Final report of project SURGE (preliminary)

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Title of the project	- Strengthening the Adaptive Potential of the Forests of Western Ukraine, Northwest Russia and Southwest Germany to Changing Environmental Conditions and Societal Needs - SURGE - Strategies and Measures for Increasing and Sustaining the Provision of Forest Ecosystem Goods and Services
Project investigators and cooperation partners	- Partner 1 (P1): Albert-Ludwigs-University Freiburg, Germany, Faculty of Environment and Natural Resources, Chair of Forest Growth, Prof. Dr. Heinrich Spiecker, Prof. Dr. Hans-Peter Kahle - P1 ALU-FR - Partner 2 (P2): Ukrainian National Forestry University, Lviv, Institute of Silviculture, Prof. Dr. Vasyl Lavnyy - P2 UNFU-LV - Partner 3 (P3): St. Petersburg State Forest Technical University, Russia, International Center of Forestry and Forest Industries, Prof. Dr. Alexander Alekseev, Prof. Dr. Maxim Chubinsky - P3 SFTU-SP

Abstract

The aim of project SURGE was to increase and sustain the provision of ecosystem goods and services from the forests of Western Ukraine, Northwest Russia and Southwest Germany under changing environmental conditions and societal needs.

The cooperation between the three partners consisted of seminars, summer schools, and workshops in the fields of forest management planning and forest resource management, which were held in Freiburg, St. Petersburg and Lviv within the period March 2016 to February 2019 (36 months). In all activities, senior and junior scientists (post-graduate students, doctoral students, young post-doctoral scientists) as well as practitioners and administration officers from the partner countries were involved.

The project activities included the establishment of demonstration plots at the Ukrainian and Russian partner institution for educational, training and research purposes as well as the setting-up of a tree-ring measurement station at the two partner institutions as measures of sustained capacity building in silvicultural techniques, production ecology and forest growth research.

The project resulted in the development of a continuation activity entitled “Norway spruce and its role in providing wood as a resource for green economy in Western Ukraine, Northwest Russia, and Southwest Germany - a feasibility study” submitted to VolkswagenStiftung in early 2019. The proposed feasibility study will serve as a platform to intensify the existing partnership and focus the further scientific collaboration on the highly relevant topic of the future of spruce dominated forests in the three regions. A full proposal for a trilateral scientific project will be submitted to VolkswagenStiftung at the next call (expected for late 2019/early 2020).

The trilateral partnership program gave young, second and third level as well as senior forest scientists, scholars and forestry practitioners from Ukraine, Russia and Germany the possibility to openly discuss in a harmless environment issues of forest-based land-use management in the context of contrasting social, economic and political concepts in the different regions. The project stimulated visionary thinking about the forest futures in each partner region and motivated young scientists to be more intensively involved in developing the respective scientific background and strengthening the trilateral partnership in the future.

Abstrakt

Das Ziel des SURGE Vorhabens bestand darin, Instrumente zu entwickeln, die geeignet sind die Bereitstellung von Ökosystemgütern und -dienstleistungen aus den Wäldern der westlichen Ukraine, Nordwest-Russlands und Südwest-Deutschlands unter veränderten Umweltbedingungen und gesellschaftlichen Ansprüchen zu steigern und nachhaltig sicherzustellen.

Die Zusammenarbeit der drei Partner bestand aus Seminaren, Sommerschulen und Workshops in den Bereichen Waldbewirtschaftungsplanung und Waldressourcenmanagement, die in Freiburg, St. Petersburg und Lemberg im Zeitraum von März 2016

bis Februar 2019 (36 Monate) stattfanden. An allen Aktivitäten waren Wissenschaftler, Nachwuchswissenschaftler (Postgraduierte, Doktoranden, junge Postdoktoranden) sowie Praktiker und Verwaltungsbeamte aus den Partnerländern beteiligt.

Zu den Projektaktivitäten gehörten die Einrichtung von Demonstrationsflächen an der ukrainischen und russischen Partnereinrichtung für Bildungs-, Schulungs- und Forschungszwecke sowie die Einrichtung einer Jahrringmessstation an den beiden Partnereinrichtungen als Maßnahmen für einen nachhaltigen Kapazitätsaufbau in Waldbau-techniken, Produktionsökologie und Waldwachstumsforschung.

