling and Reforestation Policy (2017) and the Forest Service's Native Woodland Scheme (2015). Through the DMM, Coillte have designated forest areas for biodiversity and are also supporting forest enhancement by means of corporate offsetting ventures through Natural Capital Partners and Microsoft. Furthermore, the private company 'Green Belt' has provided supplementary capacity[1]. The nine forests included in the DMM are among the most important recreational sites for a growing urban population seeking fresh air and green space. They are the most frequently visited forests in Ireland, with the DMM very much framed by the amenity and recreation value of the selected forests. As such, the DMM presents itself as a durable model for the following key reasons: 1. Coillte – as a state-owned entity - owns a large proportion of the forested area of the Dublin Mountains. 2. Prevailing policy developments now favour biodiversity restoration and enhancement. 3. The DMM provides recreational and amenity benefits for the proximate urban population of Dublin City with an established relationship with recreation users through the Dublin Mountains Partnership.
Visibility	Coillte Nature has a stated commitment to minimise impacts on local residents and to engage with all of their stakeholders to ensure that everyone knows what they're doing, how, where, when and why. They do this by: • Making regular updates on the Coillte Nature webpage: www.coillte.ie/coillte-nature/

	• Posting key dates and locations on Twitter, Facebook and Instagram • Engaging with local and national media (newspapers, radio and TV) • Putting up signs on-site to show what they're doing, where, when, why and how • Holding information days, walks, talks and other events (to commence as soon as COVID-19 restrictions allow) • Circulating information leaflets (An informational leaflet was sent to 13,200 homes across South Dublin at the commencement of the DMM) In line with these commitments: • The DMM is currently showcased on the Coillte website: https://www.coillte.ie/, as well as having its own dedicated webpage: https://www.coillte.ie/coillte-nature/ourprojects/dublinmountainsmakeover/ • Coillte has: 7,695 followers on Twitter; 14,371 followers on Facebook; 2,762 followers on Instagram (Information correct as of 21/09/2020) with regular updates relating to the DMM posted on each. The DMM communications campaign reached an audience of 2.5 million people during its launch week of May 25th 2020. This resulted in substantial local and national media attention. For example: • Articles in The Irish Times national newspaper: 27th June 2020: https://www.irishtimes.com/news/science/the-ultimate-restoration-project-rescuing-ecosystems-for-a-diversity-of-users-1.4330225 and 27th August 2020: https://www.irishtimes.com/news/science/the-ultimate-restoration-project-rescuing-ecosystems-for-a-diversity-of-users-1.4330225 • Coverage by RTÉ, Ireland's national broadcaster (9th July 2020): https://www.rte.ie/brainstorm/2020/0706/1151597-dublin-mountains-forests-makeover-climate-change-health/ • Coverage in the local media: e.g. https://www.dublinlive.ie/news/dublin-news/work-begin-plans-transform-nine-18306743 (25th May 2020) and https://www.echo.ie/tallaght/article/dublin-mountains-undergoing-a-massive-makeover (25th June 2020) • Coverage by local and national interest groups:

	https://wicklowuplands.ie/dublin-mountains-makeover-to-commence-this-summer/ https://www.dublinmountains.ie/news/latest_news/?no_cache=1 https://www.treecouncil.ie/post/dublin-mountains-makeover Social media also drove significant public engagement with the DMM project. For example: • Over the 4-day launch period, the campaign reached 227,394 people • 11,273 people engaged with (liked, clicked, commented, shared) Coillte's posts across the four channels • Positive comments overwhelmingly outweighed isolated negative comments • Coillte Nature reports that engagement rates were exceptionally high compared to industry standards Information boards are set up at each of the forests where work has commenced. For example, here is a link to the signage which was erected at the commencement of CCF work at Ballyedmonduff: https://www.coillte.ie/media/2020/07/DMM-Ballyedmonduff-signage-FINAL-PRINT-v2.pdf
Added Value:	In addition to achieving strategic objectives of reforesting landscapes, restoring biodiversity, regenerating urban forests, and rehabilitating ecosystem services, the DMM provides an important recreational function. The target forests are among the most important recreational sites for Dublin's growing urban population seeking fresh air and green space: Ticknock, Coillte's most popular forest, sees over 550 visits a day. The DMM is designed to be a slow and careful process, conducted in a way that minimises disruption to local residents and visitors, while locking in benefits for nature, recreation and the landscape of the Dublin Mountains that will be enjoyed by generations to come.
Effectiveness	The effectiveness of the DMM is underscored by the involvement of wide-ranging stakeholders in the development of the DMM as the vision for the Coillte estates in the Dublin mountains. For many years, there have been calls by multiple stakeholders to improve biodiversity and amenity access in these publicly-owned forests. These include 1) the Dublin Mountain Initiative (DMI) representing recreational users of the Dublin Mountains including Mountaineering Ireland, Cycling Ireland, the Irish Mountain Running Association and the Irish Orienteering

	Association, 2) Scouting Ireland, 3) Local Authorities (Dublin City Council, South Dublin County Council and Dún Laoghaire-Rathdown County Council), and 4) the National Parks and Wildlife Service. These stakeholders came together with Coillte to form the "Dublin Mountains Partnership" which worked to develop a shared vision for forests in the Dublin mountains. The DMM is at the heart of this vision - the culmination of this partnership approach coupled with Coillte's own desire to manage up to 20 per cent of its forests principally for biodiversity and recreation. The DMM has thereby provided a means to create multi-purpose forests which respect the diversity of stakeholder views, while creating more biodiverse forests with improved ecosystems and wide-ranging ecosystem services including socio-cultural services related to recreation.
Innovation	It is estimated that native woodlands in Ireland are worth approximately €35 million annually in amenity use alone[7]. The concept of 'Green Infrastructure' is now increasingly mainstreamed within policy discourse to include human health and wellbeing linked to functioning ecosystems[8]. Related to this, there have been repeated calls to improve the biodiversity and amenity access of public-owned forests in the Dublin Mountains. The DMM is the largest forest transformation project of its kind ever carried out in Ireland. The approach to planting trees in these forests – 90 per cent of which up until the commencement of the DMM were dominated by non-native coniferous trees – is radically changing. Sections with suitable soils are being planted with native trees, and trees will no longer be clear-felled. Instead, Continuous Cover Forestry (CCF) techniques are being used. This approach sees the removal of a small number of trees over time, allowing a mix of species and ages of trees to co-exist at the same time. CCF allows the light to reach the forest floor and new seedlings to grow. This leads to a multigenerational forest with greater species diversity into the future. The DMM is thereby creating new biodiverse habitats and landscapes, while improving the resilience of forests by having trees of different ages growing alongside each other. Furthermore, with recreation and amenity at its core, the DMM is a project that will transform the Dublin Mountains for the benefit of the environment and population well-being – this is the very essence of the European Green Deal.

[7] Bullock, C. and Hawe, J. (2014) *The Natural Capital Values of Ireland's Native Woodland*. Rathfarnham, Dublin: Woodlands of Ireland.
[8] Scott, M., Lennon, M. and Douglas, O. (2019) 'Mainstreaming green infrastructure as a health- promoting asset', *Town and Country Planning*, pp. 151–156.

Efficiency	The Dublin Mountains forests were planted with timber in mind. Today, Coillte recognises that their most significant value is in recreation for the people of Dublin City and their potential in enhancing biodiversity. The DMM is taking place on land that is already owned and planted by Coillte. There has, therefore, been no necessity for Coillte to acquire new land for the DMM. The DMM is targeting the 9 highest footfall forests for amenity and recreation in the Dublin Mountains. Every year about 600,000 people go to woods in Massey's Estate, Hell Fire Club, Cruagh, Kilmashogue, Tibradden, Ballyedmonduff, Barnasligan and Carrickgollogan to walk their dogs, hike, run, mountain bike, orienteer or horse-ride. With 550 visitors a day, Ticknock woods – right in the centre of this green east-west band of upland forestry – is Coillte's most popular forest in Ireland. As such, the long-term success of the DMM in terms of enhancing forest recreation is well-targeted. Furthermore, the former commercial plantation management approach (primarily clearfell and replant non-native conifers on a 40-year rotation) was becoming increasingly controversial and difficult to implement in these high recreation forests. The actions of the DMM will improve the biodiversity of target forests, enhance their recreational appeal and bring more autumn colour to the landscape - while still producing some timber for the sawmilling sector - and engaging an urban population in the understanding of the life-cycle and the uses of trees. As such, the DMM can be considered to be an economically, socially and environmentally efficient practice.
Externality	Where forestry is proximate to other agricultural activities and habitats (e.g. heathland in the Dublin Mountains), the biodiversity restoration benefits all. Ultimately, agriculture and forestry rely on good soil fertility which depends on vital ecosystem services provided by soil biodiversity - from soil bacteria, fungi, rotifers and earthworms [9]. The accurate valuation of the majority of these ecosystem services remains complex. Overall, it is estimated that pollinators contribute €59 million to the Irish economy[10], while the new EU Biodiversity Strategy recognizes that more than 75% of global food crop types rely on animal pollination and identifies pollinator decline as one of the five main direct drivers of biodiversity loss. Biodiverse forests will attract pollinators, which in turn help with crop pollination. This is a Nature Based Solution (NBS) which can help to ensure that biodiversity and resilience are secured at the landscape scale.

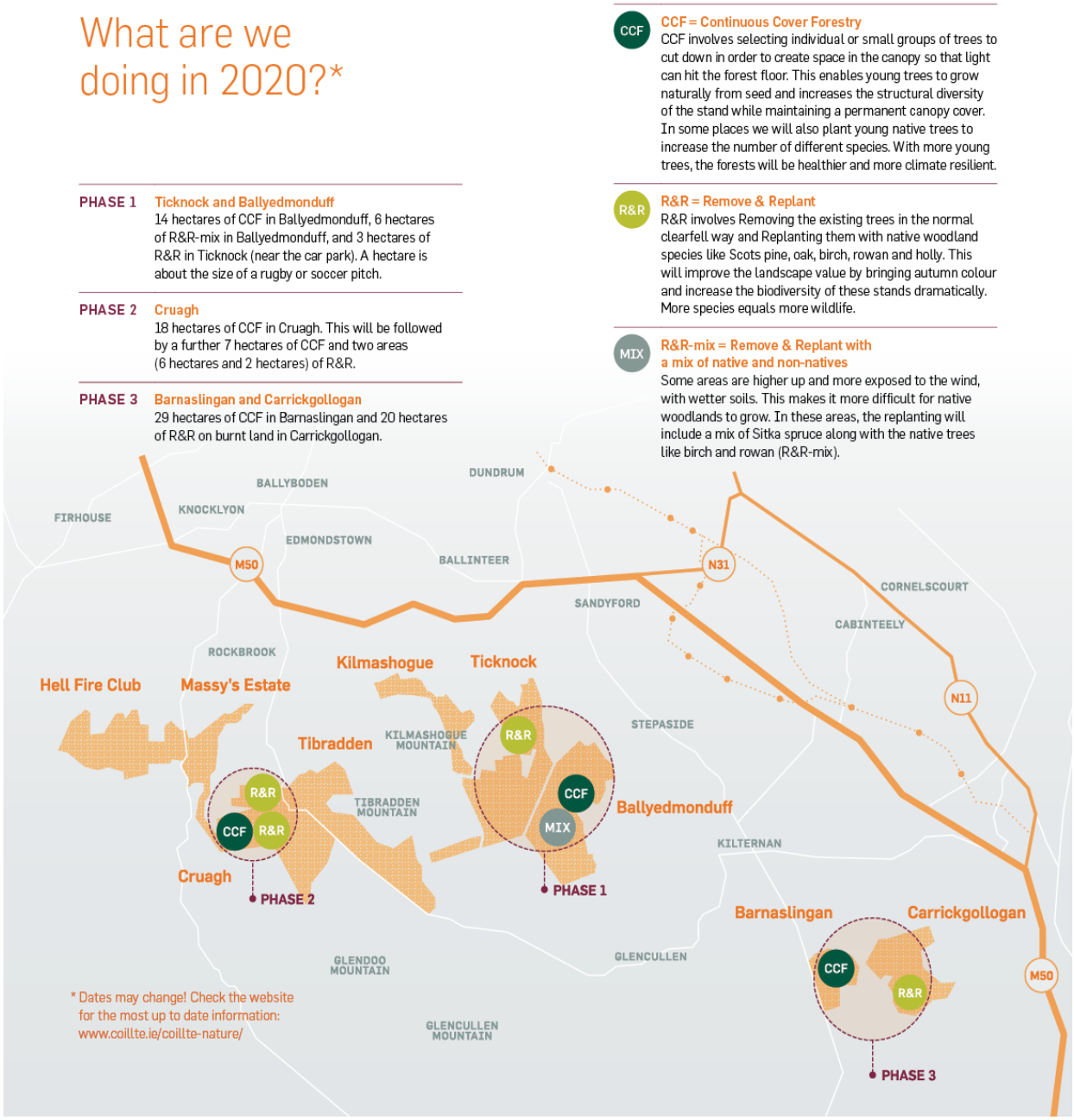
[9] Bullock, C., Kretsch, C. and Candon, E. (2008) *The Economic and Social Aspects of Biodiversity: Benefits and Costs of Biodiversity in Ireland*. Dublin: Department of Environment, Heritage and Local Government. doi: ISBN 978-1-4064-2105-7.
[10] NBDC (2015) *All-Ireland Pollinator Plan 2015-2020*. Waterford: National Biodiversity Data Centre. Available at: internal-pdf://1.72.242.14/NBDC 2015, All-Ireland Pollinator Plan.pdf.

