

PhD Course on “International Forestry and Global Issues” 3rd edition of the doctoral program

Nancy and Champenoux, France
May 19-23, 2014



Performance Report June 2014

Supported by :

Context

The Nancy-Lorraine Center of the French National Institute for Agricultural Research (INRA) has developed over several years an active partnership with the Lorraine doctoral program 'Resources, products, processes and environment' (RP2E), bringing together the University of Lorraine, AgroParis Tech, CNRS and INRA. In 2010, the Directorate-General of INRA invited seven higher education establishments with accredited doctoral programs to propose modules for advanced training for doctoral students enrolled in these schools. In collaboration with the European Forest Observatory, an integral part of the Central European regional office of the European Forest Institute (EFICENT), the INRA Nancy-Lorraine Center has designed a training module entitled 'International Forestry and Global Issues' (IFGI). This module consisted of one week-long session, fully financed by INRA, and brought together 38 doctoral students and young scientists from 13 countries (nine of whom were enrolled in the RP2E doctoral program).

The success of the first session prompted us to extend the project in 2012, within the context of a broader partnership framework. As such, the session organized for 2012 was co-organized between INRA, EFI and AgroParis Tech with co-financial support from the RP2E doctoral program, the University of Lorraine and the Urban Community of Greater Nancy. In addition, this session was awarded official recognition by the NFZ.forestnet network and by the Agreenium consortium. Intended for PhD students and young scientists working in the scientific field of forest-wood-territories, this training took place from 16 to 20 April, 2012, in Nancy-Champenoux (54). The objective was to allow young people from varying disciplinary backgrounds and nationalities to gain a greater understanding of how their research - however specialized or developed - is relevant to current debates on climate change, biodiversity and forest management.



3 program sessions have been held since 2010 (© Yves Bernardi – INRA)

The third edition of the IFGI program, which took place the week of 19-23 May 2014, continued with the groundwork principles established in the previous sessions, this year placing special emphasis on forest governance.