Das Projekt führte zur Entwicklung einer Fortsetzungsaktivität mit dem Titel "Die Fichte und ihre Rolle für die Bereitstellung von Holz als Ressource für die Bio-Ökonomie in der Westukraine, im Nordwesten Russlands und in Südwestdeutschland - eine Machbarkeitsstudie", die der VolkswagenStiftung Anfang 2019 vorgelegt wurde. Die Machbarkeitsstudie soll als Plattform dienen, um die bestehende Partnerschaft zu intensivieren und die weitere wissenschaftliche Zusammenarbeit auf das hochrelevante Thema „Zukunft der von Fichten dominierten Wälder in den drei Regionen“ zu fokussieren. Ein vollständiger Antrag für ein trilaterales wissenschaftliches Projekt wird der VolkswagenStiftung bei der nächsten Projektausschreibung (voraussichtlich Ende 2019/Anfang 2020) vorgelegt.

Das trilaterale Partnerschaftsprogramm gab jungen sowie älteren Forstwissenschaftlern, Forstpraktikern und Behördenvertretern aus der Ukraine, Russland und Deutschland die Möglichkeit, in einer unverfänglichen Atmosphäre Themen des waldbasierten Landnutzungsmanagements offen im Kontext sehr unterschiedlicher sozialer, wirtschaftlicher und politischer Konzepte in den verschiedenen Regionen zu diskutieren. Das Projekt stimulierte das visionäre Nachdenken über die Zukunft der Wälder in jeder Partnerregion und motivierte junge Wissenschaftler, sich intensiver an der Entwicklung der jeweiligen Wissensgrundlage zu beteiligen und die trilaterale Partnerschaft in der Zukunft zu stärken.

1. Report on the scientific results

The aim of the proposed project was to increase and sustain the provision of ecosystem goods and services from the forests of Western Ukraine, Northwest (NW) Russia and Southwest (SW) Germany under changing environmental conditions and societal needs. Strengthening the adaptive potential of the forests is aimed through the development of strategic and operational management tools to increase the adaptation potential of forests in the three model regions.

Through the course of the meetings (three seminars, two workshops and summer schools) held within the SURGE project in Freiburg (2016), in St. Petersburg (2017) and in Lviv (2018) the participants learnt the concepts of forest-based land-use management applied in the three different regions. Whereas the basic ecological principles of forest production are the same in the temperate forests of Western Ukraine und Southwest Germany as well as in the boreal forests in the St. Petersburg region, the processes of decision making are considerably different on all management levels between the model regions. This refers to the strategic, tactic as well as operational level of planning and also to the implementation of management measures. The current

state of the forest resources is the result of historical trends in land-use and forest management practices and largely mirrors the different social, political and economic contexts in the different regions.

The analysis of compositional, structural and functional key factors of the forest resources in the three model regions provides insight into the differences in forest resources and their management (Tab. 1). Since data from national forest inventories are lacking in Ukraine and Russia no consistent and homogeneous data set can be provided at that stage for these countries and the respective regions.

1.1 Forest policy factors

The forest cover on the three analyzed regions is 30.2% in Western Ukraine, 53.0% in NW Russia, and 38.4% in SW Germany (Tab. 1).

Ukraine is a country with a relatively small forest percentage of about 16%, which in total represents 9.7×10^6 hectares. The Transcarpathian region is characterized as an area with highest forest cover (55%), whereas in the north of the country, in the region of Polissya, the forested area amounts to 26%, in the forest-steppe zone to 13% and in the steppe zone to only 5%. Over the last 50 years forest cover increased by 150%. The majority of the Ukrainian forests (ca. 87%) are state-owned, and around 1.3×10^6 ha (ca. 13%) of forest land are attributed to communal property. These forests are in permanent use by communal enterprises subordinated to local self-governing bodies.

In terms of forest management, forests are provided to the permanent use of enterprises, institutions and organizations by several ministries and departments (Krynytskyi et al., 2017). Nowadays, more than twenty (!) ministries, agencies and organizations manage the Ukrainian forests. The largest of these is the State Forest Resources Agency of Ukraine, the main state authority in forest and hunting management (being responsible for 66% of the forest area in Ukraine). Forest management at a local level is implemented by 335 state forest enterprises that are subordinated to the State Forest Resources Agency and coordinated by its respective territorial body.