	The "Dublin Mountains Partnership" brought together wide-ranging stakeholders to develop a vision for the Dublin mountains. This approach underlies the DMM and can provide a template for similar interactions elsewhere. Indeed, the publicity around the DMM has led to calls for other Coillte forests to be similarly converted. This clearly raises important questions for the forestry sector to ensure the economic viability of commercial forestry in the context of "nature friendly" forest management and public perceptions of acceptability.
Intra-regional coordination	Interactions between stakeholders in the forestry sector are extensive in Ireland. This interaction is facilitated through collaborative research, advice and regeneration projects, and through the administration of broad-ranging grant schemes[1]. The DMM is a key project for the continued successful co-ordination of wide-ranging stakeholders in the Dublin Mountains and has acted to strengthen co-operation between key groups and organisations which make up the Dublin Mountains Partnership.
Extra regional impact	The DMM has drawn interest from a number of different groups nationally and internationally. Presentations on the practice have been given by the Coillte Nature team at the Society of Irish Foresters Sean McBride annual lecture; an online An Taisce (the Irish Heritage Trust) webinar as part of their Climate Ambassador programme and a scheduled webinar of the Institute of Chartered Foresters in the UK will take place in January 2021. The DMM project received a 'Highly Commended' award at the Irish Planning Institute Awards in 2020. The Irish Planning Institute is the all-island professional body representing planners engaged in physical and environmental planning in Ireland. In the future, Coillte may consider changing the management objective of other forests close to other urban centres beyond the Dublin region in line with the DMM approach.
Quality	This GP emphasises the objectives and values of biodiversity and recreation. Within the GP, the ongoing forest management approach includes: • An element of timber production in the areas where mature non-native spruce will be felled and converted to native woodland. • Thinning where the conifer plantations are gradually transformed to more mixed woodlands and managed by CCF principles and maintaining a permanent forest canopy. Continuous Cover Forestry (CCF) – as applied in the DMM – facilitates high quality outdoor recreation, enhances the

	landscape, stabilises soils, protects water and enriches biodiversity, while also producing valuable renewable timber. This approach may be an appealing 'starting point' for commercial foresters who are trying to balance economic viability with responsibilities for biodiversity and recreation in line with the European Green Deal. This will necessarily involve the incorporation of a multifunctional approach into forest management processes by providing pockets and networks of biodiversity/recreation opportunity if commercially viable, and if selected forests are considered suitable for CCF. The DMM, therefore, represents a high quality and well documented example of a "nature friendly" forest management approach proximate to an urban population centre.
Potential for learning or transfer	50% of the Natura 2000 sites in Europe are forests. As such, good examples of sustainable forest management approaches are vital to achieve key targets contained in the European Green Deal. The DMM is a practical example which can inform better forestry planning for biodiversity enhancement and forest recreation proximate to a large urban centre, while maintaining overall commercial viability of the forestry company. While the practice owner is state-owned, an increasing proportion of forestry activity in Ireland is being conducted on a private basis. With climate change and biodiversity now firmly at the top of EU and national agendas, private sector foresters require new knowledge in order to improve the diversity of their forests to respond to these challenges. The need for forest owners to adopt sustainable forest management (SFM) techniques is vital for biodiversity restoration and to enhance the resilience of Europe's forests. In terms of challenges: 1) there is a need to carefully manage plantation forestry for carbon sequestration. While such potential has been recognised in Ireland for some time[11], the impacts of this management technique on biodiversity (and hence on other ecosystem services) can be counterproductive if not carefully planned (e.g., Forestry located on peatland can be a net carbon emitter and cause substantial ecological degradation; 2) there has been limited concrete progress in terms of adaptation planning to ensure that biodiversity is protected in the context of climate change, while recent reviews of climate action have recommended measures that could counteract biodiversity protection measures. This includes the potential for increased afforestation without consideration of the implications for biodiversity[1]. These challenges highlight the need for better information for forest owners and managers in order to balance the

[11] Byrne, K. and Black, K. (2003) *Carbon Sequestration in Irish Forests*. COFORD Con. Dublin: COFORD.

	commercial viability of their operations with climate change mitigation and biodiversity enhancement responsibilities, in addition to recreational and amenity considerations. Implementation of this type of GP is not without practical challenges. In particular, converting areas of fast-growing spruce with a timber production objective into native woodland may not be a realistic option for many private growers. These growers have likely planted forests to provide an alternative income source and may not see any income for decades from slower growing broadleaves. Also, the Continuous Cover Forestry (CCF) approach is not suitable in all locations. CCF can be challenging to practice in Ireland due to consistently strong winds and storms, high rainfall and mild climate which results in strong vegetation growth from species such as bramble, bracken and rhododendron - many of which compete with tree seedlings. Furthermore, many of the dominant soil types are too wet to allow repeated thinning interventions required for CCF. Sharing of the DMM as a Good Practice can potentially inform the New Forest Strategy for the EU, particularly for forest restoration initiatives close to urban centres. It can also be used as a potential template for state-owned and large private commercial forestry companies across Europe to horizontally integrate ecosystem service concerns into their plans and strategies.
Further information	Dedicated webpage for the DMM: *https://www.coillte.ie/coillte-nature/ourprojects/dublinmountainsmakeover/*



Dublin Mountains Makeover - Map & Key,
© Coillte Nature

2. Forest Ecosystem Services Mapping and Assessment Methodology

Summary: In Latvia, forests are the most widespread terrestrial ecosystems covering 53% of the country. Apart from timber resources, forests provide a number of other ecosystem services (ES), many of which in the opinion of the society are more important than wood. The aim of the Forest Ecosystem Services Mapping and Assessment Methodology is to spatially map and evaluate various benefits provided by the forest, as well as changes in the provided ES over time and in the result of anthropogenic intervention, e.g., different forest management operations. To systematize the ES, the Common International Classification of Ecosystem Services (CICES)[12] was used. For a spatial evaluation of the ES the matrix model was applied [13][14][15](Burkhard et al. 2009, 2012, 2014). It presents a flexible approach which is able to deliver comparable results on various spatial scales depending on the geospatial units used in this model. Depending on the scope of assessment and data availability, the indicator scales may be built on the basis of biophysical data or expert assessment. During the research programme "Impact of forest management on ecosystem services from forests and related ecosystems", 33 ES indicators of all three ES types - provisioning, regulating and cultural - have been developed.

Eneregy wood, photo by Zane Libiete

Forest as inspiration for art, photo by Ilze Paulina

Good practice general information

[12] European Environment Agency. Towards a Common International Classification of Ecosystem Services (CICES) for Integrated Environmental and Economic Accounting. Retrieved from: https://cices.eu/resources/

[13] Burkhard, B., Kroll, F., Müller, F., and Windhorst, W. (2009). Landscapes'Capacities to Provide Ecosystem Services – a Concept for Land-Cover Based Assessments. Landscape Online 15: 1-22, DOI:10.3097/LO.200915

[14] Burkhard, B., Kroll, F., Nedkov, S., and Müller, F. (2012). Mapping ecosystem service supply, demand and budgets. Ecological Indicators 21: 17-29, DOI: 10.1016/j.ecolind.2011.06.019

[15] Burkhard, B. Kandziora, M., Hou, Y., and Müller, F. (2014). Ecosystem Service Potentials, Flows and Demands – Concepts for Spatial Localisation, Indication and Quantification. Landscape Online 34: 1-32, DOI: 10.3097/LO.201434

Title of the practice	**Forest Ecosystem Services Mapping and Assessment Methodology**
Organisation in charge of the good practice	Latvian State Forest Research Institute "Silava" (LSFRI "Silava")
Description	
Short summary of the practice	In Latvia, forests are the most widespread terrestrial ecosystems covering 53% of the country. Apart from timber resources, forests provide a number of other ecosystem services (ES), many of which in the opinion of the society are more important than wood. The aim of the Forest Ecosystem Services Mapping and Assessment Methodology (FESMAM) is to spatially map and evaluate various benefits provided by the forest, as well as changes in the provided ES over time and in the result of anthropogenic intervention, e.g., different forest management operations. To systematize the ES, the Common International Classification of Ecosystem Services (CICES) [16] was used. For a spatial evaluation of the ES the matrix model was applied [17][18][19]. It is a flexible approach which is able to deliver comparable results on various spatial scales depending on the geospatial units used in this model. Depending on the scope of assessment and data availability, the indicator scales may be built on the basis of biophysical data or expert assessment. During the research programme "Impact of forest management on ecosystem services from forests and related ecosystems", 33 ES indicators of all three ES types - provisioning, regulating and cultural - have been developed.
Category of the good practice	Empowering tools
Resources needed	Approximate costs of the development of FESMAM – €180 000. The team of one senior researcher, two researchers and three scientific assistants were involved in this task. Further 100 000 EUR are needed in the coming years to update the FESMAM, complementing it with indicators for cultural ES,

[16] European Environment Agency. Towards a Common International Classification of Ecosystem Services (CICES) for Integrated Environmental and Economic Accounting. Retrieved from: https://cices.eu/resources/

[17] Burkhard, B., Kroll, F., Müller, F., and Windhorst, W. (2009). Landscapes' Capacities to Provide Ecosystem Services – a Concept for Land-Cover Based Assessments. Landscape Online 15: 1-22, DOI:10.3097/LO.200915

[18] Burkhard, B., Kroll, F., Nedkov, S., and Müller, F. (2012). Mapping ecosystem service supply, demand and budgets. Ecological Indicators 21: 17-29, DOI: 10.1016/j.ecolind.2011.06.019