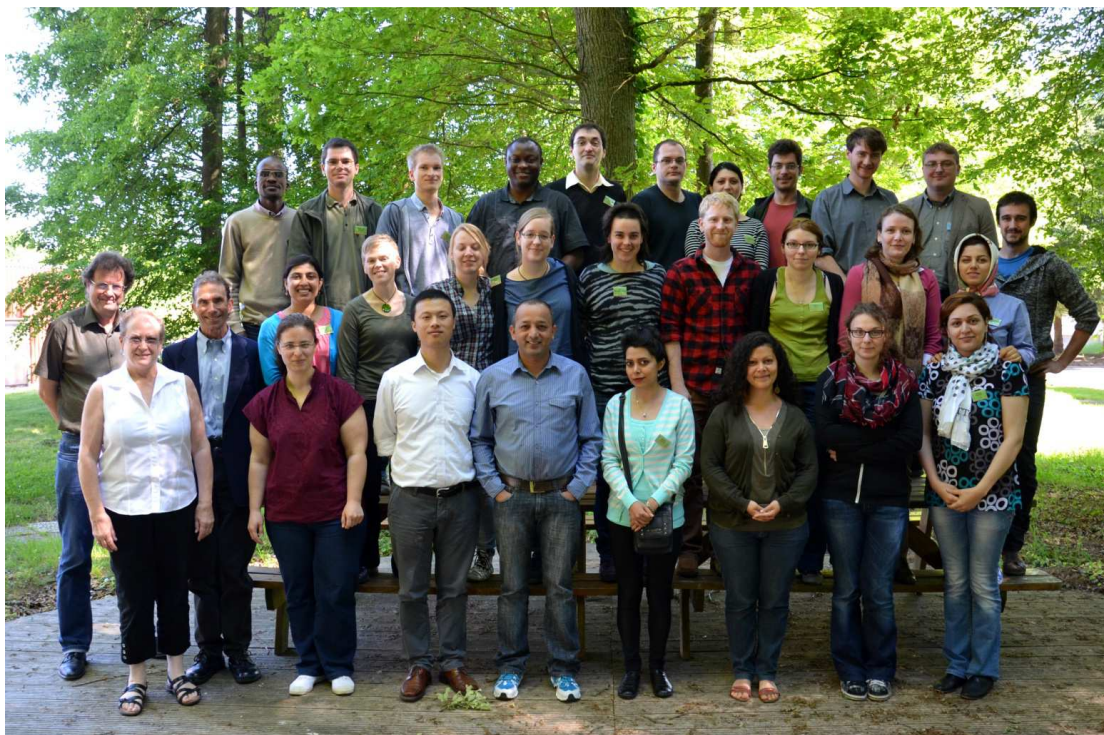
Participants and organization

Registration was free of cost but subject to selection. The organizing committee received 55 applications from 25 countries. Twenty-four participants, representing 13 countries, were selected for final registration (see attached list).

All participants visiting from outside of Nancy were provided accommodation at the Saint-Georges Residence (on the AgroParis Tech campus in Nancy) or other close-by accommodation. A briefing held Sunday evening, followed by a

meal on the AgroParis Tech campus, allowed students to meet each other before the course began. Course sessions were held on site at the INRA Nancy-Lorraine center in Champenoux (with daily bus service available between Nancy-Champenoux).

The official program was supplemented by social activities organized throughout the week for the participants in the city center of Nancy. The atmosphere was convivial and resulted in rich exchanges.



Official group photo 2014 (© Yves Bernardi – INRA)

Program and speakers

The program was developed in collaboration with two speakers who shared moderating responsibilities: Margaret Shannon, a visiting professor from the University of Freiburg and an EFI collaborator, and Joe Van Brusselen, Director of the European Forest Observatory (OEF).



Margaret Shannon lead discussions during the training (© Yves Bernardi – INRA)

When compared to other courses commonly offered by doctoral schools, this training module had the distinction of giving attention to social, economic and political issues involved in forest research. And indeed, many PhD students focus their research on specialized topics. Results of this research, however, can then be used in expert reports commissioned by policy makers and can have an impact on decision-making. It is therefore essential that doctoral students and young scientists understand the potential significance of their work beyond the scientific community so that they may place their research in a larger context.

The program involved 15 high-level professionals in their respective fields who visited from several countries and international institutions. These speakers were selected by the program moderators on the basis of their specific expertise and experiments recognized at the international level. Several speakers came from academic institutions, others from intergovernmental organizations (EFI, UN-ECE, etc.)

	Name	Area(s) of Expertise	Institution / Organization	Country
1	Marc Benoît	Agriculture, Environment	INRA / ASTER	France
2	Arnaud Brizay	Forest Governance, Economy	UN-CEE	Switzerland
3	Gérard Buttoud	Forest Governance,	University of Tuscia	Italy
4	Julien Fiquepron	Forestry, Economy, Environment	CNPF / IDF	France
5	Joanne Fitzgerald	Forest Ecology	EFI / SYCLI Unit	Finland
6	Serge Garcia	Forest Economy	INRA / AgroParis Tech, LEF	France
7	Andreas Kleinschmit von Legenfeld	Wood Engineering	FCBA	France
8	Christophe Klotz	Sustainable Development	Agrivair	France
9	Julie Marsaud	Environment, Ecology	France Nature Environment	France
10	Harald Mauser	Forest Governance	EFI / Liaison Office of Bruxelles	Belgium
11	Ed Pepke	Forest Economy	EFI / FLEGT-REDD Unit	Switzerland
12	Andreas Schuck	Forestry, Environment	EFI / EFICENT	Germany
13	Margaret Shannon	Governance	EFI / University of Fribourg, Brisgau	US
14	Christophe Van Orshoven	Forest Governance	EFI / FLEGT-REDD Unit	Spain
15	Jussi Viitanen	Economy, Forest Governance	EFI / FLEGT-REDD Unit	Spain

Since this training program involves international experts from academia and international organizations, doctoral students and young scientists are offered an excellent opportunity to interact with internationally renowned experts in science and forest policy. Each course session is dedicated to addressing a specific issue (see the attached detailed program).