In Ukraine the current financial support to forestry by the state is insufficient to meet all urgent forestry needs like sufficient level of afforestation, upgrading forestry equipment, application of new technologies and in particular for conducting forest monitoring and forest inventory, conducting aerial surveys of forests and improving forestry research.

In Northwest Russia the forest fund consists of 118×10^6 hectares. Main parts of the forested land are located in the Taiga, but in the most southern parts also temperate mixed forests occur. The forest fund is owned by the Russian Federation, but forest governance is shared between the federation and the regions. Powers related to forest management, protection and use are delegated to the regions, while the authority of the federal bodies focus mainly on policymaking, governance of forest relations by laws and regulations, and on some specific issues, such as forest inventory.

Very interesting and at the same time very different than the forest policy in Ukraine and Germany, is that the state forests in Russia can be obtained for wood harvesting, recreation or other use primarily through lease contracts extending from 10 to 49 years

that can be concluded as a result of public auction. Rights for short-term use are granted by a sale/purchase contract of forest stands. Forest users pay a lease charge or payment for sale/purchase contract to the state.

In Southwest Germany the forest cover is 38.4% of the land area. Of the 1.39 x 10^6 hectares of forest in SW Germany, 40% are community owned forests and 35.9% are private forests. The *Länder* own 23.6% of the forest, and 0.5% are owned by the Federal government.

The private forests are largely of small structure and highly fragmented. The number of private forest owners in SW Germany is around 248.000. Nearly half of the private forest area (49%) is shared by holdings with less than 20 hectares, and 23% of the private forests belong to holdings with a size of over 1,000 hectares. The ownership structures developed differently over history and from region to region. The small and smallest forest areas in private hands often were created in the course of historic farming settlement or through distribution of estates, distribution of common land or afforestation of agricultural areas.

1.2 Compositional factors

The dominating tree species in NW Ukraine is Scots pine, which occupies 35% of the entire forested area. The share of Norway spruce is 7%. However, Western Ukrainian forests are dominated by deciduous tree species, mainly pedunculate oak (28%), European beech (9%) and silver birch (6%). In NW Russia the dominating tree species are Norway spruce (46%), Scots pine (29%) and silver birch (18%), and in SW Germany the main tree species are Norway spruce (34%) and silver fir (8%) as conifers and beech (22%) and oak (7%) as broadleaves.

The average age of age-class forest stands in Ukraine is approximately 60 years, in NW Russia 82 years, and in Germany 77 years. The Ukrainian forests are mainly dominated by middle-age forests (45%) with only a small percentage of mature and over-matured forests (17%). In NW Russia more than half (62%) of the forests are matured and over-matured forests and 20% are middle-age forests. In SW Germany the percentage of mature and over-matured forests is around 27%.

1.3 Forest resources

The growing stock differs significantly across the studied regions. In total Ukraine, the growing stock reaches 2.1 x 10^9 m³ (average growing stock: 241 m^3/ha). In NW Russia 10 x 10^9 m^3 (average growing stock: 88 m^3/ha), while in SW Germany it reaches 0,5 x 10^9 m³ (average growing stock: 377 m³/ha).

The average annual wood volume increment is as well rather different between the three regions, and amounts to 3.9 m³/ha in Ukraine (5.0 m³/ha in the Carpathians, 2.5 m³/ha in the steppe zone), 1.1 m³/ha in NW Russia, and 11.2 m³/ha in SW Germany.

1.4 Forest management facts

The current forest management in **Ukraine** is mostly oriented towards increasing the forest land area. The measures of afforestation and restoration of degraded and low-

productive lands, are ongoing. More than 50% of the forests of Ukraine were planted and 60.000 to 80.000 ha were restored annually in the last decade.

Clear-cutting is the most common form of harvesting and it is used in about 85% of all logging operations. However, the share of gradual i.e. shelter-wood felling is increasing, currently its share is ca. 10% in many parts of Ukraine and up to 50% in the Carpathians region. Since clear-cutting is prevalent in the forests throughout Ukraine, forests are regenerated mainly by planting, which requires intensive tending.

In 2015 Ukraine produced 10.2 x 10^6 m^3 of fuelwood, of which 2.1 x 10^6 m^3 (20.6%) was exported, which placed Ukraine on the first place in Europe on the export of fuelwood, followed by France with 0.7 x 10^6 m^3. However, the main use of wood is to supply the domestic market to meet the needs of domestic processing industries, construction enterprises, agro-industrial and coal-mining complexes. Current Ukrainian policy aims at preventing forest enterprises of Ukraine to export unprocessed timber products such as roundwood, only fuel wood or sawn wood are allowed to be exported.

