

Introduction

About FOREST21

FOREST21 is a joint project for strengthening capacity in South African higher education in forestry. The project is implemented in collaboration of five higher education institutions (HEIs) in South Africa that have forestry curricula or will start teaching forestry.

Promoting climate-smart forestry and entrepreneurial innovativeness in forestry education will lead to job creation as well as mitigation of climate change. FOREST21 is implemented through reforming the curricula in forestry entrepreneurship education to equip graduates with problem-solving skills, an entrepreneurial mindset and climate-smart thinking.

Problem-based learning (PBL) methods and students-centred teaching are in the centre of the project. Students learn through solving real-life business challenges on the field in international teams. FOREST21 requires close collaboration with the industrial sector as well as teachers and the managerial staff in partner HEIs to find the practices in the local context.

Project Description

In South Africa, the forestry sector is increasingly seen as a critical sector for (i) livelihood development, given the simultaneous youth population bulge and high unemployment rates, as well as for (ii) the addressing of global sustainability challenges, given the potential of forestry to advance South Africa's National Climate Change Adaptation Plan (2018). Given this dual importance, Higher Education Institutions (HEIs) should naturally take a lead in preparing graduates to create sustainability-aligned economic opportunities. Yet, forestry HEIs in South Africa have constrained capacity to prepare graduates for post-school careers. These shortcomings exist for sector-specific knowledge on sustainable forestry practices, as well as for the entrepreneurial skills needed to leverage forestry opportunities. Given the importance of addressing these shortcomings, this project will involve collaboration between Finnish, Norwegian, and South African HEIs to develop the forestry-related curricula of South African HEIs, so that graduates are holistically equipped to sustainably leverage forestry for livelihood development.

The project will address:

- Increasing levels of unemployment in South Africa.

According to Statistics SA, South Africa experiences around 32.5% unemployment rate (stats sa, 2021). Youth are the most vulnerable in the South African labour market, with even university graduates in this age group having an unemployment rate of 31.0%. Forestry-related entrepreneurship can provide a partial solution to this problem, as young people have enormous potential for innovation and risk-taking, which can produce start-ups employing many people. To fully realize these opportunities embedded in forestry, HEIs should use their curricula to produce inquisitive graduates who can think in new ways, and who have the courage to meet and adapt to the challenges facing them an entrepreneurial mindset that is simultaneously mindful of sustainability.

- Foresters mitigating climate change.

Forests are critical for global ecosystems and carbon balances, especially because of their potential to sequester carbon in forests. In its 2009 Forest Sector Charter, South Africa officially recognized its massive potential to sequester carbon through new afforestation of about 100 000 hectares (Forest Strategy 2009-2030). Yet, this potential has not been exploited, sustainability has not entered the mainstream of South African Forestry, and forestry graduates have not internalized the importance, benefits, and necessity of integrating sustainability into forestry. To address this shortcoming, climate-smart forestry will seek new ways of producing, using, and repurposing traditional forestry products like wood products, pulp, paperboard, and paper. This will include teaching forestry students the principles

of the circular economy, of sustainable forestry management, and the potential of new innovative wood-based bioproducts. The overarching goal will be to not just lower the environmental impact of current forestry practices, but to leverage forestry management to increase the sequestration of carbon.

- Foresters of 21st century, education shortcomings, and new teaching methods

There is substantial discrepancy between what the forestry industry in South Africa sees as the key skills for future foresters, and what is being taught in HEIs offering forestry. Several research papers highlight this, as Längin & Ackerman (2008) and Mgaga & Scholes (2019). The higher education thus needs innovative approaches to develop 21st century foresters. To do this, South African HEIs will embrace teaching methods that not only improve information retention, but also allow students to learn how to solve real work problems. FOREST21 aims to assist a paradigm shift from teacher-centered knowledge sharing to the model where student create knowledge together for themselves (knowledge co-creation through discovery). In parallel, forestry HEIs will increase their curricula offerings on climate adaptation, and mainstream climate issues in core courses. Furthermore, HEIs need to recognize that they can serve as regional/local hubs for communities and business actors for creating, testing and disseminating knowledge and adaptation strategies.