- State of world forests and an overview of international policy;
- Production, trade and consumption of wood products in the bio-economy;
- Climate change and carbon sequestration;
- Forest Ecosystem Services;
- Regional development, forest management and society;
- The Science/Policy Interface

This year, the week began with a visit to the INRA site in Champenoux to give the students a better understanding of why their training would be held at this location. This visit is important in that it reflects one of the programs objectives of boosting visibility of research centers located in Lorraine and to highlight their attractiveness for young scientists.



Students learned about infrastructure in research on-site at the INRA Nancy-Lorraine Center (© Yves Bernardi – INRA)

In terms of method, every step is taken to allow for interactions between the students themselves and between the students and guest speakers. General plenary sessions were designed to include targeted group work sessions. In addition, students were asked to participate in round table discussions to a) present results from their working groups and b), to jointly formulate assessments and commentary on presentations and topics addressed by the different speakers. The group work sessions were supervised by both the speakers and course moderators.



Student evaluations were based on their assessments and the results of their targeted work group sessions

(© Yves Bernardi – INRA)

Course sessions held indoors were complemented by half-day off-site field sessions. This year, the group visited Vittel to better illustrate what their lesson had covered in the classroom during the morning session on s of Ecosystem Services (PSE). The students learned about the 'Vigie de l'Eau' project as well as the research program launched by INRA in Vittel and contracts and structures put in place by the Agrivair (Nestlé Waters) program designed to ensure the quality of thermal water. A speaker from the Institute for the Development of Forestry (IDF-CNPF) then explained the relevant connection to Payments for Ecosystem Services (PSE) for forests.



*An on-site field visit to Vittel directly
related to course discussions about Payment for Ecosystem Services(© Tao Ding)*

Communication

A website dedicated to the event has existed since the first edition of this course: <https://colloque.inra.fr/globalforestrycourse>. This site provides practical information about the training, program details, a list of partners and financial supporters, power-point presentations, a video filmed during the first course session and a photo album from all of the sessions.

Several email campaigns were conducted to promote the event and to encourage potential participants to apply. Promotional emails were diffused throughout several networks associated with forest research in France, Europe and around the world. Half of the participants were informed about the course via email.

Interesting to note is that these networks together with word-of-mouth communication worked surprisingly well: many of the candidates told us they learned about the program from a colleague or acquaintance (most often from thesis supervisors). With this in mind, we have made it a policy to keep email addresses of alumni to send them information on future training programs with INRA, AgroParis Tech, the University of Lorraine or the NFZ.forestnet network.

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An 'IFGI Alumni' module was created and diffused on one of the network platforms used by researchers and professionals (Linkedin) to further strengthen links established in earlier course sessions. A file sharing system was set up with participants to allow for easy access to useful course related documents.



The IFGI group as featured on LinkedIn gives students the chance to continue their exchange after their training

In 2014, the idea to film the different speakers to *consolidate* lessons from the week sessions was launched. An almost successful attempt was made with existing technical means, but providing doctoral students with a quality film production would require its own specific budget.

Financial partners

The 2014 doctoral training session 'International Forestry and Global Issues' received support funding from INRA, the University of Lorraine and the Laboratory of Excellence - Advanced Research on the Biology of Tree and Forest Ecosystems (LabEx ARBRE). This training program was awarded official recognition by the NFZ.forestnet network and by the Agreenium consortium. The European Forest Institute, via the OEF and EFICENT, also contributed to session preparation and organization.

