Annex to the Internet Survey 1 report

COST Strategic Workshop series

"Foresight on Future Demand for Forest-based Products and Services"

This is a summary from the survey responses highlighting a number of key observations for further elaboration – the chapter numbers refer to the eDelphi query numbers (see the separate eDelphi report).

1.1 Respondent profile

Total of 134 respondents filled in the respondent profile although not all responded in the survey queries (127 responses were given to the "most popular" query, i.e. to the query no.1 "Global trends and their impact on the forest-based sector by 2050"). In total 109 respondents indicated as their region Europe: Northern Europe (37), Central and Eastern Europe (27), Western Europe (27) and Southern Europe (18). Participants outside Europe come e.g. from New Zealand, Australia and South Asia (app. 8 respondents), Northern America (app. 7), as well as individual respondents from e.g. Argentina, Iran, Morocco, Turkey and Russia. Field of activity of the respondents is mainly research & technology and academia & education, total 98 respondents (51 and 47 respectively). Other fields of activity are less represented: e.g. government and administration (12), NGOs etc. (8) and business and industry (7). Sector of activity is mainly within the "traditional forest sector" i.e. forestry (55 respondents), forest-based sector (20), wood products (15) and pulp & paper (8).

Based on the respondent profiles, the group of respondents is not extensive or very heterogeneous. However, the aim is not to make statistical analysis based on the survey results, but rather, to use the survey to test the outcome of the workshop 1 (setting the scene: trends, drivers, barriers and forest-based products and services) and to contribute to the workshop 2 scenario building.

Responses in the queries

The edelphi respondent statistics show that in addition to the first query "Global trends and their impact on the forest-based sector by 2050", only partial responses we given to the thematic part of the survey (queries 2.1 – 2.6 representing different forest-based products and services groups):

1.2 Global trends, drivers, change factors and emerging issues	127
2.1 Biobased economy	65
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There are only 9 respondents who have answered to all queries of the survey, defined by geographical scope most of them from Europe (7). Others have selected one or several queries to respond.

1.2 Global trends and their influence on the forest-based sector by 2050

Key observations from the query responses, incl. questions for further thought:

- **Strong belief in technology solutions**: 102 respondents see more of solutions than risks (15) in the technology field

This raises "what if" questions ← *What if* technology risks realise, technology development pace stagnates, there is no "infinite increase in efficiency"? *What if* there is a major technology break-through in some other sector (e.g. new solution for energy generation, energy saving, new materials, new technology affecting everyday lives of a large share of the world population…)? How would these developments affect the needs and demand for forests and the forest-based solutions? Are we aware of the key sectors where major break-through might appear? Is the forest-based sector (as we define it today) already connected to these other sectors? What are the opportunities and risks, and what do we need in order to harness the technology potential also for development of the forest-based solutions?

- Increasing globalisation is expected to develop towards **free trade and global markets**: 77 respondents see free trade and global markets as a more likely future direction than increasing national protectionism (31) – although app. half of the respondents (53%) perceive that the development in a direction or another will be moderate or no major change will take place compared with the present situation.
- At the same time **differences in economic development** are expected to increase between regions: increasing differences are indicated as more likely by 77 respondents, similar development across the world by 42 respondents.
- Financial markets are expected to be dominated by **crises and uncertainty**: 83 respondents, compared with 25 respondents seeing more stability in the future

Are these three development pathways possible at the same time, and what kind of future developments do they lead? Different pace of development in different parts of globe, stronger alliances and groupings, more uncertainty, quicker changes… – what will define success (or failure) in such environment? Also an additional question can be defined: how these developments affect differences between rural and urban areas / between rich and poor?

And furthermore, if we want to investigate futures of the forest-based sector in a long-term horizon, how should we focus our exercise(s): global – Europe – within Europe / regions – local?

In the following questions the respondents' perceptions divide more or less 50/50:

- **Governance of natural resources** based on both global and local solutions. 63 respondents see the direction of global solutions and agreements becoming at least to some extent stronger, compared with the 50 respondents perceiving that development is going towards more local solutions.
- **Customers** and users both with differentiated preferences (meaning narrow market segments) and a "global customer" i.e. similar preferences and tastes all around the world.

- **Zoning** and segregation of functions or multiple functions of forests. There was also a respondent comment that both will happen simultaneously, in other words, there would be strong zoning for specific forest areas for specific uses and other forest areas designated for multiple functions.
- Forest with open **access** or more restrictions.

About the forest-based industry product portfolio:

- By 2050, the forest-based industries' portfolio(s) would be characterized mainly by new products and services instead of the products and services we know in 2010. 86 respondents perceived this direction more likely, compared with 11 respondents expecting no change to present situation and additional 24 respondents believing that the already existing products and services will still constitute the main part of forest-based industries portfolio in 40 years.

If we want to investigate futures of the forest-based sector in a long-term horizon and address especially the products and services we do not yet know, who should we get involved in our exercise(s)? How do we approach the question that the forest-based sector in 40 years might be defined differently than the forest-based sector we know today?

In the question about *probability* of certain development paths for the forest-based sector (see question 2 in query 1.2) respondents' perceptions were very much divided. But in the following two there is more consensus about the direction of development:

- *"…forest-based industry in Europe focuses on high-quality, high-tech commodities"*
- *"…forests' contribution to public health and human wellbeing is valued as a part of national wealth"*

In the thematic queries also an additional viewpoint was brought up concerning the <u>technological development</u>: although there is much emphasis on high-tech, *how about low-tech solutions* (e.g. forests as "health factories" instead of defining health as a medical sector topic, as well as possibilities related to e.g. protective functions, fresh water issues…) – are these opportunities already fully utilised for value creation in the forest-based sector?

Also the topic of <u>forests as national wealth</u> was addressed in the thematic query responses: What about poor countries which are rich measured by forest resources? How about the role of forest owners when there is an increasing value of natural resources and of the products and services which have been so far defined as public goods (e.g. soil, air, water…) – what kind of development pathways these questions open?

Furthermore, also the question of sustainability of "*forestry as a renewable project*" was addressed in the responses, e.g.: differences between regions in availability of resources, potentials and access to e.g. new technologies and solutions → increasing differences between rich and poor → pressure to land use (both from the emerging rich and from poor regions) → reducing of world's forests combined with environmental threats, e.g. impact of climate change and biodiversity loss, invasive species, diseases. What is the long-term sustainability of this renewable project?

2 Six thematic queries (forest-based products and services groups)

There were in total six thematic queries in the survey, and the questions of drivers, barriers, importance and business potential were repeated in each of them. Based on a cross-checking of the six thematic queries (see tables 1-3), the following observations and questions can be brought up for investigation:

…the following drivers would be worth taking a closer look:

- two drivers repeated in all thematic queries received only few marks as key drivers for emergence and development of any of the forest-based products and services groups:
  - green economy targets in emerging markets (BRIC)
  - economic growth

  What does this tell, would this result have been the same if the respondent group was larger and wider? If the green economy targets of BRIC countries (Brazil, Russia, India, China) are not important, what might be emerging after these "emerging markets" we know today? What role will the green economy targets have and what is the role of forest-based sector in this respect?

- policy targets and commitments are highly rated as key drivers for energy, protected areas, reducing emissions and green infrastructure products and services groups.

  How can we foresee what will be high on the political agenda in the next 40 years; are there already signs about the emerging topics which will need to be addressed with new policy targets? E.g. water, food security and land use were pointed out in the responses – how is the forest-based sector prepared for these challenges?

- urbanisation, population changes, changing lifestyles
  How much do we know about the developments of consumer / user preferences? How are the perceptions and tastes generated, and what affects these developments – incl. point of view that there are both more differentiated consumer/user groups and "a global consumer" which the forest-based sector needs to address? The role of media was emphasised in a respondent comment, but what kind of media are we talking about today and with respect to development in the next 40 years?

…the following barriers would be worth taking a closer look:

- Technology investments in other than wood-based solutions
- Lack of funding for risk investments; lack of funding mechanisms
- Lack of willingness to pay: compared with, on one hand, the call for more "market-driven" solutions or, on the other hand, call for "mandatory funding schemes" for securing certain forest-based products and services
- Impact of public perceptions, impact of media; ways of thinking "out of the box" and the traditional ways of defining sectors, "trajectory dependencies"

For this respondent group all forest-based products and services seem to be an important solution to global challenges (excluding what was defined as "luxury goods" and what comes to "green packages" and "non-

wood goods and services"). The importance for providing solutions to global challenges did not directly correspond to the business potential foreseen in the specific products and services.

About drivers and barriers as well as importance and business potentials, the following cross-references could be worth a further investigation:

- biochemistry, biorefinery products as a topic referring to several "needs" and products and services potentials – which needs are we addressing today, and what are the needs that the forest-based sector might need to address in 40 years?
- definition of "luxury" goods and services – what we understand as luxury today, might be different in 40 years? Furthermore, in the responses given to this survey, the non-wood forest goods and services seem to have similar drivers/barriers as luxury goods.
- In the free-text responses there was references made to new players entering into the field: new producers or service providers, new consumer and user groups, as well as new interest groups gaining importance in the field of governance (introducing non-governmental "regulations", demand-driven standards and norms…) – who are these new players and where do they come from; within the forest-based sector or from other sectors / fields of activity?

In the following, a few additional key words and view points are presented for the specific "products and services" groups – for further information see the complete responses in eDelphi report queries 1.2 – 2.6.

2.1 Role of forests to bio-economy

- *Keywords related to clarify the answers / to other viewpoints:* Competition with food production, coordinated investments in research and innovation, conservation of natural ecosystems, high productive plantation forests on marginal lands, regulation and harmonisation.

→ New thinking, "out of the box" and out of the existing "sectors"?
→ Ideas have been there already for decades, where are the (new?) players who will harness the possibilities?

2.2 Role of forests to energy security and energy-saving solutions

- *Keywords related to clarify the answers / to other viewpoints:* High value-added products, lack of sustainable governance, scarcity of raw materials from short distance for biorefineries, rising energy prices, transport prices; competent foresters, degradation and deforestation, other functions of forests, political will, preservation of biodiversity, reduce energy consumption, solar and wind energy, weak governance of the forest sector.