- Developing Entrepreneurial Mindsets

21st century foresters need more than just forestry knowledge. Indeed, to leverage this knowledge effectively, they need an entrepreneurial mindset. This mindset will allow HEI graduates to identify, develop, exploit, and grow sustainability-related forestry opportunities, either through starting new ventures or through “intrapreneurship” in existing ventures. However, South African HEI’s currently do little to develop these mindsets. As such, this project will work to develop entrepreneurial skills such as business plan development, while also focusing on the “softer” side of entrepreneurship so that graduates see entrepreneurship as a viable and beneficial employment pathway.

- Forestry HEIs working together

South African universities offering forestry currently do not work together. The mentality of working in silos has for a long-time been discouraged by industry government, but no change has been seen because there has not been a real opportunity for the HEIs to work together. Moreover, industry partners have sporadic cooperation with HEIs.

However, this project will provide an opportunity for all forestry companies to work with all forestry HEIs. FOREST21 is unique as all existing, and two future, forestry HEIs are part of the consortia. Also, key stakeholders and governmental actors have committed to the project to create a framework for an impactful delivery.

Target Groups

All partner HEIs have similar direct and indirect target groups with similar needs; thus target group identification and their needs analysis are presented jointly for all the Partner HEIs. The direct target groups: (i) students needing real-world relevant education, and (ii) HEIs needing to have the competence to deliver this.

- The current **forestry graduates** are not equipped with skills and competencies to perform as expected in the world of work. This is one reason for the high unemployment of graduates. In addition, because the entrepreneurship curricula do not give entrepreneurial skills, graduates do not start businesses of their own. This means that forestry-sector potential is not utilized in societal development. Further, climate change and environmental challenges put pressure on forestry graduates’ competences; they are to understand and to act through forestry for sustainability. Forestry21 aims to tackle the issue of curricula content and implementation relevancy in three of the Partner HEIs who will upgrade the current courses and in the two Partner HEIs will open new BSc forestry courses.

- **Partner HEIs** have recognised the capacity gaps in curricula content and delivery methodology in their work to produce sustainable learning outcomes to support wealth creation and environmental sustainability. In South Africa, there are only random short courses on professional pedagogics available, and teachers have not been able to benefit training on how to plan and deliver curricula in a sustainable way. Forestry is the key leverage point for environmental sustainability and therefore needs to be integrated into the new and upgraded curricula.
- **The university-industry partnership** is weak in all partner HEIs. To equip the graduates with work-life relevant skills and competences requires companies and NGOs/CBOs to be part of the learning ecosystem. Cooperation practises needs to be jointly developed and tested and after that institutionalized. Education governance needs good practises and research-based understanding on sustainable teaching and learning for the HEI quality enhancement.

Expected Project Outcome

- **Work-life responsive Climate Smart Forestry Curricula:** The curricula content is to meet the expectations of the world of work: students to be equipped with domain and metacognitive knowledge and skills to be attractive for employers, thus to be able to fulfil their respective mandates when employed. For this, graduates need (i) entrepreneurial mindset and practical entrepreneur competence which would even encourage them to establish businesses of their own and (ii) comprehensive competencies for climate change mitigation through forestry.
- **Skills development:** The partner HEI entrepreneurship curricula are concentrating on the knowledge component of competence, and the two other competence components - skills, and attitude development are both ignored. For entrepreneurial mindset building and expertise in environmental protection, skills development is crucial. The fundamental principle of competence is that competence only exists when all three parts of competence (knowing-doing-being) are present. The knowledge component is the easiest one to develop, and the skills development, where the learner applies the theory into practice, is the most challenging one. The being domain (attitude) naturally follows the skills component development; when being able to do, one develops self-confidence, the trust in him/herself and the right attitude to the work
- **Authentic learning environment:** The skills development is not possible without real-life experiences. The authentic learning environment is critical for internalizing both climate-smart forestry and sustainability. The collaborative learning ecosystem where forestry community, industry and communities are part of the learning and teaching process, is a motivating and transformative way of learning. In challenge-driven learning, students are invited to read and analyse the problem scenario, absorb and analyse information, work in teams to use creativeness and innovation, develop possible actions and present the findings. In this self-directive learning process, students take responsibility for their own learning and the teacher serves as a resource to the student teams. The skills development increases students' competitiveness in the world of work and relevance to the labour market. Also, it develops students' domain-specific knowledge and their understanding of their professional identity. For the challenge-owners the collaborative learning ecosystem brings benefits as well; at its best, they get innovative and creative solutions and in every case, they get new members to their community of practice.
- **21st-century skills:** Students of today are preparing themselves to the world of work which is constantly changing and different tomorrow than today. The domain-specific knowledge is not enough for the graduates to be qualified to meet the requirement of the future world of work. 21st-century skills emphasise critical thinking & problem solving, innovativeness & creativeness and teamwork & communication, leadership skills, self-directiveness, cross-cultural and diversity competences, lifelong learning skills and high work ethics. All of these are topics the curricula must contain. The collaborative skills development process with real-life cases contributes to developing all these metacognitive competences of future professionals.