[19] Burkhard, B. Kandziora, M., Hou, Y., and Müller, F. (2014). Ecosystem Service Potentials, Flows and Demands – Concepts for Spatial Localisation, Indication and Quantification. Landscape Online 34: 1-32, DOI: 10.3097/LO.201434

	and to upscale the forest ecosystem evaluation for the whole territory of Latvia. It is planned that the team with a similar capacity as for developing the FESMAM will be involved in the further work.
Timescale (start/end date)	January 2016-ongoing
Strategic relevance (long term impact)	The FESMAM can be applied for the evaluation of ES provided by any forests regardless of their ownership. It is suitable for an initial evaluation of the ES in a given area, as well as for the assessment of changes under the influence of external factors (either natural or human-induced) and, as such, it may be used for the strategic planning of forest management measures targeted to balance economic, environmental and social sustainability goals.
Evidence of success (results achieved)	The FESMAM has been currently tested in a model area (forested catchment of approximately 3000 ha size) typical for the state forests where intensive forest management operations have been carried out during the time period from 2015 to 2018. The evaluation of ES has been repeated twice (before and after the management intervention) to evaluate the short-term changes of ecosystem services values after forest management operations. Results of this evaluation are currently available as a research report (in Latvian, yet unpublished). It is planned that final results of the research programme "Impact of forest management on ecosystem services from forests and related ecosystems" will be available online in 2021. Individual indicators (e.g., bilberry and lingonberry yields, carbon sequestered in above-ground living biomass) according to this methodology have been calculated for the whole country; summarizing maps are included in the monograph "Latvia: land, nature, nation, state".[20]
Tangibility	FESMAM will be integrated in the decision-making system of the JSC "Latvia's State Forests" to facilitate the spatial planning of forest management. JSC "Latvia's State Forests" currently manages all public forests in Latvia that constitutes around a half of the total forest area. Public forests are managed for the benefit of the entire society and are freely accessible to the general public for recreation and non-wood forest product gathering. Therefore, up-to-date and scientifically sound information about the benefits provided by these forests is crucial to ensure multifunctional forest management.

[20] Nikodemus, O., Kļaviņš, M., Krišjāne, Z., & Zelčs, V. (2018). Latvija. Zeme, daba, tauta, valsts. *Rīga: Latvijas Universitātes Akadēmiskais apgāds*, *752*.

Durability	The FESMAM has a potential for a practical application in the forest management planning in all forests of Latvia (public and private), as well as, with particular adjustments, in other countries (depending on the data availability). As the FESMAM is based mainly on the forest inventory data, it can be used for modelling changes of the ES provision under different scenarios of the forest development.
Visibility	The visibility of this good practice has been ensured by dissemination activities of the FESMAM in national and international events (workshops and conferences, e.g., Latvian discussion forums "Cooperation and experience exchange about ecosystem services evaluation in Latvia" in 2017[21], 2018 and 2019[22], IUFRO Congress in 2017[23], international Ecosystem Service Partnership conferences in 2018[24] and 2019[25]). Apart from regularly informing the funder (JSC "Latvia's State Forests") of the research programme "Impact of forest management on ecosystem services from forests and related ecosystems", the FESMAM and first results of its evaluation have been presented to practitioners involved in the forest management (Forest Science Days) and regularly disseminated to students of the forest science, as well as private forest owners.
Added Value:	The added value of the FESMAM lies on improved possibilities for the multi-functional forest management planning, related to the results of ES assessment in different ES categories. The detailed forest compartment data enable the assessment on different spatial scales starting from local planning opportunities to regional and country-wide assessments.
Effectiveness	An assessment of fifteen ES indicators before and after intensive forest management operations (clearfelling and road construction) in a model area has been carried out to evaluate the short-term impact of forestry. On a catchment scale, the obtained results indicated slight decrease of most assessed provisioning services but, at the same time, values of regulating services increased in the short-term. In the final stage of methodology (FESMAM) development (by the end of 2020) changes of remaining indicator values will be assessed. Further development of the methodology (FESMAM) is planned by including cultural forest ecosystem services that lately have gained increasingly high importance.

[21] https://ekosistemas.daba.gov.lv/public/lat/jaunumi1/2064/
[22] https://ekosistemas.daba.gov.lv/public/lat/pasakumi11/seminari/
[23] http://iufro2017.com/wp-content/uploads/2017/11/IUFRO17_Abstract_Book.pdf
[24] https://www.espconference.org/eu2018/wiki/384868/book-of-abstracts#.W-BpGJNKhPY
[25] https://www.espconference.org/esp10/wiki/479895/proceedings

Innovation	So far, there has not been a methodology for comprehensive assessment of forest ES applicable on various planning levels. The FESMAM, with its high spatial resolution, is applicable for any forest in Latvia.
Efficiency	Regarding human and monetary resources needed, please, see a part "Resources needed".
Externality	The basis of the FESMAM (CICES classification and the Matrix model) is applicable and is already being used for the ES evaluation in several countries in different types of ecosystems. Specific forest-related indicators developed in Latvia may provide ideas and guidance for other countries with similar conditions and data availability. There already has been a collaboration of the project team with other projects implemented in Latvia, for example, "LIFE Ecosystem Services", "LIFE Restore".
Intra-regional coordination	The project team is involved in the Latvian Discussion Forum "Cooperation and experience exchange about ecosystem services evaluation in Latvia" and has presented project results in this forum's meetings in 2017, 2018 and 2019. There has been a collaboration with projects "LIFE Ecosystem Services" and "LIFE Restore" in a format of consultation, and indicator development. Lectures about programme`s "Impact of forest management on ecosystem services from forests and related ecosystems" results and ES approach in general have been held in the Latvia University of Life Sciences and Technologies, as well as presented to private forest owners during their training courses organized by the Latvian Rural Advisory and Training Centre.
Extra regional impact	Results of the project "Impact of forest management on ecosystem services from forests and related ecosystems" have been presented in the IUFRO (International Union of Forest Research Organizations) Congress in 2017 [26] and two international conferences organized by the Ecosystem Service Partnership (in 2018[27] and 2019[28]). Further outreach to the international audience is planned in a form of scientific publications and conferences.
Quality	Forest inventory data provide the spatial information with a comparatively high accuracy and resolution, enabling the evaluation on a compartment level. The developed indicators are largely based on the biophysical data, thus, providing

[26] http://iufro2017.com/wp-content/uploads/2017/11/IUFRO17_Abstract_Book.pdf
[27] https://www.espconference.org/eu2018/wiki/384868/book-of-abstracts#.W-BpGJNKhPY
[28] https://www.espconference.org/esp10/wiki/479895/proceedings

	higher accuracy contrasting with more subjective approach of the expert evaluation method. The annual results of project "Impact of forest management on ecosystem services from forests and related ecosystems" are presented and evaluated during meetings of the Scientific Advisory Board of the funder JSC "Latvia's State Forests" involving experts from academia and forest sector companies.
Potential for learning or transfer	The ES approach in general and FESMAM in particular have a wide potential for use in different geographical regions, as specific indicators may be adjusted and new indicators may be developed in the same framework depending on data availability and particular conditions. Indicators developed in Latvia may have a potential of transfer to other countries with similar forest structure and detail of forest inventory. They may also provide ideas for new indicators applicable under different conditions. The inclusion of all three ES types in the assessment highlights the multifunctionality of forest ecosystems and may help to raise awareness on sustainable management of natural resources.
Further information	*http://www.silava.lv/70/section.aspx/View/179* *https://www.lvm.lv/petijumi-un-publikacijas/mezsaimniecibas-ietekme-uz-meza-un-saistito-ekosistemu-pakalpojumiem*

3. Definition and indicators for the characterization of the Agricultural Areas

Summary: This project was promoted by the Rural World Foundation in collaboration with the Agri-territory Foundation of Catalonia, Spain, is a part of the desire to establish a consensus on the concept of 'agricultural space' in the first phase to work on the characterization of these spaces on the later phase based on objective indicators that allow their assessment. The designed indicators analyze several important variables when evaluating and determining the value of agricultural areas, such as agricultural productivity, degree of biodiversity, value of landscape, productive model or its vulnerable areas among others.

Photos of Dr. Enrique Doblas Miranda, CREAF Researcher

Good practice general information	
Title of the practice	**Definition and indicators for the characterization of the Agricultural Areas**
Organisation in charge of the good practice	It was the Rural World Foundation but this initiative has disappeared. Currently, the Directorate General of Rural Development, Catalan Department of Agriculture, Cattle, Fisheries and Food is in charge.
Description	
Short summary of the practice	The project, promoted by the Rural World Foundation in collaboration with the Agri-territory Foundation, is a part of the desire to establish a consensus on the concept of 'agricultural space' in the first phase, to later work on the characterization of these spaces based on objective indicators that allow their assessment. The designed indicators analyze several important variables when evaluating and determining the value of agricultural areas, such as agricultural productivity, degree of biodiversity, value of landscape, productive model or its vulnerable areas among others.
Category of the good practice	Information dissemination and awareness rising.

Resources needed	The cost of the project implied 25.000 €. The Characterization was based on stakeholders' meetings, implying almost zero cost.
Timescale (start/end date)	2014 - 2018
Strategic relevance (long term impact)	At present, according to the Catalan urban legislation, the land is classified into the three categories: urban, building and non-building. Agricultural areas are treated as undevelopable land only in cases without any valuation or more attribution. In this sense agrarian organizations historically have demanded a specific treatment for agrarian spaces, which was supported by the Government and the Parliament of Catalonia. The project aims to provide a tool for analysis and assessment of agricultural areas in Catalonia, expand the vision on these spaces and promote an active treatment when urban or spatial planning is required.
Evidence of success (results achieved)	In 2015, the Rural World Foundation and the Agri-territory Foundation created the Working Group of Agricultural Spaces with representation of experts from different disciplines and different institutions, which prepared the Report on Agrarian Spaces: definition and indicators for their characterization. Subsequently, the Working Group on Agricultural Areas (GTEA) developed the Protocol for the methodological analysis of characterization of agricultural areas of Catalonia in Geographical Information Systems, which analyses, integrates and interprets the indicators identified in the first document on the environment cartographic. These indicators were considered when developing the Catalan Agrarian Areas Law.
Tangibility	The designed indicators allow to analyze several important variables when evaluating and determining the value of agricultural areas, such as agricultural productivity, degree of biodiversity, value of the landscape, the productive model or its vulnerable areas among others. There are 20 indicators, which are grouped into 5 composite indicators categories and finally into 3 groups. The Protocol for the methodological analysis of the characterization of agricultural areas of Catalonia in GIS was completed in March 2018 and became a basic work to study and analyze agricultural areas through cartographic means. Different working proposals have been presented to assess the agrarian spaces in an analysis of the Catalan territory on a scale of 1: 500,000.
Durability	Although, the promoter of the Characterization, the Rural World Foundation, no longer exists, their activities have been assumed by the Directorate General of Rural Development (Catalan Department of Agriculture, Cattle, Fisheries and Food), which is committed to continue with the designed methodological analysis.