At the time this report was written, the Urban Community of Greater Nancy had not yet convened to allocate financial support funds for the IFGI 2014 doctoral program.

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Budget

A final budget assessment for this doctoral program was still pending at the time this report was written. In total, close to € 16,500 was spent on the event organization, fees and expenses for the moderators, travel expenses for the guest speakers, transportation and meals.

Results and Perspectives

The IFGI doctoral training program was concluded by the distribution of a questionnaire to evaluate the week-long session. Students commented this year on the richness and scope of the program. In addition to learning about new ideas, such as the concepts of governance and forest economy, the students valued the debates and exchange of views throughout the week and benefited individually by improving their personal skill sets (ability to work in groups, communication skills, networking, etc.).

They also noted a number of points that could be improved for the next edition. The organizing committee will be particularly interested in the students' feedback about the field visit (striking a balance between the themes covered and their direct application in the forest), specific vocabulary referenced during the course, course material distribution throughout the week and the range of views and experiences presented.

It is worth noting that the response from the guest speakers was also equally positive. Most of these speakers attended one or two days of the training, so as to be able to join in discussions and group work sessions. They found it particularly interesting working with students on the matrix provided by the moderators.

For future course sessions, the organizing committee will try to distinguish this training course in 'International Forestry and Global Issues' even further from other courses offered on the subject. The model used by the European Forest Institute for its course series 'Winter Summer Schools' is one example (one single location for the whole event). Greater contribution to event organization is also expected from the NFZ network for future course editions.

The 2014 edition in figures

55 candidates (20 women and 35 men)

24 participants (13 women and 11 men)

13 countries represented

20 reviews

15 guest speakers

7 people involved in organizing the week-long event

60 work days, corresponding to 3 months of cumulative full time work.

Appendix (in French):

Appendix 1: Program of the doctoral program

Appendix 2: Description of the field visit

Appendix 3: List of Participants

Appendix 4: List of guest speakers and members of the organizing committee

Appendix 5: Matrix of work presented to the students

Programme

DAY 1	
Monday, May 19 2014 08:30 am - 06:30 pm	
8:30	Departure from Nancy Centre
9:30 - 10:30	Welcome coffee and Introduction of the Day
10:30 - 12:30	Visit to INRA facilities
12:30 - 13:30	Lunch
13:30 - 15:30	Topic 1: State of forests and overview of international policies
13:30 - 14:15	State of the World's Forests <i>A. Brizay - FAO UNECE, Geneva</i>
14:15 - 14:30	Plenary Discussion
14:30 - 15:15	Novel approaches in global forest governance <i>M. Shannon - EFI / University of Freiburg, Freiburg</i>
15:15 - 15:30	Plenary Discussion
15:30 - 16:00	Coffee-break
16:00 - 17:30	Group work
17:30	End of the day
18:00	Departure from INRA research centre

DAY 2	
Tuesday, May 20 2014 08:30 am - 06:30 pm	
8:30	Departure from Nancy centre
9:30 - 9:45	Restitution day 1 and introduction of the day
9:45 - 12:30	Topic 2 - Production, trade and consumption of forest products in the bioeconomy
9:45 - 10:30	Production, trade and consumption patterns of forest products <i>E. Pepke - EFI / FLEGT and REDD unit, Barcelona</i>
10:30 - 10:45	Plenary Discussion
10:45 - 11:15	Coffee-break
11:15 - 12:00	Trade as leverage to improving forest governance world-wide <i>J. Viitanen - EFI / FLEGT and REDD unit, Barcelona</i>
12:00 - 12:30	Plenary Discussion
12:30 - 13:30	Lunch
13:30 - 15:30	Topic 3 - Climate change and carbon sequestration
13:30 - 14:15	An overview of the climate change impacts on forests <i>J. Fitzgerald - EFI / SYCLI unit, Joensuu</i>
14:15 - 14:30	Plenary Discussion
14:30 - 15:15	The latest change policy developments with a scope on forests <i>Speaker to be confirmed</i>
15:15 - 15:30	Plenary Discussion
15:30 - 16:00	Coffee-break
16:00 - 17:30	Group work
17:30	End of the day
18:00	Departure from INRA research centre