The low forest harvesting index in Ukraine of about 0,5-0,6 is mainly due to the fact that about 40% (!) of Ukrainian forests are excluded from the “main cuttings”. About 35% of the forests are located in zones of radioactive contamination of varying intensity. Some of the forests in contaminated areas are completely excluded from forest management. This serious fact needs to be considered when designing plans to improve implementation of sustainable forest management in the country. Even nowadays, more than 30 years after the Chernobyl nuclear disaster (1986) parts of the contaminated forested areas are still under rehabilitation processes. This allows part of the contaminated areas to resume economic activity. At the same time, in all enterprises operating in the zone of radiation pollution, strict radiation control and certification of manufactured products are carried out.

There are two main important issues concerning management of the Ukrainian forests. First of all, the forest-road construction which is considered a national problem. During 2007-2014, 3.948 km of forest roads have been contracted, including 1.398 km in the Carpathians. The forest-road density in Ukraine today reaches up to 7.3 km/ha. Second, the extent and severity of natural disturbances in Ukrainian forests have been growing during the last decades. The area of forests affected by pests and diseases did not exceed 4% at end of the 20th century, was 5-6% during 2001-2010, and reached 8% after 2011. The area of “dead forests” increased from 4.000 ha/year in the 1990s to more than 20.000 ha/year in 2015, due to unfavorable weather conditions, insects, pathogens and fire. Particularly, large areas of secondary Norway spruce stands in the Ukrainian Carpathians and Scots pine stands in the North of Ukraine are affected.

In order to ensure the implementation of ecological, social and economic functions of forests based on sustainable development in Ukraine, certification of forest management is successfully conducted. Currently, more than 3.3 x 10^6 hectares (32%) of forests have been certified in Ukraine under the Forest Stewardship Council (FSC) standards.

In **Northwest Russia** 60% of the forestland is leased for long-term use with a total of almost 7.000 lease contracts. Annual allowable cut is about 120 x 10^6 m^3, the

economically feasible cut is about 70 x 106 m³ and the actually realized wood harvesting is about 50 x 10^6 m³. The largest volumes, over 10 x 10^6 m³ per year are harvested in Vologda and Arkhangelsk regions. Intermediate fellings are not common, and their share is less than 10% of the total wood harvesting volume. Today the cut-to-length method has largely replaced the traditional tree-length harvesting system. In leased areas all silvicultural measures are under the responsibility of the leaseholders, whereas regional authorities take care of activities in forests outside leasing. Forest regeneration work is carried out in 190.000 ha annually covering about 80% of the final felling area. About 20% of the forest regeneration is conducted artificially, and the rest by assisted natural regeneration, mainly by saving existing undergrowth. Tending of young stands is carried out insufficiently, as well as thinning (Karvinen et al., 2011).

Main challenges for the forestry are low density of forest roads, outdated forest resource data, insufficient financing of silviculture and deteriorating quality of forests (Karvinen et al., 2011). Currently main trends in forest management in NW Russia are:

- development of a state (national) forest inventory
- development of forest management planning based on remote sensing data
- development of advanced centres for seedlings production
- change in the strategy (model) of forest resources use - from extensive to intensive.

In **Southwest Germany** due to the large number and forest area owned by small forest owners, their forestry consultation and supervision is a relevant issue when it comes to sustainable forest management. The owners of small forest areas are often unfamiliar with the requirements of sustainable forest management due to different reasons (e.g. geographical distances, urban lifestyles or their vocations). Furthermore, the financial revenues from forest management are often negligibly small compared to the total income of the owners. The multitude and the diversity of forest owners lead to different objectives in the treatment of the forests. Therefore, the forests differ in some parameters such as tree species composition, timber stock or utilization. In addition to questions about the use of the renewable resource timber, other aspects as adaptation of different tree species to climate change, nature conservation and biodiversity, or the control of biotic damages, demand special attention and support (www.bmel.de).