Visibility	Public report: *Agrarian Spaces: definition and indicators for their characterization. Agrarian Spaces Working group 2015*. This report establishes a broad consensus around the concept of agricultural space. Public report: *Protocol for the methodological analysis of the characterization of agricultural areas of Catalonia in GIS. Agrarian Spaces Working group 2018.* On July 26, 2018 the Rural World Foundation made a public presentation of the methodological Protocol for the characterization of agrarian spaces of Catalonia in GIS at the Department of Agriculture, Livestock, Fisheries and Food of the Generalitat (Catalonian Government).
Added Value:	The characterization includes environmental, socio-economic and territorial indicators enhancing the multifunctional value of agricultural lands.
Effectiveness	In 2018, the report of a group of experts was provided to evaluate how the Methodological Protocol model for the characterization of agricultural areas of Catalonia in GIS works in a practical territorial field: Terres de Ponent.
Innovation	In a pioneering way, the characterization of agricultural spaces facilitates identifying objectifiable indicators that determine the basic characteristics for its assessment during urban planning. The Protocol for the methodological analysis of the characterization of agricultural areas of Catalonia in GIS is a pioneer in Catalonia, which has become a basic work to study and analyse agricultural areas through cartographic means. The aim of this new tool is to equip the sector, for the first time, with the method of analysis and characterization of these spaces that allows determining their value based on an objective parameters.
Efficiency	The Characterization took more than 4 years from the initial conception until its realization. It had a low cost considering that most of the work was assumed for free by the working team described in the "Intra-regional coordination" section.
Externality	As mentioned in the Tangibility section, the Characterization includes not only environmental indicators (where ecosystem services could be found) but also socio-economic and territorial indicators.
Intra-regional coordination	The work team was composed by members of both organizers, two departments of the regional government, universities, the regional council, research centers, and citizens' associations and foundations. Also, external contribution was provided by

	local, national and international Universities, administrations outside the region, and forest owners and farmers associations.
Extra regional impact	None
Quality	The characterization is based on the study of geographical theses, law definitions, landscape indexes, cartographic sources, rural perspectives, stakeholder feedback and territorial planning guidelines.
Potential for learning or transfer	Agricultural areas are shared on the entire European territory and their valorisation is a common issue all over Europe. The characterization is based mainly in local perceptions but external advisory and bibliography were considered in the public reports. In any case, the designed methodology is easily transferable and can be adjusted to conditions of a local characterization.
Further information	*http://www.agroterritori.org/web2/wp-content/uploads/2016/04/EspaiAgrari_definicio-indicadors.pdf*

4. Catalonian Forest Laboratory

Summary: The Catalan Forest Laboratory is a joint initiative that makes available the information and data related to forests generated by two research centers for general public, experts and/or beginners. This data has been pre-processed by researchers and technicians from both research centers to minimize errors during processing the raw data. In this way, the Catalan Forest Laboratory became the starting point for researchers, students, managers or administration staff which needed an access to the data for carrying out their work. The data is stored on a portal where information, apps and other tools could be used and/or downloaded. It also offers a possibility to get to know more about one of the main treasures of the Catalan land – the forest, for the general public.

Photos of the Catalan forest made by Dr. Enrique Doblas Miranda, CREAF Researcher

Good practice general information	
Title of the practice	**Catalonian Forest Laboratory**
Organisation in charge of the good practice	CREAF & Center for Forestry Science and Technology of Catalonia (CTFC)
Description	
Short summary of the practice	The Catalan Forest Laboratory is a joint initiative that makes available the information and data related to forests generated by two research centers for general public, experts and/or beginners. This data has been pre-processed by researchers and technicians from both research centers to minimize errors during processing the raw data. In this way, the Catalan Forest Laboratory became the starting point for researchers, students, managers or administration staff which needed an access to the data for carrying out their work. The data is stored on a portal where information, apps and other tools could be used and/or downloaded. It also offers a possibility to get to know more about one of the main treasures of the Catalonian land – the forest, to the general public.
Category of the good practice	Information dissemination and awareness rising.
Resources needed	The cost of the project was €34,000 per year. One technician was fully dedicated for coordinating and developing apps (please check "Tangibility" section) and other 5 were involved at different moments.
Timescale (start/end date)	2019 – 2021
Strategic relevance (long term impact)	The Laboratory will be a backbone of the new Catalonian Forest Portal together with the Catalonian Forest Observatory.
Evidence of success (results achieved)	Right now, the Laboratory is in a testing phase and, through a citizen science initiative, people are using it to spot bugs and propose improvements. In any case, both the Climate Change Catalan Office and the Catalan Deputy Directorate-General of Forests have showed their support and interest, as well as provided funds and maintenance.
Tangibility	Available applications: FES App, to view and download data of forest ecosystem services of Catalonia. Allometr App, to calculate new variables from equations designed by species, geographical areas and levels (for all Spain). IFN App, to access, view and download the data of the National Forest Inventory in Catalonia.

	LiDAR App, to access, view and calculate forest variables from LiDAR data in Catalonia.
Durability	The Laboratory has been conceived as a dynamic instrument in order to adapt available tools (please check "Tangibility" section) for current and future information. Both, the Climate Change Catalan Office and the Catalan Deputy Directorate-General of Forests have assured its maintenance.
Visibility	More than 12 manuals including tutorials for each app, guides, practice cases and examples of use. The Laboratory was presented to potential users and the general public in March 2019 at the Catalan Department of Agriculture, Cattle, Fisheries and Food, showing total institutional support. A similar presentation is planned in 2021 to present operative improvements. The Laboratory was presented in February 2019 at a national research meeting, SIBECOL: *A new tool to visualize National Forest Inventory Data*
Added Value:	The added value of the laboratory is that it contains all the data in one place and it's free of errors. The data can be consulted using a very intuitive map viewer and can be downloaded in different formats to use for research or management.
Effectiveness	Since the beginning of 2020, the Catalan Forestry Laboratory has been made available. It is, an initiative that brings together all the information available on the forest of Catalonia in a single website.
Innovation	The data, such as the National Forest Inventory and the LiDAR data source are public but not necessarily processed. This transfer from science to policy makers and society tool directly provides useful information processed from these rough data, which are also stored in the Laboratory. Such information - forest related processed data for free in a single portal, is very useful for decision making, management or educational purposes.
Efficiency	The Laboratory took more than 3 years from the initial conception until the realization. It had a very low cost (only salaries of staff) considering that there was a technical team composed by 3 researchers and 3 senior technicians.
Externality	The Laboratory is not only focussed on the ecosystem services but it also provides very useful apps and data for forest managers and interested stakeholders, such as variables from equations designed by species, geographical areas and scales, as well as the data of the National Forest Inventory and other forest variables.

Intra-regional coordination	The Catalan Forest Laboratory is a joint initiative of CREAF and CTFC to make available for the public use information and data related to the forest generated by two research centers.
Extra regional impact	The extra regional impact hasn't been achieved yet.
Quality	Three top scientists of two different institutions, CREAF and CTFC, provided the research basis of the Laboratory. The National Forest Inventory (NFI) provides the information about situation, property and protection regime, nature, legal status, probable evolution and production capacity of all types of goods (from wood to ecosystem services) in the Spanish mountains. The same measurements are repeated every 10 years covering the entire national territory in each cycle. The NFI methodology is based on the collection of data from plots of a sampling carried out in the forested area at the provincial level. The data obtained in the field work carries largely computerized process that provides exhaustive information in the form of tables and maps.
Potential for learning or transfer	First, the Laboratory provides ready to use practical information that eases decision making, management and learning. Second, it could be used at different scales, from local to regional levels. Third, it is based on the available information about the forest cartography. If such kind of a database is available at the national level, the Laboratory is easily transferable and replicable.
Further information	*http://laboratoriforestal.creaf.uab.cat/*

5. Citizen Council for Sustainability

Summary: Barcelona's network of allies for sustainability is currently made up of more than 1 500 entities, companies, professional associations, universities, schools, facilities and public institutions. All these organizations are represented in the Citizen Council for Sustainability (CCS) on a democratic basis. The Citizen Council for Sustainability is consultative and participation city body acting in sustainability-related areas. It is a promoter of the Citizen Commitment for Sustainability 2012-2022 and provides a road map for moving towards creating more sustainable city (Barcelona). The CCS represents different groups and sectors involved in achieving objectives of the Citizen Commitment to Sustainability and has become a promoter of new strategies for engagement, co-responsibility and participation of citizens' organizations.

Good practice general information	
Title of the practice	**Citizen Council for Sustainability**
Organisation in charge of the good practice	Barcelona City Council
Description	
Short summary of the practice	Barcelona's network of allies for sustainability is currently made up of more than 1,500 entities, companies, professional associations, universities, schools, facilities and public institutions. All these organizations are represented in the Citizen Council for Sustainability (CCS) on a democratic basis. The Citizen Council for Sustainability is consultative and participation city body acting in sustainability-related areas. It is a promoter of the Citizen Commitment for Sustainability 2012-2022 and provides a road map for moving towards creating more sustainable city. The CCS represents different groups and sectors involved in achieving objectives of the Citizen Commitment to Sustainability and has become a promoter of new strategies for engagement, co-responsibility and participation of citizens' organizations.
Category of the good practice	Enabling environment.
Resources needed	The direct costs of the good practice (GP) are mainly human resources: - One full-time person dedicated to work for the secretariat of CCS and coordinate the More Sustainable Barcelona program (Please, check Visibility section for additional information.). - The team of the CCS Secretariat: 6 people dedicated to work on advising, accompanying and supporting more than 1000 allied entities and companies, secretariat of 7 working groups and facilitation of participatory processes; 4 people dedicated to work on advising for 100 trade associations and guilds and providing resources to retailers; 8 people dedicated to work on the More Sustainable Schools program, including teacher training and advice for more than 350 schools with sustainability projects, 1 person dedicated to work on communication.
Timescale (start/end date)	From 1998 onwards
Strategic relevance (long term impact)	Barcelona is firmly committed to progressing towards lasting and equitable development model that uses available resources wisely. This progress is only possible with participation and implication of the general public as a whole for defining horizons, seeking solutions and developing actions.

	The Citizen Council for the Environment and Sustainability was set up in 1998. Its first objective was to help to spread the culture of sustainability throughout the city, promote Barcelona's Local Agenda 21, as well as its implementation and follow-up. The Citizen Commitment to Sustainability is the reference framework for all of the organisations which assume their part in the responsibility for building more sustainable Barcelona and contributing to this end through their actions. In 2012, the renovation of the Citizen Commitment to Sustainability led to challenge and opportunity of reorganising the Municipal Council for the Environment and Sustainability. After the reorganisation it represented various groups and sectors involved in achieving the Commitment's goals and at the same time also promoted new strategies for the involvement, co-responsibility and participation of civil society organisations.
Evidence of success (results achieved)	The Citizen's Council for the Environment and Sustainability promoted the first Citizen Commitment to Sustainability - Barcelona's Agenda 21 – a widely agreed document that defined principles, objectives and lines of action for the 2002-2012 period. In 2012, the Citizen Council for the Environment and Sustainability along with the network of organisations involved, participated in updating and renovating the previous Citizen Commitment to Sustainability - Barcelona's Agenda 21. This process led to the formulation of new, cross-cutting goals for the following 10 years from 2012 to 2022. The Citizen's Council and the network of signatories, both are the agents that led to the development of the Barcelona Climate Plan on 2018. More recently, on 2019, the Climate Emergency Committee was created, to produce the content of the Barcelona Climate Emergency Declaration. More than 300 city organizations were involved in participatory sessions. This is the Sustainability Council working group which aimed to maintain a spirit of collective participation and commitment with which the Barcelona Climate Plan was drafted. Different Departments of the City Council and supra-municipal bodies along with all municipal groups joined together in order to create a framework to commit the City Council and all other stakeholders involved to tackle the climate emergency. On 15 January 2020, the city of Barcelona declared the climate emergency and accelerated series of changes involving all players of the city.