DAY 3

Wednesday, May 21 2014
08:30 am - 07:30 pm

8:30	Departure from Nancy centre
9:30 - 9:45	Restitution of Day 2 and introduction of the day
9:45 - 12:30	Topic 4 - Forest ecosystem services
	Payments for Ecosystem Services (PES) or how ecosystem protection and economics can go hand-in-hand <i>S. Garcia - LEF (INRA/AgroParisTech), Nancy</i>
	9:45 - 10:30
	10:30 - 10:45 Plenary Discussion
10:45 - 11:15	Coffee-break
	How one ecosystem service does not need to exclude another: experiences of the INTEGRATE project <i>A. Schuck - EFI / EFICENT Regional Office, Freiburg</i>
	11:15 - 12:00
	12:00 - 12:30 Plenary Discussion
12:30 - 13:30	Lunch
13:30 - 19:30	Field Trip to Vittel (Vosges, France)
	The water protection issues Coordination: La Vigie de l'Eau <i>M. Benoit - INRA, Mirecourt</i> <i>C. Klotz - Agrivair, Vittel</i> <i>J. Fiquepron - CNPF/IDF, Nancy</i>

DAY 4

Thursday, May 22 2014
08:30 am - 05:00 pm

8:30	Departure from Nancy centre
9:30 - 9:45	Restitution of Day 3 and introduction of the day
9:45 - 12:30	Topic 5 - Regional development, forestry and society
	Local and regional visions of the forest and governance issues <i>G. Buttoud - University of Tuscia, Viterbo</i>
	9:45 - 10:30
	10:30 - 10:45 Plenary Discussion
10:45 - 11:15	Coffee-break
	Innovation in forest wood chain and regional development <i>A. Kleinschmit v. Lengefeld - FCBA, Paris</i>
	11:15 - 12:00
	12:00 - 12:30 Plenary Discussion
12:30 - 13:30	Lunch
13:30 - 15:00	Group work
15:00 - 15:30	Coffee-break
15:30 - 17:00	Preparation of the sessions' reports by the students
17:00	End of the Day

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Special Evening 06:00 pm - 10:30 pm

Group Dinner

18:00 - 18:45	Position and role of an environmental NGO in the Forest Science - Policy interface <i>J. Marsaud - France Nature Environnement, Paris</i>
18:45 - 19:00	Discussion
19:30 - 21:30	Dinner
21:45	Departure from INRA research centre

DAY 5

Friday, May 23 2014
08:30 am - 02:30 pm

8:30	Departure from Nancy centre
9:30 - 9:45	Restitution of Day 4 and introduction of the day
9:45 - 10:45	Presentation of group works
10:45 - 11:15	Coffee-break
	Guest speaker
11:15 - 12:00	Forestry in Brussels and the Science / Policy interface <i>H. Mauser - EFI / Brussels Liaison Office, Brussels</i>
12:00 - 12:30	Summing up the week <i>M. Shannon – moderator</i>
12:30 - 13:30	Lunch
14:00	Departure from INRA research centre

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FIELD TRIP TO VITTEL IMPLUVIUM Wednesday 21 May 2014, 13:30 – 19:30

Description:

How can we adapt land management and human activities to protect water catchments without impeding local economic development? How farmers and foresters among all local actors may have a significant and proactive role to preserve quality of fresh available water for human consumption or industry needs ? In the frame of the 4th topic of the PhD course "Forest ecosystem services", a field trip to Vittel is organised on Day 3. Focusing on the theme "Vittel and the water protection issues", the field trip will be an opportunity to discuss about environmental issues, soil protection and ecosystem services before narrowing the reflection to the role of forests for the water resources protection.

