

SSAFR, 29th August 2017



SuFORun

“Models and decision Support tools for integrated Forest policy development under global change and associated Risk and UNcertainty”

<http://suforun.ctfc.cat/>



This project has received funding from the European Union's H2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 691149. This website reflects only the authors' view. The Research Executive Agency is not responsible for any use that may be made of the information it contains.



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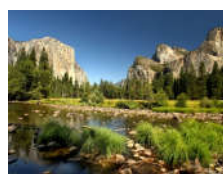
Agenda

- Background and motivation
- Project
- Topics
- Funding
- Research done

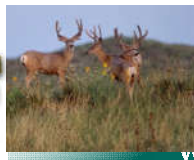
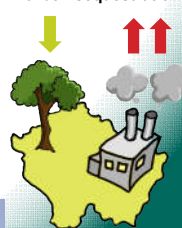
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Background

- Forestry is much more than just providing timber for the industry...
- There is demand for other wood-based products (e.g. timber, fuelwood, cork,) and forest-based services (e.g. recreation, protection, conservation)



Carbon sequestration



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Background

- In addition, there is risk like fires, biotic attacks...
- There is uncertainty also in the climate and growth patterns.
- Climate change (e.g. drought events..)

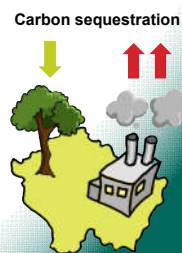


eucalyptus forest showing die-off due to prolonged drought australia -
See more at: <http://www.superstock.com/stock-photos-images/4141-26992#sihash=1JJDH2TZ.dpuf>

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Background

- Forest policy and decision makers are **challenged** by the need to balance the increasing demand for forest-based services (e.g. recreation, protection, conservation) and wood-based products (e.g. timber, fuelwood) while addressing the impacts of natural disturbances (e.g. wildfires, droughts) on potential supply.



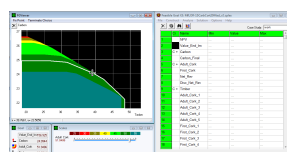
Background

- Classical** forestry production approaches to silviculture and regulation are **inadequate** to address the complexity of current forest management planning and policy-making processes.



eucalyptus forest showing die-off due to prolonged drought australia - See more at: <http://www.superstock.com/stock-photos-images/4141-26992#sthash.LIJDH2TZ.dpuf>

- New models, methods** and **DSSs** are **needed** that may effectively integrate currently fragmented multidisciplinary knowledge.



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Background

- The **EU and the American experiences** with the development/application of models and tools to support forest management and develop innovative forest policies provide a solid base for continuous improvement of its efficiency and effectiveness in a context of global change.
- Nevertheless, the **fragmentation of research** in areas such as forest modelling, forest management methods, social science, policy making and risk and uncertainty and decision support systems suggests networking and research needs to realize their interdisciplinary integration potential.
- The methods/DSS and tools developed for forest DM are **not being used** by policy makers...
- This provided the rationale for a project that might **strengthen research collaboration** through active networking and staff exchange

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Background

- The **SuFoRUn** network vision is to address **research and innovation** areas (RIAs) that have been identified as key for the **forest-based sector** and ensuring its future competitiveness.
- Computer-based decision support systems (**DSS**) are **currently drawing much attention** as a means of transfer of technology and knowledge of structure, function and processes of forest ecosystems to enhance forest management planning and policy analysis.
- Work on the integration of forest ecosystems multidisciplinary knowledge in intelligent DSS creates an **opportunity for designing and implementing an innovative environment for ecosystem based forest management planning and forestry policy analysis**.

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Background

- The **SuFoRUN** methodological approach builds from the state-of-the-art over a range of disciplines and technologies needed to innovate forest management planning as well as forest policy analysis processes.
- It is designed to help consolidate knowledge pillars to address strategic themes and key research and innovation areas – e.g. policy and good governance, multi-purpose management of forest resources, enhanced biomass production, sustainable forest products and services supply etc....

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SuFoRun Project


“Models and decision SUPPORT tools for integrated FOREst policy development under global change and associated Risk and UNCertainty”

- This project gets 1.9 Million € funding from the European Union's H2020 research and innovation programme under one of the Marie Skłodowska-Curie Actions.
- The specific action financing SuFoRun is the Research and Innovation Staff Exchange (RISE) which aims to support the career development of researchers.
- The base is the support for international collaboration through the exchange of research and innovation staff as well as sharing of knowledge.