Tangibility	The Plenary is the highest representative and participation body of the CCS. Its members represent Barcelona Sustainable Network and help to spread the culture of sustainability in the city, thus, promoting the Citizen Commitment to Sustainability, its implementation and monitoring. CCS members are municipal groups, representatives of the city districts, associative and civic sector (NGOs, citizens associations, foundations, etc.), business sector (including trade, tourism and services, construction, energy, telecommunications, environment, transport, etc.), educational centres, universities, professional associations (biologists, teachers, engineers, lawyers), unions and the Barcelona Administration.
Durability	With a recently achieved regulation, the CCS seeks to represent different groups and sectors involved in achieving objectives of the Citizen Commitment for Sustainability and, at the same time, it promotes new strategies for engagement, co-responsibility and participation of citizens' organizations.
Visibility	Continuous communication through the web with stakeholder groups, two fortnightly newsletters and social networks. Visibility through the network of allies and local media. Workshops, seminars, exchange meetings, networking and training are continuously organized. Institutional event every year for the World Environment Day. Solemn acts of signing the Citizen Commitment for Sustainability and approval of strategies at the Saló de Cent of the Barcelona City Council. Participation in international conferences and European projects. Citizen Council for Sustainability web page: https://ajuntament.barcelona.cat/ecologiaurbana/en/bodies-involved/citizen-council-for-sustainability More Sustainable Barcelona website: https://www.barcelona.cat/bcnsostenible More Sustainable Barcelona Map: https://www.bcnsostenible.cat/en/ Decidim Barcelona: https://www.decidim.barcelona/assemblies/emergencia-climatica
Added Value	The CCS seeks to ensure quality public space, green and biodiverse city that is productive and resilient, the city committed to active and sustainable mobility with public involvement and commitment.

	Collaborative dynamics of committed organizations and political will of the municipal government have progressively led to the consolidation of network of allies that generated a culture of sustainability in the city, enriched and promoted progress in climate policies, urban planning, the city's naturalization strategies and zero waste strategy among other issues. The work process is more important than its results, since through participation and co-creation the social innovation is made.
Effectiveness	Consultations facilitated by the CCS have resulted in such concrete actions as the Climate Emergency Declaration, which includes 7 model changes (urban, mobility and infrastructure, energy, economic, consumption and waste, food, and cultural and educational) and 2 adjustments (Taking care of health, well-being and environmental quality, and of water.)
Innovation	In comparison with other consultation tools, wide representation of citizen associations and meticulous pre-operational work makes the CCS highly dynamic and decisive. The innovation presented by this GP has a social character. It has been made by the co-creation process and successful involvement of society in the decision-making process.
Efficiency	The Barcelona City Council's budget dedicated for the education about sustainability, participation and promotion of citizens' action on climate is minimal compared to budgets for environmental management and urban services. At the same time, it has facilitated approval and implementation of unconventional plans and projects. The participation of society enriches public policies with out-of-the-box approaches and facilitates political approval and social acceptance of more disruptive projects. Also, shared responsibility and networking promoted through the Citizen Commitment for Sustainability are facilitating coordinated and joint action. This action involves cultural changes and requires time to get going, but it is able to generate synergies that accelerate such changes. Ecological transition and significant climate action without the involvement of all actors does not seem like a realistic alternative.
Externality	The CCS has already tackled a potential of ecosystem services in order to value ecosystems (including urban and peri-urban) sustainability but, in fact, objectives of the Council go beyond ecosystem services. The Council is an incredibly dynamic transfer tool from society to policy makers to many other

	subjects around sustainability – from climate change to urban planning.
Intra-regional coordination	The network of organisations involved has grown since 2002 and now includes a large number of municipal and supra-municipal bodies, associations, companies, schools, universities, guilds, professional associations, trade unions and all kinds of groups.
Extra regional impact	The project has been presented during its lifetime in different meetings and collections of good practices of C40, ICLEI - Local Governments for Sustainability and other networks of cities. It has also been presented in workshops and seminars linked to European projects, and in response to demands from specific cities. Also, the CCS Secretariat attends visits of other cities' representatives on an ongoing basis. We know that specific tools and resources have been replicated. However, no recollection has been made. Recent studies: Ordonez-Ponce, E. (2018). Understanding the Strategic Engagement of Partner Organizations in Large Cross-Sector Social Partnerships Implementing Community Sustainability Plans. PhD thesis. SEED, University of Waterloo, Canada. *UWSpace.* http://hdl.handle.net/10012/13567 Recent presentations: Urban Resilience in a Context of Climate Change Conference. October 2020. Climate resilience co-planning: A comparison between Barcelona and Seville by Mar Satorras (Universitat Oberta de Catalunya). Barcelona's coproduced climate action by Andoni Gónzalez (Barcelona City Council) ICLEI World Congress, Montreal, Canada. June 2018. Workshop by Amelia Clarke (University of Waterloo), Eduardo Ordonez-Ponce (University of Waterloo), Megan Meaney (ICLEI Canada), Danielle Lussier (Montreal), Marta Cuixart (Barcelona) & Denise Yoon (Korea Institute - Center for Sustainable Development) on: Designing Sustainability Partnerships: Global Survey Results and Experiences of Barcelona, Gwangju, and Montreal. Universitat Oberta de Catalunya. Barcelona. March 2018. Research seminar "Co-production of Climate Policy: A Novel Opportunity for Engaging with Urban Stakeholders? Lessons Learned from the Pla Clima in Barcelona" by Mar Grau Satorras, TURBA Lab research group of the IN3, UOC.
Quality	The CCS enshrined the spirit of Agenda 21, formulated at the Earth Summit (Rio de Janeiro, 1992) and the Charter of European Cities and Towns Towards Sustainability, otherwise known as the Aalborg Charter (1994).

Potential for learning or transfer	Considering difficulties of public consultations in order to provide an efficient management of ecosystem services the CCS provides a highly dynamic and decisive transfer tool. The methodology and procedure used to create the CCS are easily transferable to other interested city or administrative councils.
Further information	*https://ajuntament.barcelona.cat/ecologiaurbana/en/bodies-involved/citizen-council-for-sustainability*

6. Conservative management of habitats ROSCI0129 4070 and 9260 in the North West of Gorj, in Gorj County

Summary: The NORTHWESTGORJ project was aimed to restore two of degraded habitats of the "Nordul Gorjului de Vest" Natura 2000 network site and to establish conservation measures to secure their survival and long-term future. The targeted habitats were: 4070[29] (Bushes with mountain pine (*Pinus mugo*) and *Rhododendron myrtifolium*) and 9260 (sweet chestnut (*Castanea sativa*)). The restoration work involved the following: i) planting 10 ha of *Pinus mugo* and, respectively, 25 ha of *Castanea sativa* using seedlings created within the project; and ii) the application of biological and silvi-cultural methods to control the chestnut blight on 60 ha. Additional measures were expected to create long-term benefits for the biodiversity of the area through the development of an appropriate infrastructure for habitat protection and tourism control. The project also planned to raise the awareness about these issues by increasing public participation in nature-protection decision-making processes and conservation schemes.

General view (a) and detailed view (b) of juniper plantation on Mount Oslea (photo E. Juveloiu & C. Avram. *Source:* Life+11NAT/RO/825. Photos taken from: https://www.lifegreenhabitatsgorj.ro/en/

[29] Code according to EU Habitats Directive Annex I.

Good practice general information	
Title of the practice	Conservative management for 4070 and 9260 habitats of ROSCI0129 North of Western Gorj (NORTHWESTGORJ)
Organisation in charge of the good practice	Environmental Protection Agency of Gorj
Description	
Short summary of the practice	The NORTHWESTGORJ project aimed to restore two of degraded habitats of the "Nordul Gorjului de Vest" Natura 2000 network site and to establish conservation measures to secure their survival and long-term future. The targeted habitats were: 4070 (code according to EU Habitats Directive Annex I) (Bushes with mountain pine (*Pinus mugo)* and *Rhododendron myrtifolium*), and 9260 (sweet chestnut *(Castanea sativa)*). The restoration work involved the following: i) planting 10 ha of *Pinus mugo* and, respectively, 25 ha of *Castanea sativa* using seedlings created within the project; and ii) the application of biological and silvicultural methods to control the chestnut blight on 60 ha. Additional measures were expected to create long-term benefits for the biodiversity of the area through the development of an appropriate infrastructure for habitat protection and tourism control. The project also planned to raise the awareness about these issues by increasing public participation in nature-protection decision-making processes and conservation schemes.
Category of the good practice	***Enabling environment***
Resources needed	Total budget €1 987 742.00; EU contribution €993 871.00. Project location: South-West Oltenia region (Romania)
Timescale (start/end date)	02-JUL-2012 to 30-JUN -2017
Strategic relevance (long term impact)	The project team raised the public awareness on nature conservation and Natura 2000 as a part of the concept of sustainable development. Project beneficiaries established measures for the long-term conservation of restored habitats in the After-LIFE Conservation Plan. This included plans for extending the area of these two habitats and continuation of monitoring activities, as well as awareness-raising and education campaigns.
Evidence of success (results achieved)	- Restoration of the bush habitat 4070; the action consisted of the planting of mountain pine in the area destroyed by inappropriate management of pastures, tourism, and habitat protection. - Restoration of the damaged forest habitat 9260; the action was based on the European experience in developing and implementing biological control of the Asian pathogen *Cryphonectria parasitica*. The chemical control of fungus is not effective and hybridization with resistant Asian chestnut species is not allowed in protected habitats, the only effective method

	being the biological control of invasive pathogen. European study field trials had demonstrated the efficacy of measures consisting of a complex integrated biological and forest control. This method of a biological control consists of applying an experimental biological product (based on local *C. parasitica* strains infected with a specific mycovirus – CHV1) coupled with hygiene and cultural operations. After the treatment, canker sores were healing, mycovirus was spreading and the whole chestnut forests were expected to recover. The chestnut habitat restoration was based on biological control for 60 ha chestnut forests severely affected by the cancer. In parallel, forestry tending operations were executed in the same area in order to reduce the infection and increase the chestnut resistance.
Tangibility	- Restoration of 10 ha of shrubs of destroyed habitat 4070. - Ecologic reconstruction of 60 ha of the forest of 9260 habitat by using biological methods of treating the infections. - Restoration of total of 25 ha of the destroyed chestnut forest. - Adequate infrastructure in the restored habitat including a small-scale infrastructure for visitors to control tourism in these protected areas. - Informative materials: 5 boards with the habitats' information, 12 boards about the small-scale infrastructure for visitors, project presentation brochures (1000), 10 000 pieces of the guide promoting ecotourism in the protected area with the slogan "Change your attitude, protect the nature" in ROSCI 0129, two banners, 100 posters, 10 000 / DVDs and CDs informational materials, including photos and videos, 1000 leaflets on natural habitats management, 3000 ecology manuals for children. - 10 project events, including the launch of the Chestnut Festival. - Target groups made aware of the value of biodiversity and about the project funding.
Durability	It was expected to create long-term benefits for biodiversity of the area through the development of an appropriate infrastructure for habitat protection and tourism control. The project also planned to raise the awareness about these issues by increasing the public participation in nature-protection decision-making processes and conservation schemes.
Visibility	Within the LIFE+ 11 NAT / RO / 825 - NORTHWESTGORJ - project, three main categories of target groups have been identified, on which the dissemination strategy and communication plan of this project should focus: 1. Public authorities and institutions directly or indirectly interested - Gorj County Council and Prefecture, 11 local public authorities located in the ROSCI0129 ("Site of Community Importance" in Romania) Nordul Gorjului de Vest, public and