→ Role of other than forest-based solutions more important?
→ Effect of energy, materials etc. prices on other developments (e.g. regionalisation, specialisation, local solutions / global trade)?

2.3 Role of forests to green infrastructure

- *Keywords related to clarify the answers / to other viewpoints:* limited forest resources, urbanisation, "virtual reality", public perceptions, question of profitability, "green" projects

→ Role of role of urbanisation, “conscious” consumers, new lifestyles, new needs?

Note: Under this question the carbon storage topic divided the respondents into two.

2.4 Role of forests to public health and wellbeing

- *Keywords related to clarify the answers / to other viewpoints:* healthy environments, built environments, inconsistency of public policies, drug sector prospecting forests, trajectories of sectors (why we think drugs and food additives as components of “health” sector), forests as health factories, environmental education

→ Role of market-led innovation, new thinking – where do the new ideas come from, and how does the forest-based sector respond to them?

2.5 Role of forests to food and water security

- *Keywords related to clarify the answers / to other viewpoints:* population growth, urbanisation and peri-urban areas, ecosystem services, problems in food production and distribution, preservation of genetic resources

→ Role of population changes, global developments e.g. question of water: how is the monetary value defined for water security? There are already consequences of diminishing fossil fuel reserves and need for finding new solutions – but will the money (e.g. risk investments) come only after the fossil fuel resources has been definitely run out?

2.6 Role of forests to conflict resolution

- *Keywords related to clarify the answers / to other viewpoints:* growing resource scarcity, instruments and indicators in resolving conflicts, technical and political aspects

→ Are forests more of a source of conflict than source of solution?

→ Role of other sectors (call for more coherent policy); is it only a negative aspect that the forest-related issues are dispersed in many “sectors” or can developments in other sector policies stimulate “pro forest” policies and thinking?

→ New players in the field: governments, businesses, interest groups, citizen involvement – “sustainable governance”?

3. Using the results for Scenario building exercise (WS2)

The thematic surveys (queries 2.1 – 2.6) collected information on drivers and barriers as well as importance and business potential in the pre-defined products and services groups. The relatively small number of responses means that the survey can be used to test the ideas presented and to collect additional viewpoints, but no conclusions can be made on the perceptions in general about the trends, drivers and barriers or e.g. about the relative importance between the six themes presented.

For example, both of the following viewpoints are expressed in the responses:

- call for more regulation, stronger governance, mandatory (public) funding schemes;
- call for more conscious citizens, businesses and actors with own-initiative "conscious" thinking and action.

Furthermore, quite strong statements are made expressing both:

- hope for better future; belief on new solutions which will be found,
- "game lost" thinking, and
- belief on the existing possibilities, "the way things are".

The work will continue in the workshop no.2 on scenario building. The workshop will be based on an explorative approach – thus, instead of defining a specific vision or a strategy, the aim is to introduce tools and methods for scenario building, and to illustrate different development paths in the forest-based sector. The workshop will use collaborative brainstorming and learning in order to further elaborate uncertainties, potential changing factors and their links with forest-related responsibilities, rights, market potential and interests.

The key question for the scenario building workshop is:
What is the role of forests, forestry, forest-based sector in Europe in selected future horizon (2050), and what is the role of Europe in a global context?

Sub questions which were defined before carrying out the internet survey are:

- What changes **in the demand side, in a wider societal perspective and in structures** are relevant to the forest-based sector development?
- What are the **interlinkages** between forest-based sector developments and **developments in other related sectors** (e.g. environment, agri/rural, energy, technology)?
- What are **key stakeholders** for forest-based sector development (in Europe, other parts of globe; in different sectors and interest groups)? Where are the **needs** for forest-based sector defined (at global level, at regional / European level)?

The goal of the COST strategic workshop series is to define research <u>needs and topics for further investigation</u>. Furthermore the exercise will also identify themes and topics where further <u>foresight exercisers and new investigations, new forms of collaboration</u> would be needed.

All information and data collected in the COST strategic workshop series, its workshops and internet surveys will be available for further elaboration.

Table 1: DRIVERS Cross-references across the thematic queries: respondents' indication of the key drivers of emergence and development of the forest-based products and services as defined in the six themes of the survey. Factors with number (2-6) are those repeated in all/several themes. Please note also that the number of responses varies considerably across the six "products and services" themes

Drivers	Bio-economy			Energy			Green infrastructure			Health & wellbeing			Food &water			Conflict resolution	
Products:	New materials	New uses	Luxury	Wood as fuel	Biorefineries	Energy saving solutions	Green spaces	Restricted areas	Carbon storage	Source of wellbeing	Biochemistry	Green packages	Protective functions	Biochemistry	NWFP's	New financing	Planning and management systems
Increasing efficiency; possibilities for mass production; increasing productivity of agricultural land					+												
2) Policy targets and commitments; international processes, agr.s				+++		+++	+	+++	+++				+++			+++	+++
3) Consumer preferences; raising awareness, active consumer, stkh.groups		++	+++							++	++	+++	+	+	+++		+++
4) Technology development	+++	+++	+	++	+++	++					+++			++	+		
5) Green economy targets in emerging markets (BRIC)									++								
6) Economic growth		+	++														+
Availability of (cheap) raw material	+			+	+												
Scarce resources and competition for biomass	++																
Switch from petrol-based to bio-based economy				++	++									+++			
Rising public awareness; increasing value of nature and biodiversity; Increasing role of forests in policy and political arena							++	+	+	+	+					++	++
Zoning of high-efficiency production areas																	
Increasing pace of biodiversity loss								++									
Urbanisation, urban lifestyles							+++			+++		++					
Natural hazards																	
New spatial planning and architecture approaches										+		+					
New solutions for valuing public goods										++			++		++		
Examples set by voluntary based measures																	+
Commitment for financial solutions at international level																+	
Other drivers (explanations/key words in the responses):	Rising **prices** of many resources (oil, cotton, food..)	Techn. & **image** competition with other materials	Standard of living, "conscious **lifestyles**"	Rising prices for fossil fuels	Competition with other products in terms of emissions, cost, efficiency		Virtual reality; experiencing nature through **media**	(priorities derived from media-driven underst. of env.)	Financing from int.agreements/quotas; business investment in carbon offsets	Need for **healthy environments**	Increasing drug development (prospecting forests)	Need for healthy (built) environments	Population, cities; functioning of ecosystem services		Increasing problems in food production and disrribution	Growing resource scarcity	Need for **instruments and indicators** for resolving conflicts

+++ = Most important driver, ++ second most important driver, + third most important driver(s)

Table 2: BARRIERS Cross-references across the thematic queries: respondents' indication of the key barriers of emergence and development of the forest-based products and services as defined in the six themes of the survey. Factors with number (2-5) are those repeated in all/several themes. Please note also that the number of responses varies considerably across the six "products and services" themes

Barriers	Bio-economy			Energy			Green infrastructure			Health & wellbeing			Food &water			Conflict resolution	
Products:	New materials	New uses	Luxury	Wood as fuel	Biorefineries	Energy saving solutions	Green spaces	Restricted areas	Carbon storage	Source of wellbeing	Biochemistry	Green packages	Protective functions	Biochemistry	NWFP's	New financing	Planning and management systems
1) Technology investments in other than wood-based solutions	---	--	-	---	--	---					---	--		--			
2) Lacking political agreements; of harmonisation of norms, standards, regulations								-	---				-				
3) Lack of willingness to pay	-		---			--	-	---		--		---	--		--	--	
4) Lacking cooperation between value chains	--										--						
5) Lack of funding for risk investments; no financing mechanism		-			---	-	--	-	--		---	--	-	-			
Regional differences, too narrow market for commercialisation; Regional differences, no common goals			--												-		---
Risks in new technologies and materials	--	---															
Technical weakness of wood material																	
Environmental constraints				-	-												
Competition for biomass; land use; forest resources				--			---	--	-	-							
Market distortions (e.g. due to subsidies)																	
Competing commercial interests													---	---	---	-	
Invasive species, increased vulnerability of forests																	
Forced by law solutions and services																	
Access to resources										---							
No tradition to develop products and services with consumers/users										-							
Alienation from nature										-							
Inappropriate forest management													---		-		
Other sectors more powerful than the forest sector - framework conditions defined outside the forest sector																---	--
Sectorisation of interests, no coherent policy						X				X						-	---
Lack of political interest																--	
No evidence of solutions which forests provide																	
Lack of data and data access																	
Other barriers (explanations/ key words in the responses):	**Cheap existing materials** and end products; no enough money for research	Perceived risks, lack of **market-driven** business, not enough money for research	Perceived risks; **niche** markets	Poor supply chains (private forests / UK)		Lack of **sustainable governance**		**Media** impact on publ.perception/underst.; lack of reliable working mechanisms to compensate for.owners	Restricted role of forests and HWP under Kyoto	Existing sectors, e.g. medical solutions preferred over public heath; inconsistent public policies, too little focus on multiple functions from forest land		**Trajectory dependence in existing sectors**					Technical and political matters, difficult to have **globally** maintainable and readable system

--- = Most important barrier, -- second most important barrier, - third most important barrier(s)

Table 3: Importance of the solution provided by forest-based products and services to global challenges and business potential of these products and services by 2050.

	Bio-economy			Energy			Green infrastructure			Health & wellbeing			Food &water			Conflict resolution	
Products:	New materials	New uses	Luxury	Wood as fuel	Biorefineries	Energy saving solutions	Green spaces	Restricted areas	Carbon storage	Source of wellbeing	Biochemistry	Green packages	Protective functions	Biochemistry	NWFP's	New financing	Planning and management systems
Importance of the solution to global challenges	I	I	L	I	I	I	I	I	I	I	I	M	I	I	M	I	I
Business potential	H	H	M	H	H	H	H	L	H	H	H	H	H	H	M	H	M

Importance: L = Low importance, M = moderate, I = important. Business potential: L = Low, M = moderate, H = high.