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SuFoRun

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SuFoRun Project



- The project is based on a 4 year exchange programme (Feb 2016-Feb2020)
- 13 institutions from 9 countries: (2) Chile, (1) Brazil, (3) USA, (1) Costa Rica, (1) Finland, Sweden, (1) Germany, (2) Spain and (2) Portugal
- EU researchers go to America and vice-versa.

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SuFoRun Project

List of Beneficiaries

No	Name	Short name	Country	Project entry month ¹	Project exit month
1	CENTRE TECNOLÓGIC FORESTAL DE CATALUNYA	CTFC	Spain	1	48
2	UNIVERSIDAD POLITÉCNICA DE MADRID	UPM	Spain	1	48
3	Instituto Superior de Agronomia	ISA	Portugal	1	48
4	SVERIGES LANTBRUKSUNIVERSITET	SLU	Sweden	1	48
5	ITA-SUOMEN YLIOPISTO	UEF	Finland	1	48
6	ALBERT-LUDWIGS-UNIVERSITÄT FREIBURG	ALU-FR	Germany	1	48

- The consortium includes 6 EU institutions and 7 TC, (non-EU organizations).
- Partners (TC), some of them get funding which is managed at EU institutions.

Participant number	Partner Organisation Full Name	Partner Organisation Short name	Country
7	CENTRO AGRONÓMICO TROPICAL DE INVESTIGACIÓN Y ENSEÑANZA CATIE	CATIE	Costa Rica
8	The Pennsylvania State University	PSU	United States
9	UNIVERSITY OF WASHINGTON	UW	United States
10	PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE	PUC	Chile
11	UNIVERSIDADE DE SÃO PAULO	USP	Brazil
12	UNIVERSIDAD DE CHILE	UCHILE	Chile
13	Pacific Northwest Research Station	USDA	United States

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SuFoRun Project

Objective:

- The main goal is to transfer knowledge about **models** and **tools** and how to use them to develop better **management plans** addressing risk and uncertainty and how to develop **new policies**.

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SuFoRun Project

Relevant technical and scientific contributions:

- better assessment and valuation of forest wood and non-wood forest products as well as environmental services
- Understand forest dynamics and its responses to climate change and other disturbances...
- enhanced ability to predict future forest condition under risk and uncertainty on those services (forest models, simulators...)
- enhancing ability to propose adaptation and/or restoration measures
- new tools and methods to develop effective forest policies
- better assessment of trade-offs among multiple and competing objectives
- improved DSSs to better forest management decisions
- improved DSSs for collaborative (participatory) planning www.ctfc.cat

SuFoRun Project - Topics

- ☞ The project is divided in 5 Work Packages:

WP Number ⁹	WP Title	Lead beneficiary ¹⁰	Start month ¹²	End month ¹³
WP1	Project coordination	1 - CTFC	1	48
WP2	Ecosystem dynamics and disturbance (biotic and abiotic) regimes	5 - UEF	1	48
WP3	Ecosystem services supply, risk assessment and trade-off analysis	3 - ISA	1	48
WP4	Intelligent ecosystem management decision support systems	1 - CTFC	1	48
WP5	Communication and dissemination	1 - CTFC	6	48

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SuFoRun Project - Topics

- ☞ WP1: Coordination of the project
 - ☞ Coordination of the project (Partnership Agreement, travelling guidelines, funding management)
 - ☞ Managing the website
 - ☞ Reporting to EU
- ☞ WP2: Ecosystem Dynamics and Disturbances
 - ☞ To build from research on forest ecosystem functioning in each partner institution to **develop innovative tools to simulate ecosystem dynamics under disturbance (biotic and abiotic) regimes.**
 - ☞ **Enhancing quality and consistency of forest modelling** for simulating forest resources dynamics at various scales under alternative management and climate scenarios and disturbance regimes.