AGRIVAIR will introduce its partnership approach to water resources protection and the work developed in Vittel (Vosges) as a follow-up of the multidisciplinary research programme led with INRA in the late 80's. Inra research work will be presented focusing on the five main steps in this protection process. The presentation by the Institute for Forest Development of the "EAU + FOR" programme - which aims at developing partnerships between foresters and the water stakeholders - and of two French sites which are a good example of how woodland management can be adapted to protect spring catchments thanks to partnerships (Masevaux city and Syndicat Intercommunal des Eaux des Moises) will also provide food for thought.

With the participation of:

Marc BENOIT, Director of Research at the French National Institute for Agricultural Research (INRA)

Christophe KLOTZ, AGRIVAIR director (Nestlé Waters France Belgique)

Julien FIQUEPRON, Forest and Water Engineer at the French National Centre for Forest Owners (CNPF) and its Institute for Forest Development (IDF).

Coordination:

La Vigie de l'Eau, a scientific, technical and industrial cultural centre on waters in Vittel

Michelle CUSSENOT

With the support of:

INRA

CNPF – IDF

AGRIVAIR

EFICIENT (Observatory for European Forests)



AgroParisTech

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List of participants

	Photo	Name	Email	Position	Research topic	Institution	More information	Country
1		Mr. Komivi Messan Akakpo	KOMIVI.AKAKPO@YAHOO.FR	PhD Student	Deforestation and Forest Change Dynamics	Université de Versailles Saint-Quentin-en-Yvelines (UVSQ)		France
2		Mr. Andrei Ioan Apafaian	brigadieru_silvic@yahoo.com	PhD Student	Forest Engineering	Faculty of Forestry Brasov		Romania
3		Miss Maryam Bakhshi	bakhshim@zedat.fu-berlin.de	Research Fellow	Bioenergy Promotion strategies	Free University Berlin		Germany
4		Mr. Scott Cettie	scott.cettie@ifp.uni-freiburg.de	PhD Student	International Forest Policy using Discourse Analysis	Albert-Ludwigs Universität Freiburg - Faculty for Environment and Natural Resources		Germany
5		Miss Rebeca Cordero-Debets	rebeca.cordero-debets@efi.int	Junior Researcher	International policy, Forest ES, Climate change & Regional development, forestry and society	EFIATLANTIC		France

Organisation :



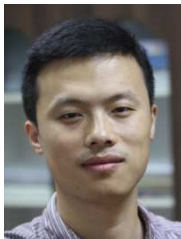


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	Photo	Name	Email	Position	Research topic	Institution	More information	Country
6		Mr. Tao Ding	dtroy921@hotmail.com	Visiting Researcher	wood heat treatment	University of Lorraine	A visiting researcher from Nanjing Forestry University, China Hosted by LERMAB, University of Lorraine	France
7		Miss Elham Elzami	Elham_L246@yahoo.com	PhD Student	Geographie	FAU		Germany
8		Miss Archana Gauli	anagauli@gmail.com	PhD Student	Genetic diversity and adaptation in Eucalyptus pauciflora	University of Tasmania		Australia
9		Mr. Mihail Hanzu	mihail.hanzu@gmail.com	Dr. Eng.	Forest biometrics	Săliște Local Council	Currently working in forest administration.	Romania

Organisation :




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	Photo	Name	Email	Position	Research topic	Institution	More information	Country
10		Miss Laura Heid	laura.heid@nancy.inra.fr	PhD Student	C allocation in forest	INRA		France
11		Mr. Ludovic Henneron	ludovic_henneron@hotmail.com	PhD Student	Effect of forest stand density management on humic epipedon biodiversity and functioning	University of Rouen		France
12		Miss Rebekka Hufner	rebekka.huefner@usf.uni-kassel.de	Research Associate	Developing a module for LandSHIFT to simulate and analyse forest change	CESR (University Kassel)		Germany
13		Miss Zineb Kebbi-Benkeder	zineb.kebbi-benkeder@nancy.inra.fr	PhD Student	Extractives of knots	INRA		France
14		Mr. Jimmy Le Bec	jimmy.le_bec@cirad.fr	PhD Student	tropical forest dynamics	IRD		France