1.5 Adaptation measures to climate change

Ukraine

In the context of anticipated climate change, a change of the forest management concept towards a close-to-nature forest management is considered as an important adaptation measure in Ukraine. This change involves a shift from the currently prevailing clear-cutting system to a selective system which leads to naturally regenerated uneven-aged, structured forest stands with multi-layer canopies. Also, under close-to-nature forest management the tree species composition will change towards more broad-leaved species.

It is well known that the implementation basis for close-to-nature forestry is the formation of uneven-aged forest stands. Unfortunately, in Ukraine, due to traditional clear-cuttings and planting of forest cultures on harvested sites, the forests are mostly even-aged and mainly monocultures. Close-to-nature forestry is considered to be especially

important for improving the ecological situation in the Ukrainian Carpathians, where negative anthropogenic impacts intensified by climate change have reached a critical level. However, the transition to close-to-nature forestry is a rather complex and long-lasting process.

NW Russia

It is known that deforestation and forest ecosystem degradation are the cause of as much as 20% of global greenhouse gas emissions, the second largest source after the energy sector. For Northwest Russia deforestation and degradation are not an issue, but adaptation of forests and forestry to possible climate changes is considered as an important issue. Current research on adaptation measures to climate change are focused mainly on its possible effects on forest productivity, species composition and biodiversity, risks of forest fires, insects, other pests and diseases appearance as well as extreme weather conditions such as wind storms, damaging rains and snowfalls, flooding and drought. Traditional forestry operations such as harvest, thinning, tending, planting was examined with respect to its adaptive capacity to different effects of possible climate changes. Special attention was paid to adaptive forestry measures for different environments from the point of view soil fertility, relief, water supply and demand as well as nutrition cycling and organic matter cycling with the aim to increase and prevent decline of the forest cover carbon sink capacity. Forestry adaptation programs were developed for the two anticipated scenarios of climate change A2 and B1 according to IPCC.

A summarised comparison between the three studied regions in terms of compositional, structural and functional characteristics of their forest resources is presented in Table 1.

1.6 References

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Table 1. Key factors of forest resources

Key factors of forest resources - compositional, structural, functional	**Western Ukraine**	**NW Russia**	**SW Germany**
Forest cover	30.2%	76.0% 118 x 10^6 ha	38.4% 1.39 x 10^6 ha
Forest ownership, number of forest owners	87% State forest 13% Community forest	100% State forest	23.6% State forest (federal) 0.5% State forest (national) 40.0% Community forest 35.9% Private forest
Forest type (by purpose)	acc. to the Forest Code (2006) there are four categories of forests in Ukraine, based on their ecological, social and economic purposes: 37.9% exploitable 32.9% protective 15.3% recreational 13.9% natural reserves, forest for scientific, historical and cultural purposes	70% of the forests are mainly targeted for wood production, and 30% are classified as protective	According to the mapping of forest functions, forests in BW are dedicated to the following functions: 87% nature protection 38% recreation 32% water protection 18% soil protection 16% climate protection 9% immission protection
Growing stock	2.1 x 10^9 m^3, 241 m^3/ha	10 x 10^9 m^3, 88 m^3/ha	0.499 10^9 m^3, 377 m^3/ha
Annual increment	3.9 m^3/ha	1.1 m^3/ha	12.3 m^3/ha

Key factors of forest resources - compositional, structural, functional	Western Ukraine	NW Russia	SW Germany
Tree species	35% Scots pine 28% Pedunculate oak 9% Common beech 7% Norway spruce 6% Silver birch 4% Black alder 4% Silver fir, Common aspen, Common hornbeam 2% Common ash 5% Other	46% Norway spruce 29% Scots pine 18% Birch 5% Aspen 2% Other	34% Norway spruce 21.8% European beech 8.0% Silver fir 7.1% European oak spec. 5.6% Scots pine 4.9% European ash 3.7% Sycamore 3.4% Douglas fir 2.3% Other coniferous 9.3% Other broadleaves
Forest age (only age-class forests)	60 years	82 years	77 years
Age-class distribution	45% middle-age 17% mature and over-mature	62% mature and over-mature 20% middle age 12% maturing 6% young	27% mature and over-mature