	private forestry organizations, Gorj Agency for Payments for Agriculture, Gorj Agency for Rural Development, members of the Scientific Council of ROSCI0129 Administration, specialists of administration of protected natural areas, etc. 2. Potential tourists and interested travel agencies. The awareness of tourists must be built mainly through printed informative materials and signboards placed in target areas, messages should be mainly related to restrictions and objectives of protected Natura2000 sites. 3. Local population in protected nature areas of the North of Western Gorj (especially for the younger generation – preschool, pupils and students) - publicly interested in the intrinsic connection between environmental protection and conservation, and a long-term quality of life.
Added Value:	NORTHWESTGORJ has a wider relevance as the demonstration project for good practices relating to the management of protected areas on a large-scale and in difficult environments, especially practices developed for the management of territories with degraded areas of two targeted habitats. At the same time, the project contributed to the improvement of habitat conservation in Romania by implementing complex treatment and restoration activities, and by fostering communication activities related to conservation, environmental education and information campaigns. These activities also raised awareness about benefits that Natura 2000 network, in particular sites containing two target habitat types, provide to both, environment and human communities. Products obtained from chestnut forests (nuts, wood, honey) represented in the past an important source of income for the local community. Therefore, the local community has positively reacted to the project activities, offering land to be planted or plantations to be treated. Before the project, all the forests and orchards were dead or in advanced dying process all over Romania (with major financial and ecologic impact). Due to the project's results, the revitalisation of all types of chestnut cultures (forestry, horticulture, landscapes, green areas) may contribute to the rural sustainable development. Traditional use of chestnut products may also be maintained.
Effectiveness	Through the restoration of '*Castanea sativa* woods' habitat, the project contributes to the improvement of a traditional source of revenue for local people, which has declined and even been lost in these areas. The sweet chestnut forests are a very good example of the habitat that provided multiple ecosystem services to human population. The conservation of such habitat types is clearly demonstrating public benefits of biodiversity conservation. For the project this was carried out by using different communication tools, such as the Chestnut Festival organized by the LIFE project team. This successful event has been taken over by local authorities and transformed into an annual cultural event.

Innovation	The present practice also brought a certain degree of innovation: • improved methods of mountain pine seedling production and plantation; • use of biological control for the chestnut affected by an invasive fungus *Cryphonectria parasitica*; • testing some improved methods of nut conservation, seedling production and sweet chestnut plantation; • raising awareness through the public participation in the nature protection in the decision-making process and the preservation of habitats important for the Community (Chestnut Festival and roundtables)
Efficiency	The implementation of this good practice involved a very large volume of work with multiple activities that allowed: i) the successful restoration of +10 ha of a destroyed mountain pine habitat; the improved methodology contributes to a better stability of the new plantation and higher rate of success for similar activities; ii) the reconstruction of more than 60 ha of sweet chestnut habitat through biological control of pathogen; the mycovirus spreading ensures a better conservation status of chestnut in +305 ha of forests; iii) restoration of more than 25 ha by planting chestnut seedlings; the improved methodology of seedling production and plantation will ensure high efficiency in chestnut regeneration. The overall objective of the project was achieved with a maximum efficiency if the sustainable approach of this good practice is considered.
Externality	The project also contributed to the restoration and revitalization of two habitat types (4070* and 9260) listed in the Annex I of the EU Habitats Directive. The NORTHWESTGORJ has a wider relevance as demonstration project for good practices relating to reconstruction / restoration of protected areas on a large-scale and in difficult environments, especially for practices developed for the management of areas with degraded areas of two targeted habitats. At the same time, the project contributed to the improvement of habitat conservation in Romania by implementing complex treatment and restoration activities, and by fostering communication activities related to conservation, environmental education and information campaigns.
Intra-regional coordination	Coordinator: Environmental Protection Agency, Gorj. Partners: • Gorj North West Site Administration; • National Research and Development Institute of Forestry ”Marin Dracea” (former Forest Research and Management Institute).
Extra regional impact	Spare mountain pine and sweet chestnut seedlings produced in the project have been already used in other projects applied in different regions (central, north-western and southern Romania).

	Mycovirus was also spread in small areas (demonstration test) from neighbouring zones (Gorj, Mehedinți and Vâlcea counties), in forests, orchards and gardens, thus targeting different categories of stakeholders. This facilitates the virus spreading and chestnut healing.
Quality	The implementation of this practice has led to improvement of the management of protected areas, positive effects on all the actors involved – authorities, locals, stakeholders, etc.
Potential for learning or transfer	Demonstrated reconstruction solutions may be replicated in similar habitats all over their natural range. These were presented to numerous stakeholders (administrators of forests, orchards and protected areas, land owners, local and regional authorities, conservationists, etc.) in the dissemination actions of the project. The improved methodology of mountain pine reconstruction was already transferred to several projects (Life+, POIM). All the new / improved solutions on chestnut production and protection were practically applied to the local landowners and administrators of forests, orchards, gardens, etc. Some of them already spread the knowledge to the local community.
Further information	*https://www.lifegreenhabitatsgorj.ro/en/*

Juniper seedlings in the mountain nursery - produced in the plastic greenhouse (a) and through acclimatization (b) (photo E. Juveloiu & C. Avram. *Source:* Project Life+ 11 NAT/RO/825
Photos taken from: https://www.lifegreenhabitatsgorj.ro/en/

7. Protecting of the English oak in the cross-border area (Oak protection/ Hungarian – Croatian border area)

Summary: The comprehensive aim of the project was to stop the deterioration of habitats made by indigenous tree species (e.g. English oak), prevention of the spread of invasive species, an objective exploration of processes and working out recommendations for complex solutions. The full achievement of this aim required the implementation of two activities:

1) in the long run the Hungarian-Croatian subsoil water monitoring system was created, consisting of 62 measurement points to provide long term data for modelling the numeric movement of the subsoil water. The data collection also served for setting up the network of automatic meteorological stations to be created within framework of the project, followed by collecting further data on both sides of the border about precipitation falling. Based on the data collected the analysis of forest conditions was made. Also, it examined water ecosystems, forecast of the development trends of oak dominated ecosystems, and tackled a possibility of setting up an alarm system to forecasts malfunctions and creating "inundation" plans and possibilities of the retention of precipitated water.

2) The project was fighting back invasive species in order to protect the indigenous ones using the framework of assessing invasive species also in the Croatian areas under the coordination of Mecsekerdő (Mecsek Forestry Co). Parallel to this on the territories of the Sellye Forestry and the Szigetvár Forestry of Mecsekerdő fighting back of invasive ligneous plant species (black locust, false indigo and tree of haven) took place on the total area of 155 ha. As a closing act, the methodology for fighting back species monitored by the Croatian side and already suppressed by the Hungarian side was prepared to summarise experiences collected during the elimination of these species.

In addition, the mobile phone application was developed to demonstrate the significance of protecting the English oak for all target groups (including hikers and the inhabitants).

Oak protection mechanical clearing of false indigo.

Oak protection marking

Oak protection monitoring

Photos: Mecsek Forestry Co

Good practice general information	
Title of the practice	**Protecting of the English oak in the cross-border area (Oak protection) –** Hungarian – Croatian cross-border areas
Organisation in charge of the good practice	Mecsek Forestry Co - (HU), HRVATSKE ŠUME d.o.o. Zagreb, Uprava šuma, Podružnica Našice (CR)
Description	
Short summary of the practice	The comprehensive aim of the project was to stop the deterioration of habitats made by indigenous tree species (e.g. English oak), prevention of the spread of invasive species, an objective exploration of processes and working out recommendations for complex solutions. The full achievement of this aim required the implementation of two activities: measuring the subsoil water level and fight back invasive species in the project area. In the long run the Hungarian-Croatian subsoil water monitoring system was created, consisting of 62 measurement points to provide long term data for modelling the numeric movement of the subsoil water. The data collection also served for setting up the network of automatic meteorological stations to be created within framework of the project, followed by collecting further data on both sides of the border about precipitation falling. Based on the data collected an analysis of forest conditions was made. This document examined also the water ecosystems, forecast of the development trends of oak dominated ecosystems, and tackled the possibility of setting up an alarm system to forecasts malfunctions and creating "inundation" plans and possibilities of the retention of precipitated water. Next to monitoring the subsoil water level, another comprehensive objective of the project was fighting back invasive species in order to protect the indigenous ones using the framework of assessing invasive species also in the Croatian areas under the coordination of Mecsekerdő (Mecsek Forestry Co). Parallel to this, on the territories of the Sellye Forestry and the Szigetvár Forestry of Mecsekerdő fighting back of invasive ligneous plant species (black locust, false indigo and tree of haven) took place on the area of 155 hectares. As a closing act, the methodology for fighting back species monitored by the Croatian side and already suppressed by the Hungarian side was prepared to summarise experiences collected during the elimination of these species. In addition, the mobile phone application was developed to demonstrate the significance of protecting the English oak for all target groups (including hikers and the inhabitants).

Category of the good practice	Empowering tools
Resources needed	The total ERDF funding of the project was 63 864 462 EUR, which covered 85% of the project's expenditures. Another 15% were provided as the own contribution. In Croatia the own contribution was covered by Hrvatske Šume (national forest company), while in Hungary 15% were provided by the State.
Timescale (start/end date)	The duration of the project was 22 months starting from 1 September 2017 until 30 June 2019.
Strategic relevance (long term impact)	The role forests play in the environment protection has increased significantly over past decades, thus the EU lays a great emphasis on protecting forests, biodiversity and soil (see: EU Forestry Strategy & AP). The long-term goal of the analysis of condition of the ground water is to have, on the basis of study and data series, an exact water governance activity (e.g. construction of canals and locks) in order to increase the vitality of forests and the preservation of the soil's fertility. Another advantage is that modelling the level of subsoil water allows planning the forest renewal and ensuring the sustainability of the indigenous species in the future.
Evidence of success (results achieved)	The project was awarded with the prestigious "good practice" title of the Directorate-General for Regional and Urban Policy of the European Commission. The project has reached several tangible results: - 38 monitoring wells were established in Hungary; - 5 monitoring wells were established in Croatia; - 17 existing wells were cleaned in Croatia; - 7 meteorology stations have been installed; - 155,17 ha of forest were cleaned from invasive species by chemical and mechanical technics; - new processes have been developed; - soil analysis was delivered; - analyses of the fauna were delivered: observing daytime butterfly stocks, night observation of insect stocks, population surveying. - the mobile application was developed that introduces the invasive species of the area, shows forest map with restrictions of visiting or fire, makes possible to report about different prohibited activities (fire, waste, vehicles, etc.) Meteorology stations and wells permanently provide valuable data, while local communities become more and more active in using the app to support the protection of local ecosystems.

Tangibility	During the project period a subsoil water monitoring system consisting of sixty wells was created and supplemented by seven automated meteorology stations providing up-to-date information about one of the most significant factors of the forest management – precipitation. Another selected objective of the project as mapping and suppression of invasive ligneous plant species: on the Hungarian side more than 150 hectares of the forest area were freed from tree-of-heaven, black locust and plant species causing the biggest problem – false indigo. Parallel to this, the mapping of invasive species also took place on the territory of the Nasice Forestry.
Durability	The *forest companies* are state-owned structures with a stable financing and human background. Therefore, they will be able to maintain the wells and the meteorology stations, and continue cleaning the forests from invasive species after the termination of this cooperation as well. A sustainability of the monitoring system has been questioned several times, so the Croatian Forestry recommended the construction of an automatic system for which they found a partner and resources within the Oak Protection project. On the basis of dynamic data collection of a new system they get a complex picture of movements and characteristics of the subsoil water, which can also help to prepare for droughts. The data provided by measurement stations are available for all users of the WEB GIS platform equipped with maps and filters at the https://oak.geof.hr/gis site. According to plans it will be supplemented by the satellite observation system, which is currently being developed and will allow the monitoring of changes of the vegetation in the future. The analyses provided by the project are also available in the downloadable format for *forest companies*, national parks and any interested parties. Members of the cooperation intend to extend researches to other indigenous species. Also, water management actions based on the research findings are expected.
Visibility	During the implementation of project its' partners placed a great emphasis on the communication of project results not only to experts but also inhabitants. The mobile application developed for the reporting of invasive species was supplemented with functions reaching a wider target group then it was originally planned with the introduction of values of the Dráva Plain to be protected and the information of threatening ligneous invasive species. Also, it contains news, recommended forest programmes and maps. The application is downloadable for both Android iOS platforms.