Project Goals and Objectives

Despite the huge potential, South Africa (SA) is having challenges to create forestry-based jobs and wealth. At the same time strong forestry expertise is needed to fulfill the national climate change/carbon commitments. One very critical reason for the forestry-sector not meeting its expectations in societal and environmental development is that the skills and competences of HEI forestry-graduates do not match the requirements of the world of work. Changing this situation requires:

- Cooperation between academia and societal/industry partners
- A new approach in HEIs for producing the new and critical competencies
- HEIs to be equipped with 21st century forestry competences

Wider Objective

Strengthening South African forestry HEIs capacity to provide work-life relevant and inclusive higher education for societal and environmental development.

Table 1: Wider Objective

Indicators	Measurement
Increased role of HEIs in climate change dialogue, innovation and societal impact	Public and private resources
Recognized expert role of teachers	Diversified career opportunities for recognized expert teachers
Improved employment and widened career opportunities of graduates	Publicity (interviews, presentations, expert opinions) Employment statistics

FOREST21 Specific Objectives

1. *Utilization of new climate smart forestry curricula with incorporation of entrepreneurial skills and metacognitive competences*

Table 2: Specific Objective 1

Indicators	Measurement	Risks	Mitigation
Number of new/updated courses integrated in partner universities	Project progress reports Workshop statistics	Commitment from university leadership and policy makers	Open, incl face-to-face, communication and actively involving HEIs management and academic leaders
Number of teachers and faculty trained in climate smart forestry courses	Self-assessments Student feedback reports	Interest and motivation of teachers and faculty Students active participation	Teachers and faculty staff Students
Increased knowledge of teachers on climate-smart forestry			
Student satisfaction on courses			

2. *Improved student-centered teaching and learning methods by introducing problem-based learning*

Table 3: Specific Objective 2

Indicators	Measurement	Risks	Mitigation
Number of teachers /faculty staff trained in PBL methodology	Lists of training participants Course statistics	Personal engagement and motivation of teachers/faculty staff	Guidance and support from project management and associate partners
Number of students trained following PBL methods	Staff capacity assessment reports	Change of staff during the project	Support and guidance to teachers/faculty staff in the transformation processes
Increased pedagogical practices of teachers/faculty staff	Student feedback reports Course performance evaluation	Students readiness and motivation for new learning practices Delays in production of PBL training materials	Sharing information for institutionalizing new competences and practices
Graduates increased innovation and problem-solving skills	Printed and digital teaching materials	Commitment and active involvement of societal/industry partners	Mentoring and coaching of students
New training materials developed	Case study reports and feedback from case-owners		Active quality management

3. *Actively cooperating network-based learning ecosystem with academia and societal/industry partners in South African context*

Table 4: Specific Objective 3

Indicators	Measurement	Risks	Mitigation
Number of collaboratively implemented field challenges	University records Discussions and reports	HEIs and teachers' capacity and interest to develop expertise for industry cooperation	Active dialogue on the cooperation benefits Active dialogue with HEIs leadership, associate partners and education authorities
Number of collaborating partnerships		Education authorities' commitment to network-based learning	Sharing knowledge and experiences
Feedback from the partners on the relevance of the cooperation			
Feedback from education policy authorities			

4. *Strengthened HEI capacity to further contextualize and develop curricula, pedagogical methodology and learning ecosystems through national and international partnerships*