Explanation for the Tables 1-3: the “products and services” descriptions used in the Internet Survey:

2.1 Role of forests to bio-economy

Forests and the wood material are recognised as a renewable resource and an important solution provider for the bio-economy. Wood is used for various purposes: timber and wood products e.g. in construction, furniture; pulp and paper products e.g. in printing, packaging and hygiene products. Competition for scarce resources leads to search for more efficient methods of production and consumption. New technologies (e.g. nanotechnology, biotechnology, ICT) are combined with the existing products, and totally new products and new uses of wood-based materials are found. Biochemists identify ways to replace oil-based materials. Diminishing natural resources also affect the value of pristine fibre and high-quality products made of natural raw materials.

In 2050 the forest-based sector contributes to bio-economy with for example the following "products and services":

- **New raw materials**, including substitutes for oil-based materials: combinations of wood-based and other materials, such as plastic, steel and recycled material; new materials e.g. for textiles, composites and cascading use; durability and reuse/recycling as a basis for product creation; optimisation of raw material production e.g. by using gene-technology in forestry, zoning of high-efficiency production forests.
- **New uses**, intelligent wood and wood based-products: new technologies enabling wood, pulp and paper based materials with nanotechnology, biotechnology, ICT solutions; products with services combined; smart systems, systems in systems solutions (e.g. intelligent packaging, textiles, buildings).
- **Wood and forest based goods as luxury**: wood as high-value pristine/natural fibre; certificates of origin are developed for high-quality, high-value materials and products made of these raw materials.

2.2 Role of forests to energy security and energy-saving solutions

Fossil fuel resources are diminishing and renewable energy sources are sought for energy security. In the beginning of the 2000s there were targets set for bioenergy and renewable energy resources, and the political and other commitments are already made at national, regional and international level. Forest-based biomass is expected to contribute to achievement of these targets, whereas the first generation energy sources, and e.g. use of food for energy, is expected to decrease. At the same time technology development is expected to contribute to new energy saving solutions.

In 2050 the forest-based sector contributes to energy security and energy-saving solutions with for example the following "products and services":

- **Wood as fuel**: resources for energy generation e.g. from short rotation coppice, forest residues, by-products and wood, paper and other waste composites; new solutions for processing wood fibre for fuel.
- **Biorefineries**: forest-based chemicals for energy production; new technologies for biodiesel and other fuels, electricity production and heating.
- **New energy saving solutions**: zero-energy and zero-waste systems for example in construction and logistics; new combinations of different energy sources, optimisation of energy grid, including locally and regionally self sufficient systems; increasing durability and re-usability; new optimisation solutions e.g. printing on demand, 3D printing.

2.3 Role of forests to green infrastructure

Forests are an important part of landscapes and ecological bases for many functions. Climate change challenges have made forests more visible in the international political arena. Natural hazards and extreme events have increased awareness among the public about the protective functions of forests as well as the challenges ahead.

In 2050 the forest-based sector contributes to green infrastructure with for example the following "products and services":

- **Forests as green spaces** and shelterbelts: new architecture and spatial solutions in urban environments for e.g. agricultural production, use of damaged or abandoned areas; pattern management and zoning for creation of shelterbelts for e.g. fresh water, reducing pollution and noise; fire management; preventing desertification, wind and flood damages.
- **Restricted forest areas** for protection of landscape, biodiversity, flora and fauna: limited access to biodiversity hotspots, new financing and payment mechanisms combining both taxes and voluntary payments.
- **Forests as carbon storage**: global network of green infrastructure; improvements in carbon storage features (e.g. tree breeding); new investment and financing schemes based both on regulation and voluntary payment systems.

2.4 Role of forests to public health and wellbeing

Forests provide both physical and psychological benefits to human health and wellbeing. There is a trend of increasing emphases on Lifestyles of Health and Sustainability (LOHAS) and holistic approach to a meaningful living. Increasing urbanisation and increased access to virtual environments set new demands for humans, at the same time as connection to nature becomes weaker.

In 2050 the forest-based sector contributes to public health and wellbeing with for example the following "products and services":

- **Forests as source of wellbeing**; harmony with nature and sustainability e.g. forest spas and rehabilitation centres; forests as a source of both nutrition and exercise, as well as recreation and therapeutic experience; urban and periurban forests designated for public health; new urban - wilderness frontiers for activities such as sports, hunting, art, spiritualism etc.
- **Biochemistry**, forests providing chemical components for health and wellbeing, e.g. enzymes, food additives, vitamins, cosmetics, pharmaceutics and medicines.
- **"Green packages"** of forest related products and services, including "virtual forests" providing forest experience for all senses (sound, visual); entertainment, educational, heritage activities (virtual forestry, education laboratories); new frontiers; "back to nature" packages for urban dwellers, such as green weddings, green funerals.

2.5 Role of forests to food and water security

Increasing population puts pressure on land use. Agricultural land is a valuable resource and attracts foreign investments. Sustainable resource use is targeted with technology innovations, new solutions, and increased efficiency in agricultural production. In the beginning of the 2000s forest lands were converted to agricultural land, especially in the tropics. At the same time forests' role in protection of soil, water and air has become visible through e.g. extreme events and natural hazards causing risks for food and water security.

In 2050 the forest-based sector contributes to food and water security with for example the following "products and services":

- **Forest protective functions** for food supply and water security: shelterbelts, regulation of ecosystem services (such as erosion prevention, nutrient sequestration, and local and regional climate regulation), new solutions for soil and water protection, fresh water supply, air and microclimate protection, as well as protection of flora and fauna.
- **Forest-based biochemistry**, chemical components for securing food supply and water security: wood and other forest resources based raw materials for e.g. fertilizers, pesticides, anti-microbiological substances for agriculture, as well as components for food additives, synthetic food and new sources of protein (substitutes for meat production).
- **Non-wood forest products and services** (NWFPS) for food supply: e.g. berries, mushrooms, herbs and game; management, cultivation and certification of these resources, products and services including "food is not just nutrition" packages, in other words NWFPS sector providing organic/natural products, but also experiences and source of self-fulfilment.

2.6 Role of forests to conflict resolution

The role of forests in the international policy arena has increased due to the international negotiations and agreements on e.g. climate change, biodiversity, desertification, reduction of emissions due to deforestation and degradation of forests, illegal logging, trade of endangered species flora and fauna. Natural resources planning and management approaches are developed using new ICT solution for example for wider public participation and stakeholder involvement.

In 2050 the forest-based sector contributes to conflictresolution with for example the following "products and services":

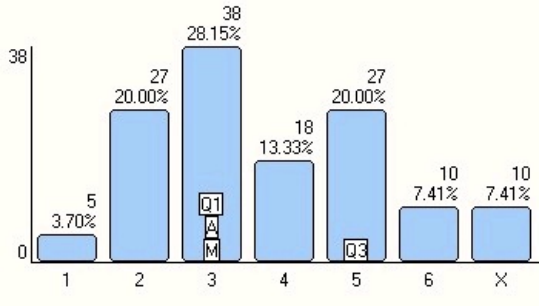
- **New funding and financing schemes**: new trading, payment and investment systems for e.g. emissions, biodiversity, forest protection functions, ecosystem services and other public goods; stock exchange of soft values and other pilot solutions applicable to many natural resources sectors
- **Resource planning and management systems**: coherent strategies for dealing with conflicts between different uses of natural resources, including sustainability indicators and criteria; new solutions for data and information collection, monitoring and alert systems, wood and non-wood verification and tracking systems, decision making tools using ICT, social networks and virtual communities, instruments for forest policy and governance, and e.g. regional agenda building.

1.1 Respondent profile

1. Please choose your region

- 1 = choose here
- 2 = Central and Eastern Europe
- 3 = Northern Europe
- 4 = Southern Europe
- 5 = Western Europe
- 6 = International
- X = Other than Europe

n=135, A=67.00, M=67.00, Q1=33.00, Q3=100.00



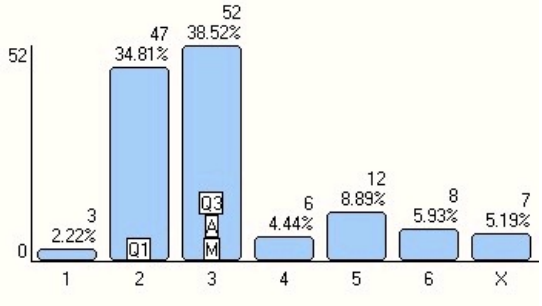
If other than Europe, please specify:

- Bosnia nad Herzegovina
- Argentina
- New Zealand
- New Zealand
- Canada
- USA
- Germany
- FAO
- Russia
- Canada
- North America
- United States of America
- Croatia
- Iran
- New Zealand
- Turkey
- Morocco
- United States
- USA
- South Asia
- New Zealand
- Australia

2. Please choose your field of activity

- 1 = choose here
- 2 = Academia and education
- 3 = Research and technology development
- 4 = Industry and business
- 5 = Government and other administration institutions
- 6 = Interest groups, NGOs, civil organisations
- X = Other

n=135, A=67.00, M=67.00, Q1=33.00, Q3=100.00



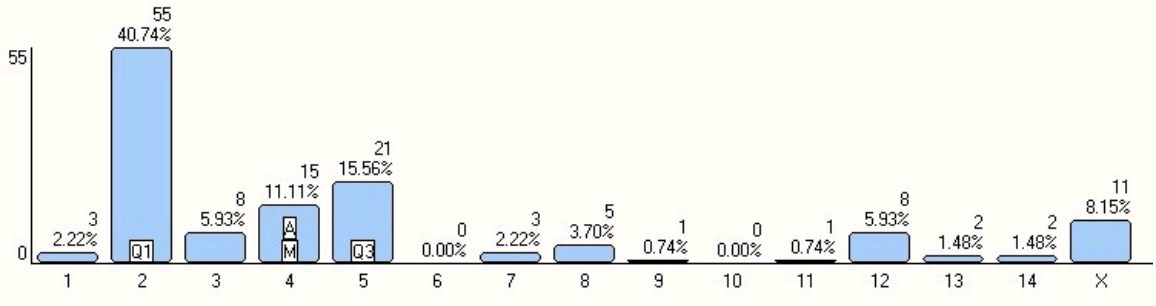
If other, please specify:

- int organization
- prof. dr.
- Consulting
- Consulting
- research and technology
- forestry engineer
- and NGO
- iNTERNATIONAL FOREST ORGANISATION
- European professional association
- retired forester
- development organization
- forest owners association

3. Please choose your sector of activity

- 1 = choose here
- 2 = Forestry
- 3 = Pulp and paper
- 4 = Wood product
- 5 = Forest-based sector
- 6 = Chemicals
- 7 = Construction
- 8 = Printing and media
- 9 = Technology
- 10 = Machinery
- 11 = Agriculture and rural development
- 12 = Environment
- 13 = Energy
- 14 = Conservation
- X = Other

n=135, A=67.00, M=67.00, Q1=33.00, Q3=100.00



If other, please specify:

- Wood product
- Silviculture, forest genetics, forest breeading
- genetics
- Biotechnology
- Wood tehnologv, Production and organiation
- forest management planing & forest entrepreneurs irganization
- Consulting
- Climate
- Government
- urban forestry
- wood technology
- urban forestry and restoration
- green space management and urban forestry
- a mix across biorefineries, energy, forest growing, wood processing pulp and paper, new materials

- Climate change
- forestry, pulp and paper
- conservation, forestry

1.2 Global trends and their influence on the forest-based sector by 2050

We cannot predict the future, but we can investigate alternative futures. This exercise is about exploring different development paths, identifying changing factors and their links with forest-related responsibilities, rights, market potential and interests.