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SuFoRun Project - Topics

- ☉ WP2: Ecosystem Dynamics and Disturbances:
 - ☉ WP2.1. **Generating information** that may be used to **improve or develop models** (e.g. empirical, processbased or expert models). This WP may provide information and guidelines for adaptive management, restoration measures in degraded landscapes, may provide information on the general dynamics of the ecosystem.
 - ☉ WP2.2. Aims at developing/improving growth models:
 - ☉ for simulating more **complex ecosystems** such as mixed and uneven-aged forests as well as new models for clonal forests;
 - ☉ to predict **wood properties** (including tree crown architecture);
 - ☉ for **non-wood forest products** (NWFP)
 - ☉ calibrating **process-based models** for country-specific species and sites

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SuFoRun Project - Topics

- ☉ WP2.3. Aims at the development of **disturbance** (pests, wildlife, wind and snow storms) **occurrence and impact models**. In addition, Airborne LiDAR technology has proved its potential on identifying the occurrence and impact of disturbances on forest landscapes and provide a platform for assessing the spatial relation between forest resources and risk. This task will study the potential of this technique to model and analyse disturbances.
- ☉ WP2.4. Methodologies to predict social, economic and environmental indicators
- ☉ WP2.5 Improved **simulators** for adaptive forest regimes e.g. management treatments such as thinning and pruning, as well as modules for natural regeneration and conversion of forest types within a region.

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SuFoRun Project - Topics

- ⌚ WP3: Ecosystem Services Supply, risk assessment and trade-off analysis.

- ⌚ Objectives: To build from research on forest resources economics and management science in each partner institution to **develop innovative tools to simulate the impact of decisions** and of social and policy options on forest ecosystems and on the provision of ecosystem services.

- ⌚ WP3 is organized in sub-wp:

- ⌚ WP 3.1. development of **spatial optimisation** and simulation methods
- ⌚ WP 3.2. development of current spatially explicit management science approaches to further address **risk and uncertainty**.
- ⌚ WP 3.3. development of approaches to **combine spatial optimisation and multi-criteria methods** to enhance criteria trade-off analysis in multi-purpose management of forests

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SuFoRun Project - Topics

- ⌚ WP4: Intelligent ecosystem management decision support systems

- ⌚ Objectives: To build from research in information and computer sciences in partner institutions to **provide a framework for the interdisciplinary synthesis of knowledge developed under WP 1 and 2**.

- ⌚ WP4, is organized in sub-wp:

- ⌚ WP 4.1. aims at the development of DSS architectures for optimized multifunctional forest management and supply chain management.
- ⌚ WP 4.2. aims at exploring the integration of multi-criteria spatial DSS and knowledge-based systems (KBS) within Intelligent Decision Support Systems.
- ⌚ WP 4.3. aims at the development of DSS **web-based architectures** and functionalities for supporting multi-purpose forest management and policy analysis processes.

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SuFoRun Project - Results

Expected Results WP1

Coordination

Reports, Publications..

Expected Results WP2

Review of existing empirical and process based models in the Participant Countries

Report of models for non-wood products and services (e.g. cork...)

Paper on the calibration of process-based models for different Countries

Report on the development of disturbance and impact models

Special issue on models to predict growth of forests under risk and uncertainty?

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SuFoRun Project - Results

Expected Results WP3

Paper reporting the state-of-the art of simulation Approaches

Paper reporting the state-of-the-art of integration of risk and uncertainty in spatially explicit ecosystem management Planning

Library of methods to integrate risk in forest planning

Special issue of journal focussing on the methods for Ecosystem services supply, risk assessment and trade-off analysis

Expected Results WP4

Integration of methods and models into a knowledge-based DSS

Initial DSS application for adaptive forest Management delivered via web

Expected Results WP5

Organization of meetings, seminars, courses and conferences.

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SuFoRun Project – Exchange program

- Summary of the exchange program for the whole project.

Origin partner	Origin country	Hosting institution												Total months	
		CTFC	UPM	ISA	SLU	UEF	ALU-FR	CATIE	PSU	PUC	UCH	USDA	USP		UW
CTFC	Spain							12	1	20	10	20	1	9	73
UPM	Spain							5	4	6	2	4	6	6	33
ISA	Portugal							15	8	5	13	29	11	18	99
SLU	Sweden							13	7	5	6	7		21	59
UEF	Finland								6	2		14		8	30
ALU-FR	Germany							2	11	4		4	9	7	37
CATIE	Costa Rica		15	6	3	6									30
PSU	USA			3			2								5
PUC	Chile		17	6	9	1	4								37
UCH	Chile	10	5		2	2	2								21
USDA	USA			3											3
USP	Brazil	2	3	2	3		4								14
UW	USA			3											3
TOTAL		12	40	23	17	9	12	47	37	42	31	78	27	69	444