Key factors of forest resources - compositional, structural, functional	Ukraine	NW Russia	SW Germany
Rotation period	Norway spruce: 101 years Scots pine: 81 years European beech: 81 years Oak spec.: 111 years	The rotation periods in Northwest Russian forestry are long. On the same latitudes where rotation period for coniferous forests in Europe is 80–100 years, the Russian period is commonly 120–140 years. In Russia, the rotation period is determined according to biological facts, not according to economical aspects.	Typical rotation periods are: Norway spruce: 110-130 years Silver fir: 140 years Scots pine: 100 years European beech: 145 years European oaks: 180-240 years
Accessibility (Forest road density)	7.3 m/ha	According to the official calculations, the optimal road density in Northwest Russia should be 20–22 metres per hectare. In reality the density is significantly lower, around 2 m/ha.	50.8 m/ha (in federal and national forest)
Annual harvest	22.0 x 10^6 m^3 2.3 m^3/ha	50.0 x 10^6 m^3 0,4 m^3/ha	15.2 x 10^6 m^3, 11.6 m^3/ha
Harvest index m^3 cut (harvest) / m^3 produced (growth)	0.58	0.42	0.94

Key factors of forest resources - compositional, structural, functional	**Ukraine**	**NW Russia**	**SW Germany**
National forest inventory (NFI) - yes/no, first, last	No	The NFI system is new in Russia and the country is only gaining its first experiences of its implementation. Execution of the new system started along with the 2006 Forest Code. Prior to this, the forest resource data at country level was compiled from inventory and forest planning data, produced at forest district level. The results of the first NFI are expected to be finalised by 2020.	1986-1988 2001-2002 2011-2012
Disturbances (amount of damaged wood, cause of damage)	Sanitary cuttings: 3.0 x 10^6 m^3 Causes: bark beetles, root rot, ash dieback	Sanitary cuttings: 3.94 x 10^6 m^3 Area damaged: 47.7 x 10^3 ha Factors: 1. Damaging weather conditions: 57.1% 2. Forest fires: 21.6% 3. Diseases: 11.8% 4. Manmade effects: 7.6% 5. Insects: 1.9 %	6.3% of allowable cut (public forest, average 1953-2009)

2. Self-evaluation in comparison with the original objectives and working plan

The overall goal of the SURGE project was to develop strategic and operational management tools for increasing the adaptation potential of forests in Western Ukraine, Northwest Russia and Southwest Germany in the context of a changing climate and societal needs. Within the 36 months mobility project not all components of these ambiguous aims could be fully achieved. The academic program which included the organization of three seminars, two summer schools, two workshops, as well as the installation of demonstration plots and the setting up of a tree-ring measuring system at two partner institutions was fully implemented.

Highly relevant was (i) the implementation of the forest management demonstration plots established according to common standards in Western Ukraine and NW Russia, and, (ii) the setting up of a tree-ring measuring system for research and educational purposes at the two partner institutions. These two activities provide a long-lasting capacity building instrument for the intensification and sustainable development of the partnership on research and academic levels. Both, the Ukrainian and the Russian partner confirmed to put high priority to the maintenance, further development and educational use of the long-term research plots as well as the tree-ring measuring system.

Due to the fact that multiple scientific disciplines and stakeholders at different levels are addressed by the broad project objectives, the project consortium decided to develop a more focused research agenda for a follow-up project (see section 4).

3. Added value gained through interdisciplinary and international cooperation

The project SURGE has contributed to improve the collaboration between the three partner institutions. Young scientists, in particular, have benefited from the project activities through the international cooperation and by the input of senior scientists. Without such a project, the chances to visit the partner countries for professional purposes including the contacts with different stakeholders could not have been realized. The project benefitted significantly from the inclusion of scientists from different forest sciences disciplines, especially at St. Petersburg State Forest Technical University and at University Freiburg.

The trilateral partnership program made it possible that young, third level as well as senior forest scientists and forestry practitioners from Ukraine, Russia and Germany had the possibility to openly discuss in a harmless environment matters of forest-based land-use management in the context of contrasting social, economic and political concepts in the different regions. The project stimulated visions about the forest futures in each partner region and motivated young scientists to be more intensively involved in developing and strengthening this partnership in the future.

4. Future perspectives and sustainability of the project (e.g. follow-up projects, appointments)

The project resulted in the development of a continuation activity entitled “Norway spruce and its role in providing wood as a resource for green economy in Western Ukraine, Northwest Russia, and Southwest Germany - a feasibility study” submitted to VolkswagenStiftung. The proposed feasibility study will serve as a platform to intensify the existing partnership and focus the further scientific collaboration on the highly relevant topic of the future of spruce dominated forests in the three regions. A full proposal for a scientific project will be submitted to VolkswagenStiftung late 2019/early 2020.