	In addition, a brochure was made for inhabitants about the invasive species, but experts are also able to use detailed methodological guidelines concerning the suppression of the invasive plants. The project has organised kick off and closing conferences, and several workshops for ca 100 participants.
Added Value	Even ten years ago, costs of protecting the ecosystem from invasive species have reached approximately €12 billions in the European Union. Different scientific studies agree that the most remarkable risk among all factors threatening biodiversity is the penetration of invasive plants and animals. The most significant added value of the project is the cleaning of 155 hectares, which were freed from invasive species. Another project result is the methodology worked out for the suppression of false indigo (Amorpha fruticose). The forest companies have also identified possibilities of an adaptive forest management applied for the stocks of oak. By analysing data on precipitation and temperature, measurements of soil layers and subsoil water level, and LiDAR based monitoring the forestry attempts to model the consequences of climate change. Besides the increase of a mean temperature during, both, extremely wet and too dry periods are expected. This all forecasts an increased importance of the water management activity. Studies delivered by the Oakprotection project will support forest managers in their everyday monitoring activities and plantation of oak forests.
Effectiveness	The project brought together environmental experts from Croatia and Hungary to prevent habitat loss of the English oak and other native trees. They worked on collecting data and analysing conditions in local forests and putting in place measures to stop the spread of invasive species. The effectiveness of cooperation was grounded by the involvement of scientific actors (Croatian Forest Research Institute, SM Növényvédőszer Kft., NARIC Forest Research Institute, Institute of Geography and Earth Sciences University of Pécs), as well as experts of diverse forest management activities (e.g. pesticide producers) and forest managers, who possess practical everyday experiences from ground surveys and forest monitoring. The establishment/management of 60 measuring points of ground water monitoring system is a significant achievement. Thanks to this modern technology forest companies are able to perform professional forest management and decision-making supported by reliable measurements. Another key goal of the project was to fight back against invasive plant and tree species that threaten the viability of

	English oak and other indigenous species. The project assessed such invaders on both sides of the border. This work led to the clearing of about 155 hectares of three invasive species – acacia, false indigo and tree of haven. The project drafted a methodology to monitor the progress of native species after the removal of unwanted plants and trees. In addition, the mobile app was developed to demonstrate the significance of issues tackled by the project for the benefit of local people and tourists. In total 95 people took part in the project's joint educational training and awareness-raising events. Two environmental studies were published.
Innovation	Nature protection efforts are reflected by technologies applied in the project, on the one hand (e.g.: injection), and it was a goal, on the other hand, to restore original habitats, which create ecological conditions for protected plant and insect species that were formerly suppressed by false indigo.
Efficiency	The Mecsekerdő Zrt forest company succeeded to clear more than one-third (155 hectares) of its 400 hectares of infected forest area: 155 hectares. Two forest companies collaborated in the good practice: Mecsekerdő Zrt from Hungary, and Našice Forest Company from Croatia. Both forest companies manage large forest areas: 55.000 hectares are managed by the Hungarian forest company, while the operational area of Našice Forest Company is almost 74.000 hectares. The two companies employ altogether 948 workers, their everyday activities were supported by the good practice as on the one hand an efficient monitoring system could be set up, on the other hand protecting indigenous species form invasive plants became easier with the decrease of the invasive population's size. As a result of the good practice the information flow between the two forest companies became more frequent.
Externality	Experiences of the Oak protection project can be channelled into the implementation actions of the EU Biodiversity Strategy and particularly to the tasks related to the fight against Invasive Alien Species. The project can be also interpreted as a local 'projection' of the information exchange mechanism developed by the European Commission, which strives to facilitate the implementation of the EU policy on invasive alien species: the European Alien Species Information Network (EASIN). It's an online platform that aims to facilitate access to existing information on alien species from a range of sources. The EASIN includes the Species Search and Mapping tool allowing basic and advanced search of a database including over 14 000 alien species in Europe and showing their

	distribution on a map. The EASIN includes the notification system (NOTSYS) for the Member States to inform the Commission about new observations of the invasive alien species (IAS) and rapid eradication measures taken. The app of the Oak protection project includes the same features: descriptions on invasive species, map and a notification system. Users of this app may become 'citizen scientists' and monitor invasive alien species in their regions. The experiences of the project's app can be forwarded to the EC. This could base a new level of cooperation among the European Commission's Joint Research Centre and local forest companies and support early detections of new invaders.
Intra-regional coordination	Protecting forests' ecosystem presents an increasingly serious challenge for *forest companies*, as the climate change causes a significant problem in the field of forest management, e.g. winters becoming milder and precipitation patterns more extreme year by year. Thus soil water balance and microclimates are changing, and forest zones sometimes are shifting. Consequently, many invasive species have appeared, which are more resistant to new circumstances (e.g.: the lack of rainfall). As a new tendency, native species die off as their habitats are steadily declining. The above mentioned problems exist in both, the area of Mecsekerdő Zrt. and the Forestry of Nasice in Croatia. The lack of drought and groundwater present the major source of concern in the area of operation of both forest companies. 10.000 m^3 of the English Oak registered to die off annually in the Forestry of Koska (Croatia). Among native species the most affected and the most sensitive one is the English Oak having a significant natural and economic value. However, tan, ash and beech are also at risk on the Hungarian side. In addition, next to the lack of water there is a great new problem that invasive species drown native species in this habitat (e.g.: Black Locust, Amorpha, Tree of Heaven). The estimated infected area of forests managed by Mecsekerdő Zrt. is more than 400 hectares. The infected part of the project area is 155.17 hectares and the most common species are Amorpha. Based on similar professional challenges, geographical proximity and existing working relationships the two forest companies have decided to jointly find a solution to the problem above.
Extra regional impact	The project activities are in line with the European Commission's LIFE programme and the purpose of LIFE platform meeting on Invasive Alien Species. The event took place in Milan, Italy on 29th and 30th November 2017, within the framework of the LIFE GESTIRE2020 (LIFE14 IPE IT 018) project. Invasive Alien Species (IAS) and their impact to the environment are one of the key topics addressed by LIFE projects over the years, which should deserve adequate

	dissemination and which should act as example for the development of further ideas and proposals. The meeting brought together LIFE projects and other organizations, to share many experiences and case studies on this topic, assess strength and weaknesses of the LIFE programme in relation to the implementation of the EU Regulation of IAS, evaluated future challenges and opportunities, including links with other nature protection legislation and with other EU financial resources. The results of the Oak protection can be channeled to the activities of this network.
Quality	The outstanding quality of the project concept and its results are proven by the fact that that it was selected as the best practice by the Interreg V-A Hungary-Croatia Co-operation Programme 2014-2020. Regarding the preparation of studies, practical information was collected during on-the-spot visits. The ecological study is a key document of the cooperation. During its preparation the fieldwork was carried out. It included investigation of the structure of stands on the test plots, determination of the growth of pedunculate oaks, analysation of the features of forest soils, as well as the field research on the status of aquatic ecosystems. The data on forest stands and performed forest work were taken from the Croatian Forests database and the data on the LiDAR imaging were processed. This action was performed twice for the study area: April 2018 and April 2019.
Potential for learning or transfer (1000 char)	Results of the pilot actions (chemical and mechanical cleaning), monitoring well establishment and operation, meteorology station measurement results and cooperation among different stakeholders of the area can be analysed by other regions. Also, the cooperation has revealed an interesting social aspect – the community of foresters is a closed circle in certain respect, which hinders gathering of the information about their work and dissemination of their experiences. This shows that in the future co-operation the attitude shaping impact has to be considered and related supporting activities have to be integrated.
Further information	*http://oakprotection.eu/en*

8. Introducing airborne imaging technologies in forest management near the Drava River

Summary: The good practice was implemented as an activity of the project 'Restoring Ecological Diversity of Forests with Airborne Imaging Technologies (RED FAITH)' financed by the Hungary-Croatia Cross-border Co-operation Programme. Climate change adaptation and environment protection are important challenges in the EU, and due to its remarkable natural values it has a special importance for the Hungarian-Croatian border region. With its manifold ecosystem services forests of the area are not only valuable reserves of biodiversity and pristine landscapes for recreation, but also provide renewable resources, bioenergy and offer employment in rural areas. A healthy forest possesses the ability to sustain the unique species composition and processes that exist within it. Through climate change, forests are highly endangered by hail, drought, diseases and by spread of invasive species. The forest companies of the border region agree that monitoring of forests is the first step to impede the spread of invasive species and other endangering factors.

The project sets out the overall objective of contributing to preservation and protection of biodiversity in forest areas by supporting *forest companies* and other organizations responsible for managing habitats in detailed up-to-date monitoring with airborne imaging. As a specific objective it accelerates reactions to emerging hazards, protects/restores natural assets by enabling *forest companies* to select the most efficient interventions, as well as improves knowledge of forest engineers, raise awareness on forest values and sets up CB (cross-border) cooperation of *forest companies*.

Initially, *forest companies* compared their surveys applied, conducted research on airborne technologies and defined parameters for monitoring. As the pilot action it was planned to monitor 24 838 ha by aerial imagery. The evaluation of pilot results (differentiating species, calculating stocks, recognizing invasive species and diseases, etc.) was delivered by experts, while integration of images into digital regional planning maps for energy and environment related investments were delivered by the cooperating organisations of the RED FAITH project, using ArchGIS. In Croatia, low altitude photos were taken by drones where irregularities were identified by the pilots. Afterwards, results were evaluated jointly with Hungarian and Croatian partners.