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SuFoRun Project – Exchange program

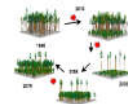
- Current situation:
 - More than 40 researchers have participated (this includes experienced researchers and early stage researchers).
 - Around 150 PMs have been used.
 - At least 20 publications are being prepared
 - 5 International meetings have been prepared
 - Networks built...
- Regarding secondments:

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Research done under WP2. Ecosystem dynamics and disturbance regimes

Research Done:

- Joana Paulo (ISA, PT) visit CATIE. Model for Quassia Amara production and growth. Calibration of YieldSafe model for Chilean conditions. João Palma (ISA, PT).
- Rasoul Yousepfour (ALU-FR, DE) visit to CATIE. Calibration of 3PG model for Teak plantations in Costa Rica.
- Magda pla (CTFC, Spain) visit to USDA. Quantify forest damage from invasive species and fires.
- Mireia Clemente (CTFC, SP) visit to USDA. Significance of soil microbial community in ecosystem dynamics and disturbances: Soil Organic Matter Persistence And Carbon Cycle Feedbacks.
- Mechanistically link tree growth to climatic variations. Antoine Cabon (CTFC, SP) visit to USDA.



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WP2. Ecosystem dynamics and disturbance regimes

Author: Joana Paulo (ISA, Portugal)
Host: Róger Vilallobos (CATIE, Costa Rica)

Objective: Development of production models:

- Measurements of Quassia amara plots + data gathering.
- Development of a growth model for Quassia amara
- The model is sensitive for different shading conditions which allows testing different management alternatives



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WP2. Ecosystem dynamics and disturbance regimes

Author: Anja Nölte, Henrik Meilby, Rasoul Yousefpour (ALU-FR, Germany)

Host: CATIE, Costa Rica.

Objective: Calibration of 3PG model for teak plantations in CR conditions.

- Measurements of plots + data gathering.
- Calibration of 3PG growth model for Teak plantations
- The model is sensitive to climate data
- Allow making projections under climate change conditions.



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WP2. Ecosystem dynamics and disturbance regimes

Autor: MAGDA PLA

Host: TERESA HOLLINGSWORTH, PNW Research Station – University of Alaska Fairbanks (UAF)

Share remote sensing imagery methodologies to analyse:

- Forest browning trends
- Quantify and limit forest damage from invasive species (spruce black beetle in Alaska - Pine processionary in Catalonia)
- Quantify Forest fire severity, analyze patterns and future trends on forest dynamics.
- Results: ongoing work



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WP2. Ecosystem dynamics and disturbance regimes

Author: Antoine Cabon (CTFC)

Hosts: David Woodruff & Frederick Meinzer (USDA- Corvallis)

Mechanistically link tree growth to climatic variations:

- Context: In order to predict tree growth under climate change it is necessary to mechanistically model the process underlying it. However it is still unclear whether growth is driven by carbon assimilation and allocation or by the direct control of environmental factors on the cambial activity.

Research:

- 1- Identifying the drivers of growth and especially the relative roles of photosynthesis, temperature and water availability to explain growth at the cambial level.
- 2 - Integrate the identified processes in a soil-vegetation-atmosphere model in order to predict the effects of climatic variations on tree growth.

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WP2. Ecosystem dynamics and disturbance regimes

Author: Mireia Llorente (CTFC)

Host: Keith Reynolds (USDA- Corvallis), David Myrold (Oregon Univ).

Evaluation of the biodiversity and functionality of the soil microbial community as a tool for the assessment of ecosystem dynamics and disturbances:

- include more explicit representations of microbial community and functions that control decomposition.
- The ultimate benefits from this knowledge will be to promote managing of the plant-soil system to improve soil microbial communities most important for promoting soil carbon storage across the diverse conditions present in the forest systems.

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Research done under WP3: Ecosystem Services Supply, risk assessment and trade-off analysis.

Objectives:

- ☺ To build from research on forest resources economics and management science in each partner institution to develop innovative tools to simulate the impact of decisions and of social and policy options on forest ecosystems and on the provision of ecosystem services.