The project consortium is currently preparing a manuscript on “Density profiles, width and anatomical features of Norway spruce and Scots pine tree-rings from Western Ukraine, Northwest Russia and Southwest Germany” which is based on research material collected and measured within the project SURGE and which will be submitted in 2019 to an international scientific journal.

Stimulated by the successful cooperation in the SURGE project, two partners (ALU-FR and SFTU-SP) have successfully applied for an ERASMUS+ academic mobility program which supports exchange of students, PhD candidates and scientists between the two partner institutions. This EC program will in addition contribute to sustaining the partnership.

The Department of Silviculture at the Ukrainian National University in Lviv has created a series of permanent experimental plots for conversion cuts and single tree selection in the “Stradch Educational and Production Forestry Enterprise”, in the “Bibrka State Forestry Enterprise”, in the “Stryy State Forestry Enterprise” and in the “Radechiv State Hunting and Forestry Enterprise”. Similarly, in the St. Petersburg region, permanent experimental plots of different tree species (spruce, pine and birch) have been established in the “Lisino Training and Experimental Forest” (implementation of future-crop tree management). At St. Petersburg State Forest Technical University the demonstration plots were already included into the teaching program “35.03.01-Forestry” for practical training of bachelor students. The experimental plots are added to the register of research plots in the forestry regulation for the Training and Experimental forest of the Leningrad region.

As part of the project activities two tree-ring measuring systems (LINTAB™ 6 Professional Package, RinnTech, Heidelberg) were purchased and installed at each partner institution in Lviv and St. Petersburg. Having the possibility to measure different tree-ring parameters (e.g. tree-ring width, early- and late-wood width) students and scientists at the partner institutions in Lviv and St. Petersburg are able to conduct future tree-ring based studies by using this equipment. Tree-ring based studies have a high potential for providing relevant and important input to the knowledge basis of forest adaptation management. At SFTU-SP three MSc students (two second year students, and one first year student) from the forestry program are currently working on their master thesis using the LINTAB system to measure tree-rings of old growth Scots pine trees sampled from memorial places around Lindulovskaya forest and in the park of St. Petersburg State Forest Technical University. The oldest tree analyzed up to now has an age of 215 years (*Larix decidua*).

5. Contribution to the specific aims of the funding initiative

The trilateral partnership program made it possible that young, third level as well as senior forest scientists, scholars and forestry practitioners from Ukraine, Russia and Germany had the possibility to openly discuss in a harmless environment issues of forest-based land-use management in the context of contrasting social, economic and political concepts in the different regions. The project SURGE stimulated visionary thinking about the forest futures in each partner region and motivated young scientists to be more intensively involved in developing and strengthening this partnership in the future.

6. Public relation activities and resonance in the media

Public relation activities were limited to reports in local news in St. Petersburg and Lviv and to a press release at University Freiburg.

7. Further aspects (e.g. particularly beneficial or obstructive circumstances, experiences with cooperation)

Financial support of project SURGE by the VolkswagenStiftung, a non-governmental organization well-recognized in Ukraine and Russia, is considered to be a cornerstone for the successful trilateral cooperation. A statement judged particularly by our Eastern European partners.

Appendix 1

Researchers and students who participated in the SURGE project (mobilities of all participants were financed by the VolkswagenStiftung within the SURGE project).

Partner	Name	Institution
1	Dr. Daniela Diaconu	Chair of Forest Growth, University Freiburg
1	Prof. Dr. Marc Hanewinkel	Chair of Forestry Economics and Forest Planning, University Freiburg
1	Prof. Dr. Dirk Jaeger	Chair of Forest Operations, University Freiburg
1	Prof. Dr. Hans-Peter Kahle	Chair of Forest Growth, University Freiburg
1	Prof. Dr. Daniela Kleinschmit	Chair of Forest and Environmental Policy, University Freiburg
1	Dr. Arno Mattes	Forest officer, Baden-Württemberg, Forest management planing
1	Prof. Dr. Dr. h.c. Heinrich Spiecker	Chair of Forest Growth, University Freiburg
1	Burkhard Steckel	Forest district officer, Johanniskreuz
2	Vasyl Banderych	Director of National Park "Skoliwski Beskydy"
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