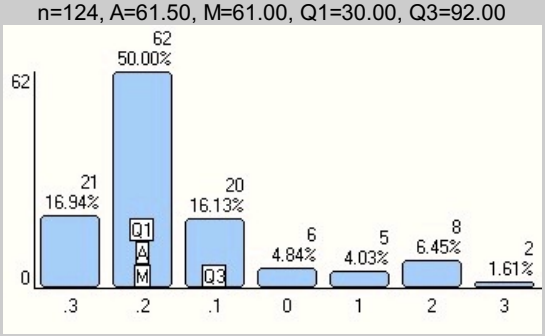
Question 1: Below there is a list of factors for different development paths **at global level. Indicate your perception about the direction of the development of these factors by 2050** (0 = "no changes").

Technology:

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=124, A=61.50, M=61.00, Q1=30.00, Q3=92.00

Technology solutions



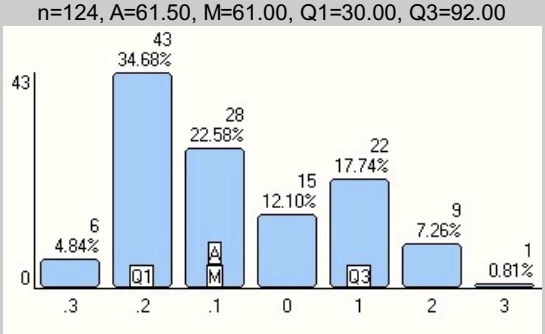
Technology risks

Trade and markets:

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=124, A=61.50, M=61.00, Q1=30.00, Q3=92.00

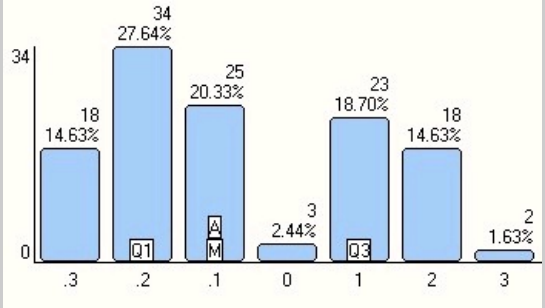
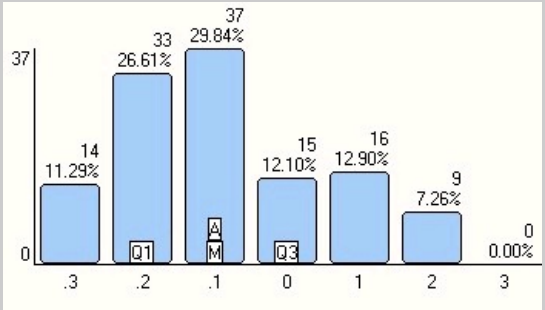
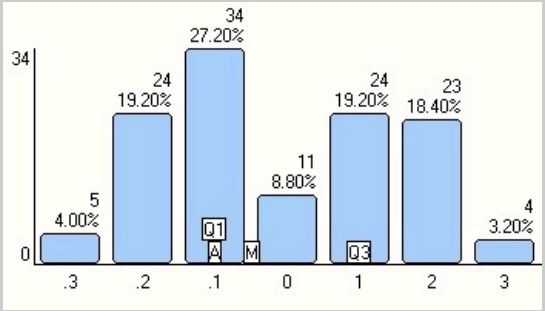
Free trade, global markets



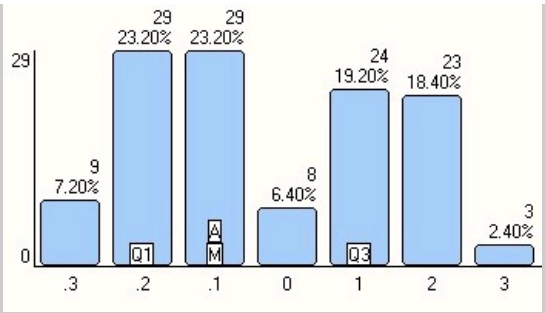
National protectionism

Economic development:

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1

Increasing regional differences	• 2 = 2 • 3 = 3 n=123, A=61.00, M=61.00, Q1=30.00, Q3=91.00  	Similar development across the world
Crisis, uncertainty	**Financial markets**: • .3 = 3 • .2 = 2 • .1 = 1 • 0 = 0 • 1 = 1 • 2 = 2 • 3 = 3 n=124, A=61.50, M=61.00, Q1=30.00, Q3=92.00  	Stability
Global solutions / agreements	**Governance of natural resources**: • .3 = 3 • .2 = 2 • .1 = 1 • 0 = 0 • 1 = 1 • 2 = 2 • 3 = 3 n=125, A=62.00, M=62.50, Q1=31.00, Q3=93.00  	Local solutions / agreements
Differentiated preferences,	**Customers and users**: • .3 = 3 • .2 = 2 • .1 = 1 • 0 = 0 • 1 = 1 • 2 = 2 • 3 = 3 n=125, A=62.00, M=62.00, Q1=31.00, Q3=93.00	Similar preferences all around the world, global customers /

narrow market segments



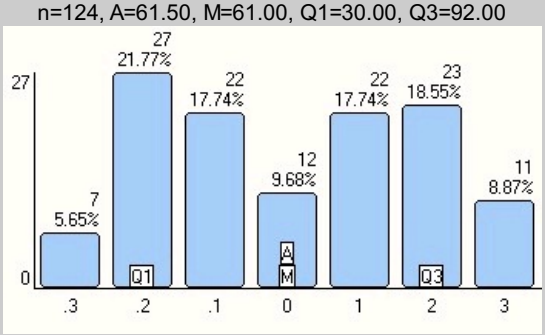
the world, global customers / users

Natural resource planning and management:

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=124, A=61.50, M=61.00, Q1=30.00, Q3=92.00

Zoning (specific functions in specific areas)



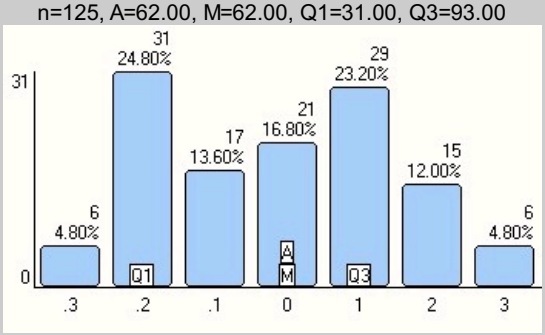
Multiple functions (integration of several functions)

Access to forests:

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=125, A=62.00, M=62.00, Q1=31.00, Q3=93.00

Open access



More restrictions

Forest-based industries' product portfolio:

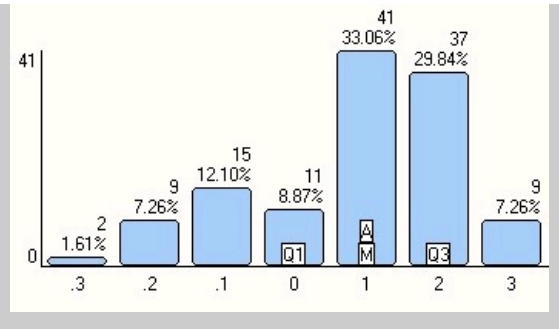
- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=124, A=61.50, M=61.00, Q1=30.00, Q3=92.00

Mainly present (2010) products

Mainly new products and

and services



services

If you wish, you can explain your answers:

- Increasing wealth and economic power in Asia will be countered by political instability as aspiring middle classes seek western-style individual determinism and indiginous regions seek greater autonomy. Governments will be focused on domestic issues and will be unwilling to make commitments, or to comply with their commitments, to global processes that inhibit economic development. There is a possibility that technology might present opportunities for 'leap-frogging' historic development trajectories so that 'clean' development occurs. Forestry as a renewable 'project' will benefit with new markets for services and products developing.
- The forest resources will be limited in relation to the demand of timber as sustainable building material. Development and research activities on wood products are too slow in order to provide the market with smart products based on less material use. In comparison with other industry, wood industry operates on smaller scale and is not research driven.
- I am involved in basic research (DNA technology) so these questions are way beyond my reach.
- The global crisis will continue and, quite probably, drive the world back to the previous, traditional and local use of forest resources (raw materials and energy). As a result regionalisation is quite likely to increase. More local restrictions will be needed to protect some precious forest areas from the continuously growing pressure of a world growing population.
- Technology will provide solutions (efficient wood based biofuels and othet bioproducts, for example?). However some key problems will not be solved by technology with out major changes in forestry (pine nematode and other diseases, forest fire risk...). Technology risks maybe related to the use of GMOs and clonal forestry in some types of forestry. Also technological developments in other fields may be regarded as risks to the development of forest based solutions to global challenges. More efficient coal and carbon storage technologies, nuclear, solar and other renewable energy developments. New agricultural based materials could reduce the role of forest based products.
- In the future, will significantly increase the technology and the demand for special products and materials, but will also jincrese the differences between rich and poor. At the same time reducing of the world forests will continue despite attempts to stop this trend.
- Mainly new products since many old products (i.e. printing paper) are dying.