Research Done:

- ☺ Addressing Climate Change in a Stochastic Optimization Model in Forest Planning. Jordi Garcia-Gonzalo
- ☺ Developing multi-objective stochastic models to account for uncertainty in multi-objective forest planning. Eduardo-Álvarez Miranda
- ☺ A MIP Approach for Multi-Action Planning for Threat Management. Habitat conservation problems. José Salgado (UChile - Virgilio Hermoso CTFC).
- ☺ Developing Pareto Frontier approaches to examine trade-offs between wildfire risk and the provision of other ecosystem services. Susete Marques and José G. Borges (ISA, Portugal) visiting (PSU, USA)

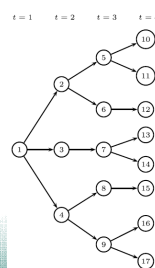
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WP2. Ecosystem dynamics and disturbance regimes

Autors: Jordi Garci-Gonzalo (CTFC, Spain), Andrés Weintraub, Eduardo Álvarez-Miranda, José Salgado, (Uchile, Chile).
Exchanges between CTFC and Univ of Chile

Developing stochastic management models to address climate change:

- ☺ Stochastic LP and MIP models to account for climate change.
- ☺ Multi-objective stochastic models to take into account climate change uncertainty.
- ☺ Use of decomposition methods to solve large stochastic problems.



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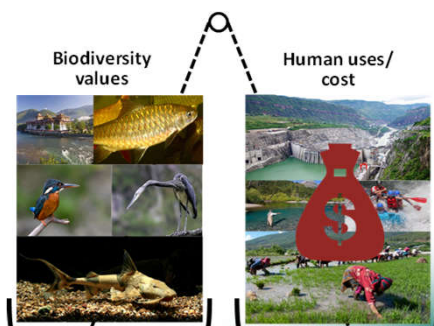
WP2. Ecosystem dynamics and disturbance regimes

Autor: Virgilio Hermoso (CTFC, Spain)

Host: Andrés Weintraub, Eduardo Álvarez-Miranda, Juan Ignacio Villasante, Cristóbal Pais, (Uchile, Chile).

Dealing with conservation problems:

- 🕒 Developing a MIP Approach for Multi-Action Planning for Threat Management. Habitat conservation problems.
- 🕒 Co-lateral result: One student from U.Chile may come to CTFC to do his PhD.



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WP2. Ecosystem dynamics and disturbance regimes

Autor: Susete Marques, José Borges (ISA, Portugal)

Host: Marc McDill

Developing Pareto Frontier approaches to examine trade-offs between wildfire risk and the provision of other ecosystem services:

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WP4: Intelligent ecosystem management decision support systems

Objectives:

- ☞ To build from research in information and computer sciences in partner institutions to provide a framework for the interdisciplinary synthesis of knowledge developed under WP 1 and 2.

Research Done:

- ☞ Using EMDS to define PEG (management of lands to support fire suppression). José Ramón González-Olabarria, Míriam Piqué (CTFC).
- ☞ Marco Matos and José G. Borges.
- ☞ Development of a web-based DSS + visualization tools. Jordi Garcia-Gonzalo, Irina Cristal, Cristóbal Pais, Andrés Weintaub.

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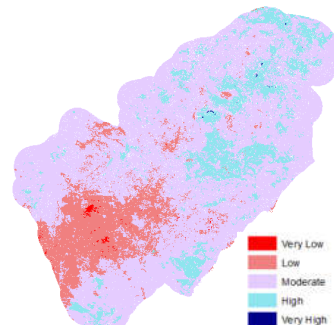
WP4: Intelligent ecosystem management decision support systems

Autor: José Ramón González, Míriam Piqué (CTFC, Spain).

Host: Keith Reynolds, PNW Resarch Station.