Table 5: Specific Objective 4

Indicators	Measurement	Risks	Mitigation
Forestry21 teacher network created and active	Network activity HEIs strategies and policies	Teachers commitment and limited time resources	Encouraging active participation of individuals
Further development of curricula incorporated in HEIs strategies	Experiences of teachers, faculty staff and management	Resources for network management	Participatory project management encourages to cooperation
Mechanism established to continue collaboration within South African HEIs	Publications, articles Cooperation MoUs and partnership agreements	Continuous commitment and cooperation of HEIs, authorities and industry stakeholders	Dissemination of best practices
Number of publications and articles			
Cooperation mechanisms set up for national and international partnerships			

Project Coordinator

Participating Organizations

Table 6: Participating Organizations

Institution	Abbr	Description
Fort Cox Agriculture and Forestry Training Institute	Fort Cox	Established in 1930, the only SA institution offering Diplomas in Forestry; visions is to be the leading center in sustainable agriculture and forestry by providing quality education and training in agriculture and forestry, by engaging to applied research and community outreach with final objective to improve livelihood in SA.
Nelson Mandela University	NMU	Roots back to 1911, when the oldest forestry campus of SA was established to Tokai near Cape Town. Todau NMU, after several mergers and name changes, has a proud tradition of excellence and service to the forestry industry.
Tschwane University of Technology	TUT	Established in 2003 through several mergers; defines itself as a people's university that makes knowledge work. Strategic Plan 2020-25 wants TUT learning to become a continuum of creation, innovation and technology transfer to serve the communities; to find authentic and enduring solutions to communities' most pressing problems.
Stellenbosch University	SU	The oldest university in South Africa; received full university status in 1918. SU wants to be research-intensive university which attracts outstanding students, employ talented staff and provide a world-class environment; a place connected to the world, while enriching and transforming local, continental and global communities.
University of Venda	UNIVEN	Opened in 1982 to cater for the then Homeland of Venda; since its establishment, the UNIVEN has experienced tremendous growth and change and to date the university has established itself as a national asset through its niche on problem oriented, project-based curriculum with a strength in nurturing under prepared students into nationally competitive graduates.
Häme University of Applied Sciences	HAMK	Häme University of Applied Sciences (HAMK) is a multidisciplinary, workplace-orientated higher education institution. HAMK offers 27 Bachelor's degree programmes, 10 Master's degree programmes and professional teacher education. Ten of the degree programmes are taught in English.
Inland Norway University of Applied Sciences	INN	INN is a result of the 2017 merger of two academic institutions with long traditions. It now runs 6 campuses with a total of 16,000 students on a vast range of study programs, including 4 PhD programs.
Aalto University	Aalto	By merging three leading Finnish universities in 2010, Aalto was founded to work as a societally embedded research university. In a short space of time, Aalto University has since become a forerunner in our key areas. We are renowned for our sense of community and culture of entrepreneurship and innovation.

Project Characteristics

Work Packages

Table 7: Work Packages

WP	Lead	Co_Lead	Content
WP1	SU	NMU	Foundation for paradigm change FOREST21 Curricula with entrepreneurship competence + soft skills integration. Creation of joint understanding PBL + Climate Smart Forestry Curricula and build HEI ownership to the transformation.
WP2	NMU	TUT, UNIVEN, Aalto	Trainings on PBL-method and contextualizing it through field-challenges; knowledge creation of climate smart forestry; setting up structures for the project sustainability and further methodological development.
WP3	INN	SU, UNIVEN, Fort Cox	PAR-based quality assurance of the project implementation and management.
WP4	TUT	Fort Cox, SU	Dissemination and exploitation; project information
WP5	HAMK		Functional and participatory project management structures

Table 8: WP 1 - Activities

Activities	Time
Feasibility Study on PBL /pedagogical competence and knowledge on climate smart forestry to define the Partner HEIs' institutional and individual gaps and stakeholder mapping. Incl. HBRA/Gender.	Report prepared; time 1-9/21.
Curricula development workshop to set up the contextualized PBL frame, FOREST21 Curricula methodology & development and training needs collaborative learning ecosystem building (community of praxis). European partners will share their knowledge of competence-bases methods. Following the workshop, the adaptation of PBL to the new FOREST21 Curricula/development of new PBL-based curricula is done.	9/21
Curricula developed (2) and up-graded (5): all Partner HEIs.	Accredited by end of 2022.