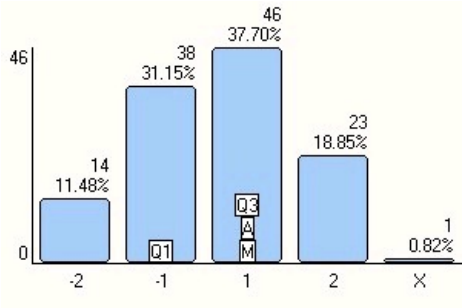
These are examples of factors where we can make assumptions about the futures - either based on the past developments or based on observations about possible changes in the development trends. As important as making visible the assumptions behind our thinking, it is also to challenge our thinking about the futures: *what if* the development is not what we expect, what are *factors of change*, what are the *emerging issues* that will be important for defining new opportunities and challenges in a long-time horizon.

Question 2: Below there are a number of statements about different development paths related to forests, forestry and the forest-based sector in 2050 at global level. What is your perception, **how probable are these forest-based sector development paths** (*in Italic font*)?

Scale:
-2 = very improbable
-1 = somewhat improbable
1 = somewhat probable
2 = very probable
X = don't know

- Increasing productivity of agricultural land and new solutions for food production lessen pressure to land resources at global level…
  …forest cover increases for green infrastructure, landscapes and protective functions.
  - -2 = -2
  - -1 = -1
  - 1 = 1
  - 2 = 2
  - X = X

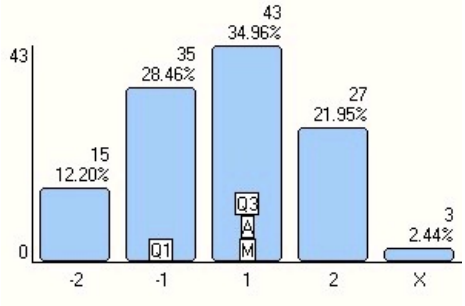
  n=122, A=60.50, M=60.00, Q1=30.00, Q3=90.00



- Efficient replacements of fossil fuel are not found…
  …forest biomass is used in massive scale to energy generation and there is less innovation and decreasing added value in other uses of wood.

  - -2 = -2
  - -1 = -1
  - 1 = 1
  - 2 = 2
  - X = X

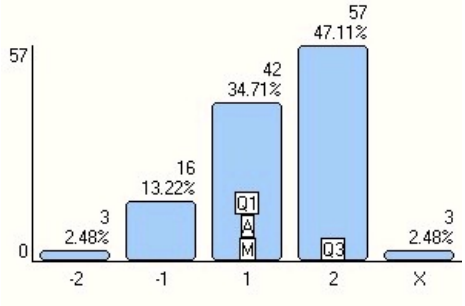
  n=123, A=61.00, M=61.00, Q1=30.00, Q3=91.00



- Wood processing industries concentrate in forest production areas with fast growing species…
  …forest-based industry in Europe focuses on high-quality, high-tech commodities (products and services).

  - -2 = -2
  - -1 = -1
  - 1 = 1
  - 2 = 2
  - X = X

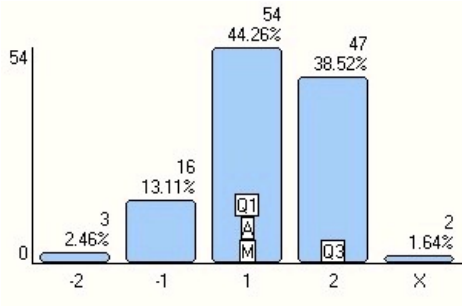
  n=121, A=60.00, M=60.00, Q1=30.00, Q3=90.00



- Increased urbanisation change societies, new metrics for wealth are invented…
  …forests' contribution to public health and human wellbeing is valued as a part of national wealth.

  - -2 = -2
  - -1 = -1
  - 1 = 1
  - 2 = 2
  - X = X

  n=122, A=60.50, M=60.00, Q1=30.00, Q3=90.00

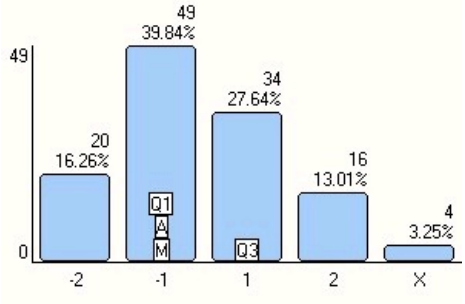


- Natural resources become scarce resources and new raw materials are produced artificially...

…instead of wood, substitute materials are used.

- -2 = -2
- -1 = -1
- 1 = 1
- 2 = 2
- X = X

n=123, A=61.00, M=61.00, Q1=30.00, Q3=91.00



If you wish, you can explain your answers:

- -
- Productivity of agricultural land may increase but this won't take away the pressure on land resources as the world population keeps on growing at a very fast rate.
- Population growth diminishes but increasing wealth leads to continuing growth in demands on natural resources becaause consumption increases. Productivity gains in the landed industries are absorbed by this demand and pressure to reduce forest area and increase agriculture continues.
- National economic policies will depend more on forest-related services. Presumably globalization will slack due to high transportation costs.
- Techonology cannot increase indefinitively the efficience in the use iof natural/forest resources, more problems and conflicts are likely to happen
- 1) current tendency for rural abandonment and increased forest cover will continue in next decades. Many of those lands are of marginal agricultural value. At some point in time land this process will stop. This will happen earlier in some european regions than in others.2) In many areas biomass for energy will be the primary use of forest resources and the only profitable one due to energy policy frameworks. These is clear in many mediterranean and low productivity, low timber quality regions.3) Current trends seems to go in this direction. Some subsectors (pulp and paper) will delocalize (to areas of high forest productivity in southern hemisphere. However,others (furniture?) could delocalize to areas close to main markets and with low manufacturing costs (like china and india). Still, within europe industry will still be strong in areas of low productivity but big forest resources (nordic countries, for example). Also bioenergy could still be relevant in central and Northern europe and develop in Southern Europe as a low-tech commodity.4) Social perceptions will be shaped also by basic needs. Increased needs for biomass of bioenergy and raw materials will also shape public perception on forests and forestry. Public goods provided for forest will still have a low market or economic recognition in relation to provision of raw materials.5) Forest cannot provide all the energy or the needs for raw materials society is and will be demanding. Thus the role of forestry will be important but maybe not capital in solving the energy and climate change challenges. New coal technologies, resurgence of nuclear energy along with traditional and new materials for construction will play a very important role.
- second question: I think the first part is very probably, but also there will be massive innovation in other uses.
- We can not predict what will happen soon in Cancun on the behavior of world leaders concerning climate change? If these changes really happen, or as recently claimed - this is a great global conspiracy? So, I want to say that many things we do not know to predict more accurately for our forestry sector future development.
- If efficient substitutes to fossil fuel are not found, there are other solutions than only bioenergy. As wood does not need much energy for its processing, one saves energy when using wood as a material. It is a pity that this is not well recognised and it is probably more efficient form an energy point of view than the use of direct bioenergy.
- In a NorthWest European perspective it is very likely that the forest cover increases
- I dont think forest biomass will be used on a massive scale for energy globally, but i think it will be where it is an obvious and natural thing to grow.
- The questions above are very unclear and for instance the second one includes a question that cannot be answered as it includes two issues (1)forest biomass is used in massive scale to energy generation OPPOSITE TO 2) there is less innovation and decreasing added value in other uses of wood). For instance these issues are separate and I would have wanted to give a different answer to them and not one single answer.
- Point 1. I expect the area of forest designated for green infrastructure etc to increase but not necessarily the total global forest area.Point 4. Answer relates to my global assessment. In Europe I would assign a rating of +2
- My answers are mainly from the viewpoint of the the wood products industry.

Question 3: Here you can add any other viewpoints to the role forests and the forest-based products and services in 2050.

- -
- There is likely to be a growth in non-governmental regulation, like that we have seen with forest certification. This will partly be driven by environmentalism but there will also be a sgnificant growth in financial instruments that require certification and compliance e.g. carbon derivatives. The result will be a complex interplay between Governments, third-sector environmental bodies and commercial standard-setting and measuring bodies.
- I think that in future forest owners gain in importance, because the forests are a renewable resource
- Forest has a lot of functions with regard to climate, recreation, energy production and use as building material. The use of wood has to be more efficient because of the scarcity of raw materials. Research and development should be

focused on wood fibre material/products so that a whole tree use is possible. Living trees could be used as structures for buildings on the forest site.