Using EMDS to define PEG (management of lands to support fire suppression)

- First define which factors make an area of high priority
 - High risk of GIF (big fires) fuels, fire behaviour
 - High exposure (houses)
 - Infrastructures (wáter points, roads.. That allow fire fighters to work safely)
- Combine "hard data" from LiDAR, Fire simulation with end user knowledge and requirements.
- The result is a **strategic** plan where management priorities are given for each polygon. Which áreas should be treated to reduce the risk of GIF

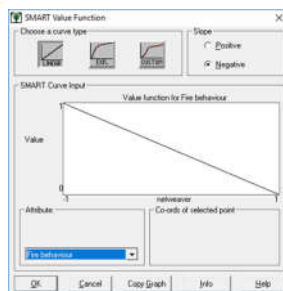


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WP4: Intelligent ecosystem management decision support systems

Autor: José Borges and Marco Matos (ISA, Portugal).
Host: Keith Reynolds, PNW Research Station.

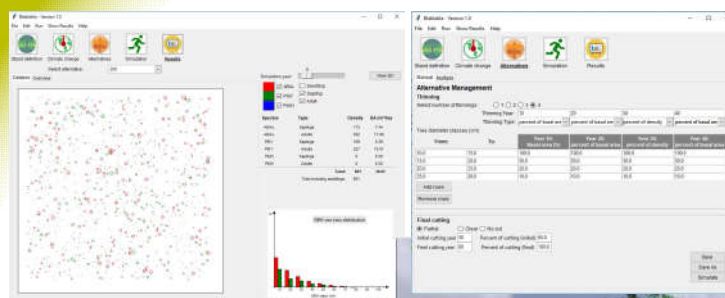
to research the potential of combining knowledge-based and web based decision support systems



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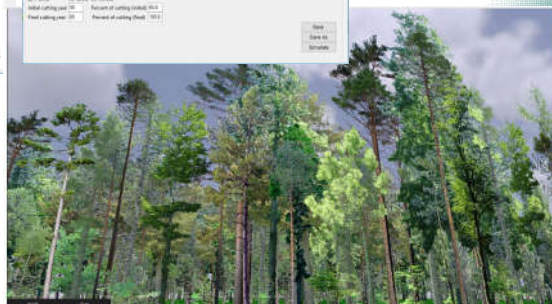
WP4: Intelligent ecosystem management decision support systems

Jordi Garcia-Gonzalo, Cristóbal Pais, Irina Cristal, JR González-Olabarria.
Development of a web-based DSS incorporating visualizatio tools



3D View of the stand

Video, landscape visualization



WP5: Events Organized and Future events

Events:

- Kick-off meeting and seminar on (Lisbon, February 2016).
- Research seminar on (Madrid, October 2016).
- Annual SuFoRun meeting and seminar (State College, January 2017).
- Course on 3-PG FOREST GROWTH MODEL co-organized with the Pontificia Catholic University of Chile (July 2017, Santiago de Chile).
- Co-organization of the SSAFR conference, <http://www.ssafr2017.org/>, (Seattle, August 2017).
- Research seminar (Solsona, September 2017).
- Annual SuFoRun meeting and seminar (Turrialba, Costa Rica, January 2018).
- Risk Analysis Conference (Solsona, 4th to 8th, or 11th-15th June 2018). (See previous conference <http://riskanalysis-iufro.org//2016meeting.html>).
- Annual meeting and conference in conjunction with SSAFR (Chile, January 2019).
- Final SuFoRun conference (Brasil, October 2019).

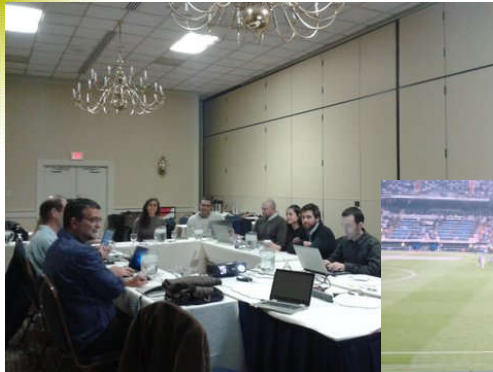
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Conclusions

- The Marie Curie Actions are very interesting source of funding for Exchange of knowledge and researchers.
- In our case through SuFoRun we are funding a great amount of exchanges (at this momento 40 researchers have already visited other institutions).
- This has allowed us not only to achive some good research results but has allowed to sthreinthen research ties as well as expaned our networks of contacts.
- SuFoRun comes to an end in January 2020. But during 2018 we may think about a new application for funding...

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- LAST BUT NOT LEAST... THIS IS NOT ONLY ABOUT WORKING:



- ITS ALSO ABOUT NETWORKING



- THANK YOU