Table 9: WP 1 - Details

Indicators	Measurement	Risks	Mitigation
Feasibility study on current competences and knowledge needs on individual and institutional levels	Feasibility study report	HEIs faculty commitment and participation in the survey	Awareness creation among key stakeholders
	Project progress reports		
	Course descriptions	Involvement of students to the feasibility study	Transparent and participatory working methods to create and keep commitment and ownership to the project
Number of new/revised courses	Course accreditation data	HEIs faculty and management commitment in course development and accreditation	Support of associate partners
	Assessment reports		
Number of courses accredited in partner HEIs	Workshop reports		
Capacity assessments during curricula development workshop		Personal interest and engagement of teachers/staff	Clear selection processes to workshops and trainings
Key stakeholders identified		Interest and commitment of societal/industry partners	Awareness creation among key stakeholders

Table 10: WP 2 - Activities

Activities	Time
Pedagogical training workshop I and II: teaching methods (PBL, ODL), guidance on students' field cases and competence-based assessment, collaborative learning ecosystem building, field challenge preparation.	Number of Partner HEI staff/faculty trained 50, number of Programme country trainers 12. 2/22 UNIVEN and NMU 9/22
Climate Smart Forestry workshop: Associate Partner participation encouraged (own cost)	Number of Partner HEI staff/faculty trained 25, number of Programme country trainers 8. 5/22
Web-based support for pedagogical and climate smart forestry development provided. All partners before and after capacity building workshops.	By 1/22-8/22
Pedagogical and climate smart forestry workshop training materials developed, incl. digi.	By 8/22.
Establishment of societal/industry partnerships (min 5/Partner): all Partner HEIs.	By 11/22
Student challenges (total 195 students): Students from all Project countries participate and based on the interest of students and needs of the case, diverse student teams are formed. Field challenges are organized in unison with the PBL- workshops to save in travel costs. Student challenges are built and formulated around the Partner HEIs local partnerships. Teachers and faculty staff from all partners supervise jointly the challenges and fieldwork.	All Partner HEI: Total number of Partner country students 150, Programme country students 45. 2-3/22, 9-10/22, 2-3/23
PBL-FOREST21 Teacher Manual prepared: all partners	By 8/23
PBL-FOREST21 Network with min. 50 members established	By 8/23

Activities	Time
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Table 11: WP 2 - Details

Indicators	Measurement	Risks	Mitigation
Feasibility study on current competences and knowledge needs on individual and institutional levels	Feasibility study report Project progress reports Course descriptions	HEIs faculty commitment and participation in the survey Involvement of students to the feasibility study	Awareness creation among key stakeholders Transparent and participatory working methods to create and keep commitment and ownership to the project
Number of new/revised courses	Course accreditation data Assessment reports	HEIs faculty and management commitment in course development and accreditation	Support of associate partners
Number of courses accredited in partner HEIs	Workshop reports	Personal interest and engagement of teachers/staff	Clear selection processes to workshops and trainings
Capacity assessments during curricula development workshop		Interest and commitment of societal/industry partners	Awareness creation among key stakeholders

Table 12: WP 3 - Activities

Activities	Time
PAR-Quality Plan (QP) prepared and Quality Platform set up. QP defines scheduled quality assurance activities with objectives, roles, and responsibilities. Included HBRA/Gender Action Plan + Check list. Quality Management Platform used for data collection and reporting.	By 8/21
Quality data collection and analysis.	2-3/22 and 6-7/23
Web-based support for pedagogical and climate smart forestry development provided. All partners before and after capacity building workshops.	9/23
Project QP and process used to upgrade Partner HEIs' education quality management	By 8/22.