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	Photo	Name	Email	Position	Research topic	Institution	More information	Country
15		Dr. Amanda Matson	amatson@gwdg.de	Post-doc	GHG exchange, N cycling, tropical canopy soils	University of Goettingen	Recently graduated, currently looking at GHG exchange in forest soils in Panama	Germany
16		Miss Sulmaz Mohandesi Namin	solmazmohandesi@yahoo.com	PhD Student	Management evaluation in Golestan Forest National Park, Iran	Institute of Forest Economics and Forest Management Planning, Technische Universität Dresden		Germany
17		Miss Lur Moragues-Saitua	lur.mosai@gmail.com	PhD Student	Forest soils, adaptation to and mitigation of climate change	NEIKER-Tecnalia		Spain
18		Mr. Prem Raj Neupane	neuprem@gmail.com	PhD Student	REDD+ potentials within a forested landscape mosaic in Dinh Hoa, Viet Nam	University Hamburg		Germany
19		Mr. Patrick Opoku	opoku_patrick@yahoo.com	Humboldt Research Fellow	Forest Conservation in Ghana as a contribution to climate protection	Technical University of Dresden		Germany

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	Photo	Name	Email	Position	Research topic	Institution	More information	Country
20		Miss Ayda Rostami Jalilian	rostamiaida@gmail.com	Graduated	forestry	Bangor university		Iran
21		Mr. Paul Rougieux	paul.rougieux@efi.int	Research Assistant	Forest Sector - Modelling consumption production and trade of forest products in Europe	European Forest Institute, EFICIENT-OEF		France
22		Mr. Rami Saad	rami.saad@slu.se	PhD Student	Forest Planning	Swedish University of Agricultural Sciences		Sweden
23		Miss Seyedeh Masoumeh Saderi	ssaderi@nancy.inra.fr	PhD Student	wood anatomy and forest ecology	INRA Nancy		France
24		Miss Carolin Ronja Stiehl	cstiehl@gwdg.de	PhD Student	Tree species diversity in Chilean Mediterranean Forests - are naturalness and economics compatible?	Faculty of Forest Sciences and Forest Ecology, University of Göttingen		Germany

Organisation :



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	Photo	Name	Email	Position	Research topic	Institution	More information	Country
25		Miss Annabelle Sueur	asueur@nancy.inra.fr	PhD Student	Determining the impact of climate change on the mortality of the main french tree species.	AgroParisTech Nancy		France

Organisation :



AgroParisTech



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RP2

Grand Nancy

Contacts

Speakers

Name	Organisation	email
Arnaud Brizay	FAO/UNECE – Forestry and Timber Section	arnaud.brizay@unece.org
Gérard Buttoud	University of Tuscia	gerard.buttoud@hotmail.fr
Joanne Fitzgerald	EFI – SYCLI Unit	joanne.fitzgerald@efi.int
Serge Garcia	INRA-AgroParisTech Laboratoire d'Economie Forestière	serge.garcia@nancy.inra.fr
Andreas Kleinschmit von Lengefeld	FCBA	andreas.kleinschmit@fcba.fr
Julie Marsaud	France Nature Environnement	julie.marsaud@fne.asso.fr
Harald Mauser	EFI – Brussels Liaison Office	harald.mauser@efi.int
Ed Pepke	EFI - FLEGT and REDD Unit	ed.pepke@efi.int
Andreas Schuck	EFI - EFICIENT	andreas.schuck@efi.int
Jussi Viitanen	EFI- FLEGT and REDD Unit	jussi.viitanen@efi.int