Red Faith Forest
Photos: Mecsek Forestry Co

Red Faith training of forest managers

Good practice general information	
Title of the practice	**Introducing airborne imaging technologies in forest management near the Drava River**
Organisation in charge of the good practice	Mecsek Forest company Co (HU) Project partners in RED FAITH project: Baranya County Municipality (HU), FOOZOS (CR), Croatian Forest company - HRVATSKE ŠUME d.o.o. (CR)
Description	
Short summary of the practice	The good practice was implemented as an activity of the project 'Restoring Ecological Diversity of Forests with Airborne Imaging Technologies (RED FAITH)', financed by the Hungary-Croatia Cross-border Co-operation Programme. Climate change adaptation and environment protection are important challenges in EU, and due to its remarkable natural values it has a special importance for the Hungarian-Croatian border region. With its manifold ecosystem services, forests of the area are not only valuable reserves of biodiversity and pristine landscapes for recreation, but also provide renewable resources, bioenergy and offer employment in rural areas. A healthy forest possesses the ability to sustain the unique species composition and processes that exist within it. Through climate change, forests are highly endangered by hail, drought, diseases, and by spread of invasive species. The forest companies of the border region agree that monitoring of forests is the first step to impede the spread of invasive species and other endangering factors. The project sets out the overall objective of contributing to preservation and protection of biodiversity in forest areas by supporting *forest companies* and other organizations responsible for managing habitats in detailed, up-to-date monitoring with airborne imaging. As a specific objective it accelerates reactions to emerging hazards, protects/restores natural assets by enabling *forest companies* to select the most efficient interventions, improves knowledge of forest engineers, raise awareness on forest values and sets up CB (cross-border) cooperation of *forest companies*. Initially, *forest companies* compared their surveys applied, conducted research on airborne technologies and defined parameters for monitoring. As the pilot action it was planned to monitor 24 838 ha by aerial imagery. The evaluation of pilot results (differentiating species, calculating stocks, recognizing invasive species and diseases, etc.) was delivered by experts, while integration of images into digital regional planning maps for energy and environment related investments were delivered by the cooperating organisations of the RED FAITH

	project, using ArchGIS. In Croatia, low altitude photos were taken by drones where irregularities were identified by the pilots. Afterwards, results were evaluated jointly with Hungarian and Croatian partners.
Category of the good practice	Empowering tools
Resources needed	The total ERDF funding of the project was 485 401.94 EUR, which covers 85% of the project's expenditure. Further 15% were provided as own contribution. In Croatia the own contribution was covered by partners themselves, while in Hungary 15% were provided by the State.
Timescale (start/end date)	The duration of the project was 2 years from 1 October 2017 until 30 September 2019.
Strategic relevance (long term impact)	The project directly addresses the challenge of a climate change and contributes for the sustainable management of ecosystem via providing detailed, up-to-date information on forest conditions. Partners foster the introduction of airborne monitoring technology, which represents very high resource efficiency. The current good practice didn't include any component to make economic analysis, but the financial saving potential of airborne imaging was already calculated by a project (CHANGEHABITATS 2) financed by the 7th Framework Programme, which concluded that cost savings up to 3.4 Billion Euros at EU level could be achieved by reducing field work for habitat mapping by analysis of airborne sensed data. Pilot actions, CB action plan, trainings and awareness raising can all contribute to ensure a sustainable operation of this process. The pilots ensure better reaction of the results of climate change (weather events, invasion of insects, diseases & invasive species), as aerial imaging provides a possibility for early recognizing these problems and intervening rapidly.
Evidence of success (results achieved)	The applied technologies (multispectral imaging, hyperspectral imaging, LiDAR - Light Detection and Ranging) ensure much better access to forest areas then ground surveys, and they are able to map large surfaces quickly. However, automatic recognition and identification of different species is a challenge, as the high quality of images must be permanently ensured. Even so, the introduction of multispectral, hyperspectral and Lidar technologies can be evaluated as a breakthrough in forest monitoring, which can be advised and supported by other forest companies and national parks in Europe. The reasonability of their application is proved by the high level of interest of forest managers, environmental experts and other stakeholders, such as local authorities. The good practice targeted to reach 276 persons directly at project events, such as workshops and conferences. Two

	national parks and four forest companies have benefited from the project. Besides providing professional knowledge to forest managers, 76 children were also targeted to raise their awareness on the values of the ecosystem.
Tangibility	The cooperation resulted in tangible results, such as aerial images of the forest area covered by pilot actions, databases generated from aerial images, studies like "Forest company Applications of Airborne Remote Sensing Techniques", "The mysteries of modern mapmaking and remote sensing", "Evaluation Study of Experimental Action". Besides, the introduction of the aerial imaging technologies, the Forest House of Tikves (Croatia) was renovated and multimedia devices were procured to introduce natural assets and values of forests for children. Two national parks, four forest companies and a county municipality benefited from experimenting the possibility of forest monitoring by airborne technologies. 76 children were educated at two already existing forest schools in the two countries.
Durability	The *forest companies* are state-owned structures with stable financing and human background. Therefore, they are able to maintain the achieved results and apply the airborne technologies tested by the project as pilot actions in long terms. The joint action plan creates the framework for the cross-border cooperation, sharing knowledge and building individual relationships. To embed this knowledge into everyday work of *forest companies*, trainings for professionals were organized. As the aerial images present a spectacular experience for wider public, they were inserted into training materials of forest schools and trainings for children were organized at forest houses of Mecsekerdő and forest house of Hrvatske Sume at Tikves. The forest schools were equipped with multimedia devices for visualization of training materials. Continuation of a joint work was supported by the cross-border action plan, network of *forest companies* and intranet. Also, other *forest companies* are ready to take over experiences of the good practice and have expressed an interest in a long-term cooperation by issuing the letters of support. Awareness raising will be continued by using training materials at forest schools, which are regularly organized by the *forest companies*. Besides, the cross-border action plan will be forwarded to the relevant ministries of both partnering countries, Hungary and Croatia, for consideration and utilization for updating the national forest management guidelines and strategies.
Visibility	The cooperation produced several internal and public communication actions. The conceptual questions on forest monitoring methods, technological requirements, analysing

	the results and educating forest managers were discussed at 5 project meetings in Hungary and Croatia. The project partners also launched the project website (https://www.redfaith.hu/en). Besides, leaflet and brochure were prepared to describe objectives and duties of the cooperation. The partners informed wider public about actual tasks at the kick off conference in Hungary and the closing conference in Croatia. Four workshops were organised for professionals (2 in HU, 2 in CR), where mainly airborne imaging technologies, their benefits and practical results have been introduced, and the feedback from forest managers and stakeholders was collected. The studies delivered by the project (currently applied processes of forest monitoring, comparative analysis of current processes of forest monitoring, study on available airborne imaging technologies, legal regulations related to airborne monitoring) were made available for public. Another important strand of the communication was provided by training activities; forest managers were trained to use new imaging technologies. Besides, trainings were organised for pupils about the forest vegetation and their protection. For this purpose, the Forest Company House at Tikves (CR) was renovated and prepared for forest school's activities; multimedia devices for trainings were installed at forest school's premises. Partners have elaborated a joint training material for experts - forest managers, environment experts, and 2 training materials for children studying at forest schools (1CR, 1HU). The organisation of trainings for experts and children were also a part of the project.
Added Value	The accessibility of forest areas is diverse. Their unified monitoring can be efficiently ensured by technologies used by the good practice – containing aerial imaging, and also evaluation of these images. Limited accessibility is one of the main reasons why airborne monitoring is necessary, as some forest areas can be reached with more difficulties. Aerial imaging eliminates this obstacle and provides the possibility of monitoring all forest areas without facing the problems deriving from the differences of landscape – only favourable weather conditions are needed for the flights and taking images. Besides, as these forest areas are not located at transport hubs, they are not well-known for tourists. Awareness rising is important to attract visitors - with special attention on children - to these destinations. The promotion of forests as ecosystems is also an added value of the project, which is delivered via trainings and diverse communication actions.
Effectiveness	Usually, the forest monitoring is handled by ground surveys, but this is time-consuming and expensive process, besides

	forest managers are not able to check the crowns of trees, which would make it possible to recognize irregularities earlier. The airborne hyperspectral remote sensing technology might be the best technique to map invasive species, as images can cover large area quickly with relative high ground and radiometric resolution. It can detect small patches that otherwise might have been missed by ground surveys. In its most common form, it is an airborne optical remote-sensing technology that measures scattered light to find range and other information on a distant target. The ability to capture the height at such high resolution is Lidar's principal advantage (Lidar stands for light detection and ranging.). Traditionally, foresters and land managers have relied on topographic maps for terrain classification and field surveys to obtain tree volumes and height information. Lidar penetrates the tree canopy to return a more accurate interpretation of the ground surface. This increases the accuracy of terrain classification and thereby the resultant interpretation and analysis of the geographic features. Forest inventories can be conducted at nearly the single tree level, offering more accurate representations of the true forest stand structure and damages.
Innovation	Although penetration of geographical information systems (GIS) in the forest industry of countries with developed forest management has made possible the optimization of these working methods, *forest companies* of the CR-HU border region haven't exploited this possibility yet. The focus of the project was on hyperspectral, multispectral point cloud-based data, airborne remote sensing, pixel- and cloud-based vegetation mapping. These technologies represent the latest trends of spatial data application at the forest company.
Efficiency	The penetration of geographical information systems (GIS) into the forest industry of countries with developed forest management (Canada, UK) has made possible the optimization of working methods. The GIS is becoming one of the most essential tools for the forest management. In this context, there is a business need for a continuous up-to-date inventory of existing forest resources (location, condition). This is compelling for foresters to look for more cost-effective and faster alternatives of ground surveys. The CR-HU border region hasn't exploited this possibility yet, as technologies were not known in these countries – airborne monitoring (mostly Lidar and hyperspectral) is a very innovative technology itself.
Externality	The area of remote sensing and global information system is extremely active in Hungary. Within this area, a successful co-operation between forest company management departments, universities and scientific institutions can be effectively

	realized by applying the latest devices and methods. The integration of airborne laser mapping (LiDAR), airborne digital photography (making of digital orthophotos) and airborne hyperspectral imaging will be suitable to determine the woody vegetation structure of the examined area, thus to differentiate them on the level of species and to locate invasive wood species. An important feature is that this technology can be used in other regions as well, as the forest vegetation does not stop at regional or country borders.
Intra-regional coordination	More than 124 000 ha of forests are managed by the partners, where share of the Natura 2000 sites is extremely high (76% in HU). By involving the other two forest companies (Somogy County, Zala County) of South Transdanubian Region and the Danube Drava National Park to the analysis of the results and evaluation of their applicability, the project covers the entire forest land of the border area.
Extra regional impact	The challenge of mapping forest areas by new technologies to identify invasive species and diseases needs to be tackled by interregional (cross-border) cooperation, as forests are composed of similar species and the natural and human hazards always cross the borders. Risks & benefits of airborne imaging will be jointly analyzed, which makes the initiation of innovative technologies safer. The beneficiaries have widened their cooperation by involving 2 other forest companies (SEFAG Zrt, Zalaerdő Zrt), 2 national parks (Duna Dráva Nemzeti Park, Javna ustanova Park prirode Kopački Rit) and 3 environment protection related organizations (J.U. Agencija za upravljanje zaštićenim prirodnim vrijednostima na području Osječko-baranjske županije, Sveučilište Josipa Jurja Strossmayera u Osijeku, Izviđački klub Javor Osijek) as supporting stakeholders. The *forest companies* and national parks will use the training material developed in result of project implementation for professional trainings. For them the results of pilot actions are also important as remarkable share of the *forest companies* belong to Natura 2000 sites: from the 55 000 ha forests of Mecsekerdő Zrt 40 765 ha (76%) are registered as Natura 2000 sites. Moreover, *forest companies* will set up a network, which will be widened by the other regional offices of Hrvatske Sume and other Hungarian forest companies.
Quality	The quality can be interpreted as a process quality and also as an accuracy of the data gained from the imaging. Regarding the processes, the concept proved to be successful – hyperspectral, multispectral, lidar airborne imaging combined with low altitude drone monitoring is a complex tool for analysing the vegetation. In addition, as the application of these technologies in forest management is an innovation, some 'beginner'

	problems have appeared in terms of the data accuracy – the automatized identification of different species might sometimes bring false results. This shortage can be eliminated by more routine in the aerial imaging and fine-tuning of the evaluation software.
Potential for learning or transfer (1000 char)	The results of pilot actions (aerial imaging of forest areas) can be discussed with Hungarian and Croatian forest companies, the evaluation of an experimental action can be downloaded and analysed for the local adaptation. After setting the goals for other regions – like creating a repository of species, identifying invasive species, detecting diseases of the vegetation – the applicable imaging technics can be selected, mixed tools can be defined. The expected costs of the airborne imaging and quality of images, potential obstacles, timeframes can be predicted from experiences of the pilot action. With this support, efficiency of monitoring of the European forest areas can be raised and databases can be unified.
Further information	https://www.redfaith.hu/en