Table 13: WP 3 - Details

Indicators	Measurement	Risks	Mitigation
Quality plan in place		Project supports good models for quality monitoring, evaluation and learning	Adequate planning, reflection, learning and taking action
Data collected and analyzed			
Quality plan followed			
Feedback from faculty			

Table 14: WP 4 - Activities

Activities	Time
Dissemination & Exploitation Plan (DEP) developed; Covers time from the project start beyond project exit. DEP guides dissemination during and at the end of the Project SMART indicators prepared and used for measuring D&E efficiency D&E Manager with Partners	by 8/21
Internal Project information channels and working platforms established and in function, incl. HEIs students' and staffs' information	1/21-12/23
Forestry South Africa (FSA) and Associate Partners heavily involved and support	21-12/23 and beyond the Project exits
Project information to key stakeholders	
Publications (min 5) and conference papers (min 5)	by 11/23
Final seminar: to present the Project results to a broader audience including public and private forestry sector, NGOs, student communities, and national & regional education managers	9/23

Table 15: WP 4 - Details

Indicators	Measurement	Risks	Mitigation
Dissemination and exploitation plan in place and action	Project progress reports Monitoring and evaluation reports	Appropriate quality of dissemination materials and actions	Timely dissemination and adequate resources by partner HEIs
Use of project website, social media, brochures, leaflets, newsletters			FSA's strong supporting role in SA dissemination
Meetings, personal communication			
Publications, presentations			
Final workshop organized			

Table 16: WP 5 - Activities

Activities	Time
Setting up the project modalities: LCs, Project Management Team, Advisory Board, partnership agreements signed. Project Management Guidelines incl. finance, prepared & project management practices developed	
Kick-off meeting organised	3/21
Mid-term review and Final evaluation + audit	5-7/22 and 9-12/23
Interim and Final reports	

Table 17: WP 5 - Details

Indicators	Measurement	Risks	Mitigation
Project Management Team (PBT), Project Advisory Board (PAB), needs-based core teams working	Project progress reports	Ability for cross-cultural team working and co-creation	Jointly agreed work methods
	Minutes of meetings		
	Management guideline		Flexibility to tackle emerging issues and needs
	Kick-off workshop report		
	Mid-term review, final evaluation, audit reports		
	Interim and final reports		

Regulatory Framework and References

Structure for Project Work and Cooperation

Key Project Deliverables, Milestones and Processes

Expected Tangible Results

Tangible results of FOREST21 are the following:

- SU: Updated curriculum for BSc Forestry and Natural Resource Sciences
- Fort Cox: New forestry curriculum: Advanced Diploma in Forestry Management
- NMU: Updated curriculum for
 - BSc Honours in Natural Resource Management (NQF Level 8)
 - BSc Honours in Natural Resource Management (NQF Level 7)
- TUT: New curriculum: Forestry Management
- UNIVEN: Updated curriculum: Bachelor of Science in Forestry
- Number of trained/trainers/students:

- Pedagogical training: Number of teaching staff/faculty trained: 50
- Number of Programme Country HEI trainers: 12
- Climate-smart forestry training: Number of teaching staff/faculty trained: 25
- Number of students participating to the methodology contextualization/field challenges: 195 total
- Industry Partnerships signed: Each Partner HEI to sign min. 5 societal/industry partnerships (total 25)
- Reports and publications
 - Feasibility study Report
 - PBL-FORESTRY21 Teacher Training Manual (best practices)
 - Min. 5 peer reviewed papers and min. 5 conference papers published
- Network established: PBL-FORESTRY21 Expert Network with min. 50 members established and in function

Definitions

Quality Management

Quality Planning

Quality Assurance

Quality assurance is an ongoing effort to address improvements of the deliverables over time through small, incremental changes or through system-level changes if so needed. The data collection timeline follows the cycles of WPs.

Quality Control

Längin, D., & Ackerman, P. (2008). *Transforming forestry education: Challenges and opportunities - a south african perspective* (A. B. Temu, S. A. O. Chamsama, J. Kung'u, J. R. S. Kaboggoza, B. Chikamai, & A. M. Kiwia, Eds.; pp. 83–102). ICRAF.

Mgaga, P., & Scholes, M. C. (2019). Does tertiary education in South Africa equip professional foresters for the future? *Southern Forests: A Journal of Forest Science*, 81(4), 377–385. <https://doi.org/10.2989/20702620.2019.1615230>

stats sa. (2021). *Work & labour force*. http://www.statssa.gov.za/?page_id=737&id=1