Course organisers

Name	Organisation	email
Jo Van Brusselen	EFICIENT (OEF)	jo.vanbrusselen@efi.int
Erwin Dreyer	INRA, Nancy	erwin.dreyer@nancy.inra.fr
Bernard Roman-Amat	AgroParisTech, centre de Nancy	bernard.roman-amat@agroparistech.fr
Margaret Shannon	EFI	margaret.shannon@efi.int

Technical/organisational support

Name	Organisation	email
Yves Bernardi	INRA, Nancy	yves.bernardi@nancy.inra.fr
Barbara Lacor	EFICIENT (OEF)	barbara.lacor@efi.int
Céline Ranger	INRA, Nancy	celine.ranger@nancy.inra.fr

Useful Contacts

Barbara Lacor: +358 50 57 50 386

At AgroParisTech's residence: Mr. Valentin STEFAN (trainee at OEF): Room 210, +49 15750983710

Table 1 Transnational business governance (TBG) interactions: An analytical framework

Dimension of interaction	Component of regulatory governance					
	Goal/agenda setting	Rule formation	Implementation	Monitoring, information gathering	Compliance promotion, enforcement	Evaluation, review
Who or what interacts						
Drivers and shapers						
Mechanisms and pathways						
Character of interaction						
Effects of interaction						
Change over time						

Table 2 Transnational business governance (TBG) interactions: Applying the framework to forest governance

Dimension of interaction	Component of regulatory governance					
	Goal/agenda setting	Rule formation	Implementation	Monitoring, information gathering	Compliance promotion, enforcement	Evaluation, review
Who or what interacts	Transnational networks of firms, NGOs, state agencies, experts	State agencies and TBG programs; firms and NGOs comment and critique	Companies, certifiers, state agencies, NGOs	Certifiers, state agencies, NGO watchdogs	State agencies, timber producers, retailers, (especially) forest campaigners	Stakeholders within TBG programs; FSC and other TBG programs within ISEAL Alliance
Drivers and shapers	Transnational timber chains; tropical forest destruction; governance failures	Received technical standards; intergovernmental criteria and indicators	Costs; producer management capacities; reputational risk; state procurement policies	Received criteria and indicators; information gathering and management capacities	Information costs; available technologies; reputational capital	Market pressure, meta-regulatory standards (e.g. ISEAL Impacts code)
Mechanisms and pathways	Intergovernmental meetings; boycott movements; shaming campaigns	Rule borrowing, adaptation; interlocking memberships; multi-stakeholder processes	Contracts, informal supplier relationships; production chain management	Production chains; standardized reporting requirements; external monitoring	Best practice promulgation; brand management and pressure	Comparison, benchmarking, rule mimicry, institutional isomorphism
Character of interaction	Discursive articulation of principles; competitive promotion of crises, threats	Imitation, competition, niche-carving	Division of labor between firms, certifiers, watchdogs; market competition	Division of labor among firms, certifiers, state; conflictual surveillance, whistle-blowing	Cooperation, confrontation	Orchestration (e.g. ISEAL), coordination, competition
Effects of interaction	Dialogue over guiding principles; movement toward criteria and indicators	Similar institutional structures, continuing differentiation among rule systems	Increased external accountability to multiple actors	Increasing quantity of information; possibly growing consistency in measures	Competitive enforcement; possibly increased overall enforcement	Frequent rule revision, possibly learning, enhanced regulatory capacity
Change over time	From closed, expert communities to open multi-stakeholder networks	From state-centric to transnational network interactions; apparent upward trend in stringency	From management control to shared responsibility with division of labor	From state-industry division to multi-stakeholder information production; possible overall expansion	Decreasing reliance on state; increasing number of enforcement mechanisms; increasing formalization	Converging norms, institutional design; expanding non-state authority tempered by recent state resurgence

FSC, Forest Stewardship Council; ISEAL, International Social and Environmental Accreditation and Labeling.