- The forest would be developed to asured both environmental protection and resources for sustaniable development
- Fully "back to past" - raw materials and energy. In any case forest resources will continue to shrink as stated, for instance, by the 4 scenarios of future depicted by the Millennium Development Assessment (MDA)
- Carbon sinkNon-economical values as biodiversity, landscape,...
- I think concepts like forest as natural capital should be more important
- Role of forests in 2050:Energy, Biomaterials, Carbon capture, environmental remediation, recreation, cultural roles
- IN 2010 we are still grappling with the biosynthesis of cellulose microcrytsals in plant cell walls be they peas or poplars. As scientific understanding increases on tree growth rates so will society's innovation about forest productivity and innovation of forest products.
- Thinking of a optimistic scenario for 2050, would require questioning the paradigm of "development", and the increasing consumption of energy and materials by our society. Changes in the direction of real sustainability will not come until we are not able to think of de-growth and admit that a more sustainable way of living implies questioning the current consumption levels. Therefore, I am quite skeptical about our society being able to reconsider its own values scale. this is my point of view to answer this questionnaire.
- Biodiversity enhancement for increased climate change biodiversity.
- Food and energy are more pressing questions than forests. That is why forests will continue to be replaced by food and bioenergy production. But because neither agricultural land nor forests can solve the huge demand for energy, energy will not be the strongest driver in forest use.
- forest-based sectors will cooperate internationally, but development of national economies will strongly determine the specific policies in each country. National forest-products industry development and the use of wood will depend on the successful interaction of three basic foundations: industrial development, scientific and research support, and political support.
- In the next 40 years, we like it or not, we will fight with two diametrically opposite wishes. On the one hand one of our favourit demands will be to replace fossil fuels using biomass and to ncrease the fertile fields of food. On the other hand we will try to conserve natural forests and increase the amount of forest plantations to get as much raw material as we ever had. The supstitution of wood by new materials (composites, modified wood,...) will be present more than now.
- I think role of forest will recover importance in social services like recreation in non productive areas, and will be more areas in production in intensive way (fast grow species) and also much more protective areas for genetic resources. I sure thant plantations and genetic improvement could get less presure in valuable species. Like tropical ones.
- Within the Western European society, quality of life and environment will be an important issue. Increasing time for leisure and a more active senior population will increase the need for recreational and qualitative green areas in an urbanising world. The role of forests in providing ecosystem services will increase.
- For many reasons the world will never go on without forests. The more people, the more trees will be needed.
- In general I believe that the 'urbanisation' of forestry will be an important factor, with forests in and near cities providing a wide range of benefits to urban dwellers.
- Substitutes of wood, concrete and steel, will be ruled out of construction due to high fossile energy intensity. This will push forward developmet of wood products to make supply meet the demand.
- In 2050 resource will lack : food, wood, energy, ... so many things will become more expensive, included travel costs.
- On Zoning versus multiple functions: both will increase. More segregation/zoning on one hand, but also multiple functions in areas that are not strictly protected or focusing on intensive production.
- I think the role adn products adn services forests will provide will be much more diverse than currently.
- Trend more and more towards more value-adding products in traditional Forest-based products' producers today.
- The role of ecological services of forests, especially the role of water cycle generation, retention and protection will become a major topic for sustainable forest management, yet its adequate valuation also in monetary terms will remain disputed.
- Assuming we do not squander our forest resources, there will be even greater demand for them. For the most part, I believe we can meet this rising/new demand.
- A major factor will be the increasingly visible non-viability of alternative, non renewable paths, based on fossil fuels and non-renewable materials. despite the historic injustice ("the West wasted energy, why not the developing world)", scarcities will force higher prices and more thrifty resource use.
- Forest-based products will be mainly high added value products. Energy will come from non-carbon containing resources like solar and wind
- Important contribution to climate change, as carbon friendly products
- The huge potential for chemical processing of wood to modified fibres or completely new materials has been known for at least forty years but very little innnovation has been seen. The forest-based industry has been (still is) too conservative to make change. Real development may come from new players rather than from traditional forest/paper companies.
- Undoubtedly, the most important challenge that forests and forest-based products will have to face in 2050 is to increase their contribution to the fight against climate change. However, the speed of climate change and rising temperatures is threatening the forest ecosystems' capacity to adapt. Climate change will have different consequences on the wide array of forests in Europe. The northern regions of Europe could become more productive, but also more affected by diseases and pest infestations. Also, the species' capacity to adapt would be higher in boreal and oceanic regions. On the contrary, in the Mediterranean and temperate continental region, possibilities for adaptation would be limited. Mediterranean forests would be affected by more frequent extreme events, such as storms and fires. Forest productivity in semi-arid regions of southern Europe would decline and the species would be substantially altered. Prairies could even replace some forest systems. Therefore, the adoption now of appropriate adaptation measures is essential to ensure that forests continue to fulfil their multifunctional role in the future. Due to the variability of climate change effects on European forests, adaptation strategies should be defined at regional and local level, but coordinated at the European one. This requirement may also include transnational cooperation between Member States which share the same bioclimatic region. It is essential to understand the impacts of climate change on forests in order to develop appropriate adaptation strategies and to exploit the mitigation potential of forests in the future. The complexity of the phenomenon of climate change imposes the need to take immediate action and base efficient policy decisions on a scientific approach as thoroughly as possible.
- There will be a growing appreciation of their value (partly from a climate change perspective) by world governments and civil societyPlantation forests, mainly in the S hemisphere, will be the main source of industrial wood.
- I think that sustainable forest management must be use all over the country side to improve wood production in quality and volume without risks of deforestation or destroy biodiversity
- The role of forests increases, but with different functions: energy production and fuelwood in developping countries;

social functions in western countries: forests for health and wellbeind and environmental education;forests in general are threatend for diverse reasons; a world wide convention has to be found to save the worlds most worthful forest regions for social and biodiversity reasons;trees for energy in large scale plantations dominate regions and threaten their social well beiing;forest based products are increasingly important: timber as well as non-timber products;
- I believe that a large share of the traditional products from the wood industry will survive, whereas the pulp & paper industry will have to develop new products due to decreased demand for traditional paper products (e.g. printing paper). Innovation will to a large degree be motivated by a need for more efficient use of wood resources. Product development will focus on providing specialized products in stead of generic products that the customers must adapt to their particular needs.

2.1 Role of forests to bio-economy

Forests and the wood material are recognised as a renewable resource and an important solution provider for the bio-economy. Wood is used for various purposes: timber and wood products e.g. in construction, furniture; pulp and paper products e.g. in printing, packaging and hygiene products. Competition for scarce resources leads to search for more efficient methods of production and consumption. New technologies (e.g. nanotechnology, biotechnology, ICT) are combined with the existing products, and totally new products and new uses of wood-based materials are found. Biochemists identify ways to replace oil-based materials. Diminishing natural resources also affect the value of pristine fibre and high-quality products made of natural raw materials.

In 2050 the forest-based sector contributes to bio-economy with for example the following "products and services":

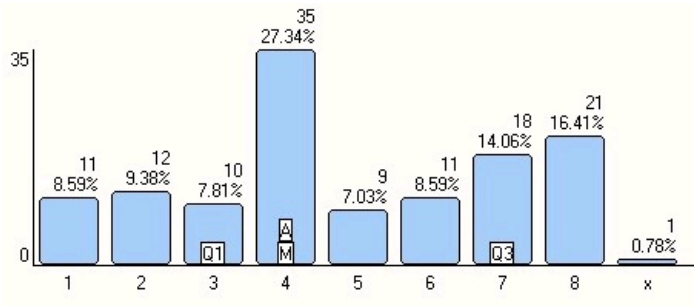
- **New raw materials, including substitutes for oil-based materials**: combinations of wood-based and other materials, such as plastic, steel and recycled material; new materials e.g. for textiles, composites and cascading use; durability and reuse/recycling as a basis for product creation; optimisation of raw material production e.g. by using gene-technology in forestry, zoning of high-efficiency production forests.
- **New uses, intelligent wood and wood based-products**: new technologies enabling wood, pulp and paper based materials with nanotechnology, biotechnology, ICT solutions; products with services combined; smart systems, systems in systems solutions (e.g. intelligent packaging, textiles, buildings).
- **Wood and forest based goods as luxury**: wood as high-value pristine/natural fibre; certificates of origin are developed for high-quality, high-value materials and products made of these raw materials.

Question 1: What are the **key drivers supporting the emergence and development of these forest-based products and services**? Select two main drivers for each product/ service heading from the list or add another factor:

- 1 = Increasing efficiency
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Availability of raw material
- 8 = Scarce resources and competition for biomass
- x = Other, please specify:

New raw materials

n=128, A=63.50, M=63.00, Q1=31.00, Q3=95.00



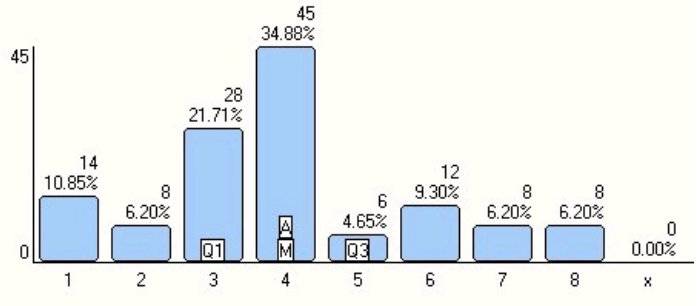
- explanation: competition of "dendromass" to other raw materials: price + technological capabilities
- Rising price levels for many resources, such as oil, cotton, phosphate, food and fibre

- 1 = Increasing efficiency
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development

- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Availability of raw material
- 8 = Scarce resources and competition for biomass
- x = Other, please specify:

n=129, A=4.00, M=4.00, Q1=3.00, Q3=5.00

New uses

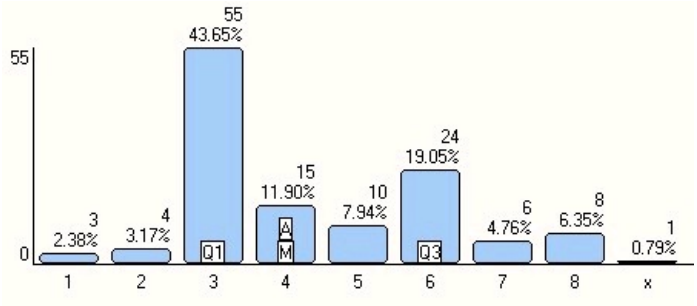


- explanation: technological & image competition with other materials

- 1 = Increasing efficiency
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Availability of raw material
- 8 = Scarce resources and competition for biomass
- x = Other, please specify:

n=126, A=62.50, M=62.00, Q1=31.00, Q3=93.00

Luxury



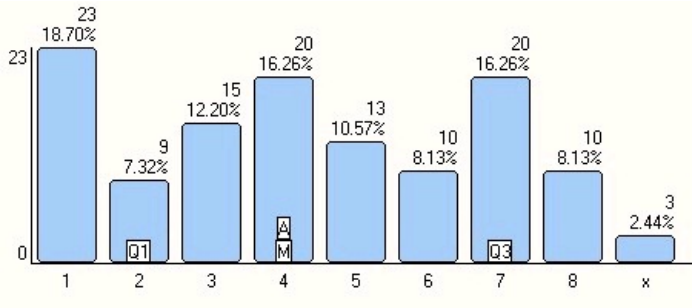
- explanation: level of living standard, increase of "conscious" life style

Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Technology investments in other than wood-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Risks in new technologies and materials
- 8 = Technical weakness of wood material
- x = Other, please specify:

n=123, A=61.00, M=61.00, Q1=30.00, Q3=91.00

New raw materials

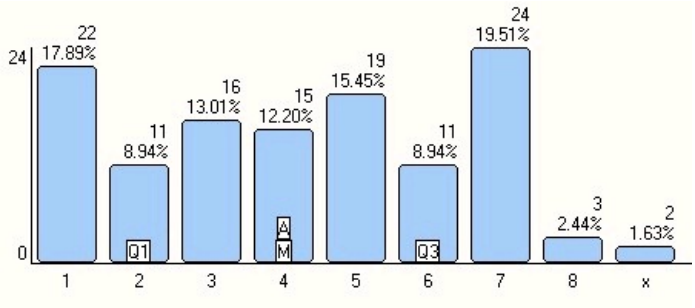


- Risk averseness, unsubstantiated perceptions, for example on GMOs
- cheap existing materials
- not enough money for research
- Competing resources and end products are still cheap to use and produce

- 1 = Technology investments in other than wood-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Risks in new technologies and materials
- 8 = Technical weakness of wood material
- x = Other, please specify:

n=123, A=61.00, M=61.00, Q1=30.00, Q3=91.00

New uses

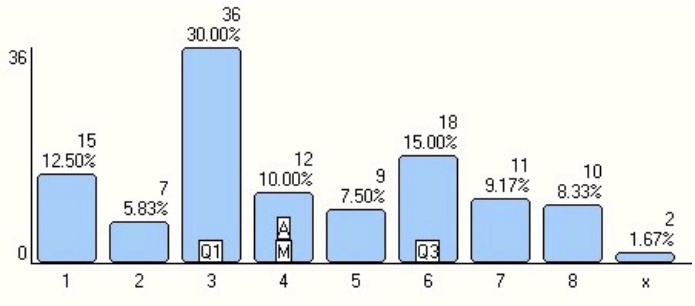


- Perceived risks, science averse society, fear/emotion
- Lack of market-driven businesses
- not enough money for research

- 1 = Technology investments in other than wood-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Risks in new technologies and materials
- 8 = Technical weakness of wood material
- x = Other, please specify:

n=120, A=59.50, M=59.00, Q1=29.00, Q3=89.00

Luxury



- Perceived risks, science averse society, fear / emotion
- often niche markets

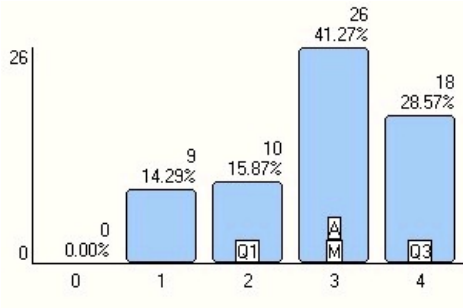
Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Of moderate importance
3 = Important
4 = Very important

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=63, A=2.84, M=3.00, Q1=2.00, Q3=4.00

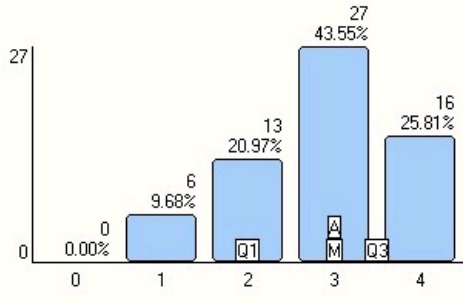
New materials



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=62, A=2.85, M=3.00, Q1=2.00, Q3=3.75

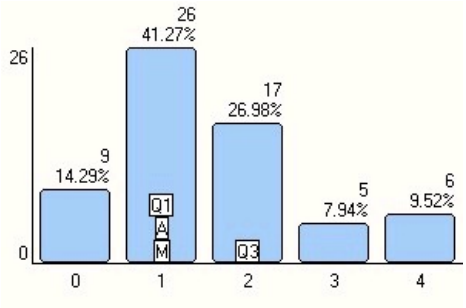
New uses



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=63, A=1.57, M=1.00, Q1=1.00, Q3=2.00

Luxury



If you wish, you can explain your response here:

- -
- Reach people (countries) will by in spite all the problems.
- The major global challenges in 2050 will still be continuing deforestation and lacking SFM. The discussed three fields of solutions are rather marginal to tackle these.

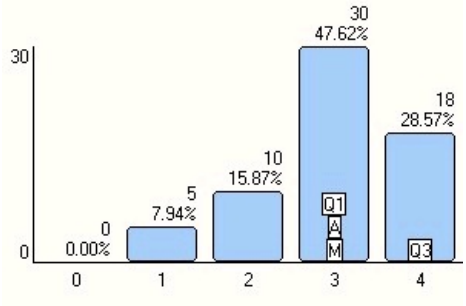
Question 4. What is the **business potential** of these forest-based products and services by 2050?

Scale:
0 = Very low
1 = Low
2 = Moderate
3 = High
4 = Very high

New materials

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

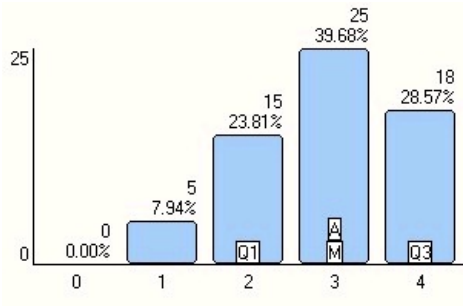
n=63, A=2.97, M=3.00, Q1=3.00, Q3=4.00



New uses

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

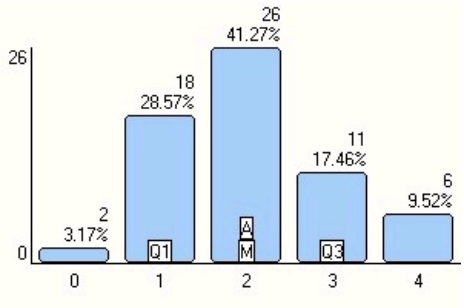
n=63, A=2.89, M=3.00, Q1=2.00, Q3=4.00



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=63, A=2.02, M=2.00, Q1=1.00, Q3=3.00

Luxury



If you wish, you can explain your response here:

- -
- Modern, advanced wood uses could become very competitive to other materials.

Question 5. Here you can add any other viewpoint with regard to the role of forests to bio-economy by 2050:

- -
- It can assure a lot of products in the condions of sustainability.
- Critically important, particularly when considering that highly productive plantation forests can be planted on marginal lands, avoiding competition with food production. Also, providing a powerful strategy to leave natural ecosystems alone.
- The significance of forests and particularly bio mass will increase and innfluence bio-economy more than other sources.
- I think htere is more than 2 main drivers in these categories, there are several factors at play, regulation will be important as well as harmonisation globally adn value chain coordination
- It is important to invest in research and innovation in a coordinated way on behalf of the sector and the public administration (EU and MS)

2.2 Role of forests to energy security and energy-saving solutions

Fossil fuel resources are diminishing and renewable energy sources are sought for energy security. In the beginning of the 2000s there were targets set for bioenergy and renewable energy resources, and the political and other commitments are already made at national, regional and international level. Forest-based biomass is expected to contribute to achievement of these targets, whereas the first generation energy sources, and e.g. use of food for energy, is expected to decrease. At the same time technology development is expected to contribute to new energy saving solutions.

In 2050 the forest-based sector contributes to energy security and energy-saving solutions with for example the following "products and services":

- **Wood as fuel:** resources for energy generation e.g. from short rotation coppice, forest residues, by-products and wood, paper and other waste composites; new solutions for processing wood fibre for fuel.
- **Biorefineries:** forest-based chemicals for energy production; new technologies for biodiesel and other fuels, electricity production and heating.
- **New energy saving solutions**: zero-energy and zero-waste systems for example in construction and logistics; new combinations of different energy sources, optimisation of energy grid, including locally and regionally self sufficient systems; increasing durability and re-usability; new optimisation solutions e.g. printing on demand, 3D printing.

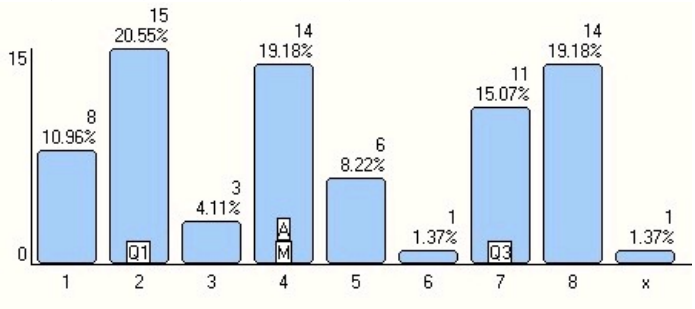
Question 1: What are the **key drivers supporting the emergence and development of these forest-based products and services**? Select two main drivers for each product/ service heading from the list or add another factor:

- 1 = Possibilities for economies of scale (mass production)
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth

- 7 = Availability of cheap raw material
- 8 = Switch from petrol-based economy to bio-based economy
- x = Other, please specify:

Wood as fuel

n=73, A=36.00, M=36.00, Q1=18.00, Q3=54.00

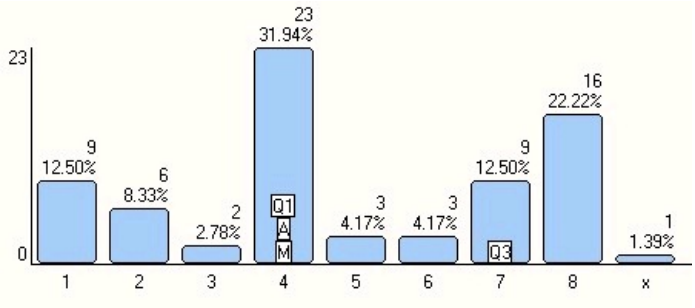


- The main pressure will be rising prices for fossil fuels

- 1 = Possibilities for economies of scale (mass production)
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Availability of cheap raw material
- 8 = Switch from petrol-based economy to bio-based economy
- x = Other, please specify:

Biorefineries

n=72, A=35.50, M=35.00, Q1=17.00, Q3=53.00

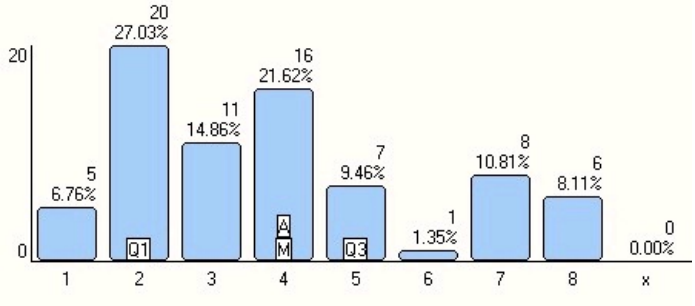


- competitveness in terms of emissions, cost and efficiency to competing products

- 1 = Possibilities for economies of scale (mass production)
- 2 = Policy targets and commitments
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Availability of cheap raw material
- 8 = Switch from petrol-based economy to bio-based economy
- x = Other, please specify:

Energy saving solutions

n=74, A=3.88, M=4.00, Q1=2.00, Q3=5.00

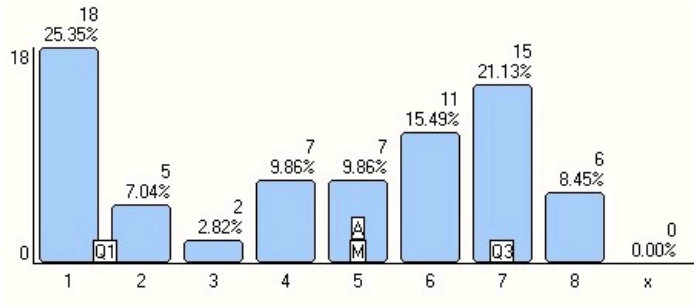


Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Technology investments in other energy sources and solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Environmental constraints
- 7 = Competition for biomass
- 8 = Market distortions (e.g. due to subsidies)
- x = Other, please specify:

n=71, A=4.45, M=5.00, Q1=1.50, Q3=7.00

Wood as fuel

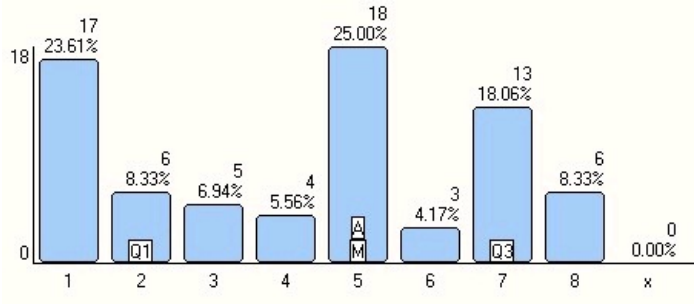


- In UK poor supply chains from small, private woodlands

- 1 = Technology investments in other energy sources and solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Environmental constraints
- 7 = Competition for biomass
- 8 = Market distortions (e.g. due to subsidies)
- x = Other, please specify:

n=72, A=4.26, M=5.00, Q1=2.00, Q3=7.00

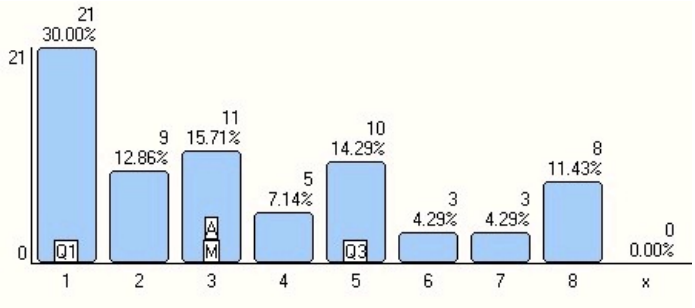
Biorefineries



- 1 = Technology investments in other energy sources and solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Environmental constraints
- 7 = Competition for biomass
- 8 = Market distortions (e.g. due to subsidies)
- x = Other, please specify:

n=70, A=3.50, M=3.00, Q1=1.00, Q3=5.00

Energy saving solutions



- Lack of sustainable governance

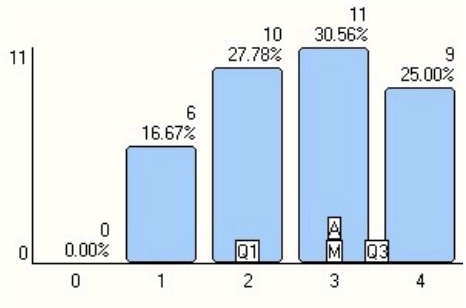
Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Of moderate importance
3 = Important
4 = Very important

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=36, A=2.64, M=3.00, Q1=2.00, Q3=3.25

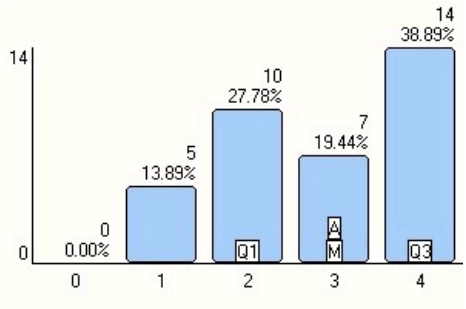
Wood as fuel



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=36, A=2.83, M=3.00, Q1=2.00, Q3=4.00

Biorefineries

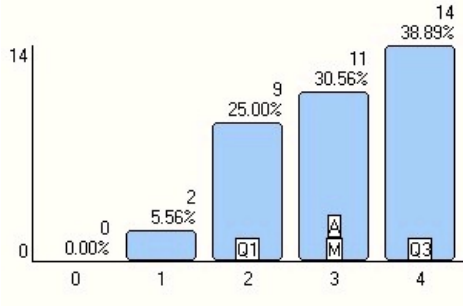


- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

- 4 = 4

n=36, A=3.03, M=3.00, Q1=2.00, Q3=4.00

Energy saving solutions



If you wish, you can explain your response here:

- -
- Wood is already the world's most used source of energy outside transport.Bio materials as a source of refined products is inevitable - though perhaps not by 2050.Wood as a renewable material with very low embedded energy will be a fashionable discourse within 15 years.
- With rising energy prices, all these solutions arre pretty important. Energy saving is the area where the biggest gains can be made. Wood as fuel will be very important locally all over the world. Biorefineries will have some importance, but allso some problems - the global biomass will not suffice for the bravest biorefinery visions.

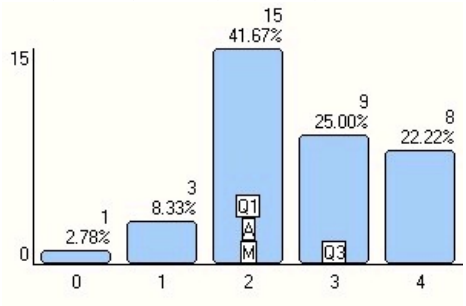
Question 4. What is the **business potential** of these forest-based products and services by 2050?

Scale:
0 = Very low
1 = Low
2 = Moderate
3 = High
4 = Very high

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=36, A=2.56, M=2.00, Q1=2.00, Q3=3.00

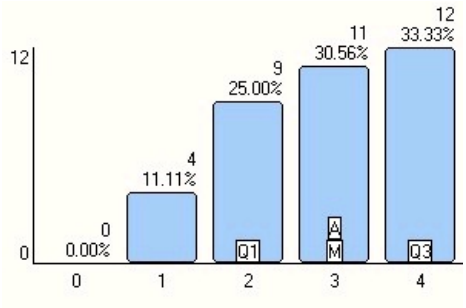
Wood as fuel



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=36, A=2.86, M=3.00, Q1=2.00, Q3=4.00

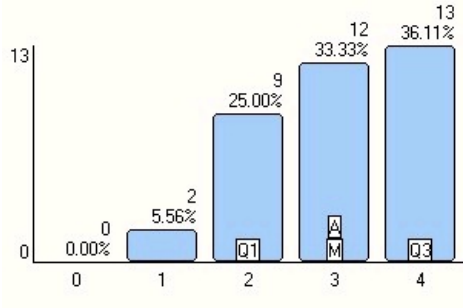
Biorefineries



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=36, A=3.00, M=3.00, Q1=2.00, Q3=4.00

Energy saving solutions



If you wish, you can explain your response here:

- -
- The importance is inversely related to the capital cost of investments to develop the sector.
- Biorefineries might have problems with finding enough raw material from short distance. Transport prices might rise a lot and affect logistics. Biorefineries must be able to produce high value-added products to thrive, biodiesel will not be enough.

Question 5. Here you can add any other viewpoint with regard to the role of forests to energy security and energy-saving solutions by 2050:

- -
- It is possible that in the future a large part of our energy will come from forest resources but these are not endless and we have to be very careful that our need for energy doesn't harm other functions of the forest, for example preservation of biodiversity and our natural heritage. Thus, solutions for our ever growing energy demands can't come from the forest alone and also other solutions have to be found, e.g. solar and wind energy. At the same time we should also reduce energy consumption.
- The forest sector has not yet properly understofdd the value of wood as a renewable, low embedded energy product.
- Natural harvesters of solar energy, natural sequestors of carbon dioxide, and natural phytoremediants of nitrous oxide, FORESTS are HEALTH FACTORIES cleaning the air and earth for us for free.
- The role of forests to energy security and energy-saving solutions by 2050 and beyond is eseential for humanity in the present and the future. If this role in actually not efficient, it is mainly due to the political will which is not well established in many countries, and the weak governance of the forestr sector and that of the related sectors. In developing countries, particularly, where forests are being degraded, and deforested, forest management and governance should be carried out by competent foresters.

2.3 Role of forests to green infrastructure

Forests are an important part of landscapes and ecological bases for many functions. Climate change challenges have made forests more visible in the international political arena. Natural hazards and extreme events have increased awareness among the public about the protective functions of forests as well as the challenges ahead.

In 2050 the forest-based sector contributes to green infrastructure with for example the following "products and services":

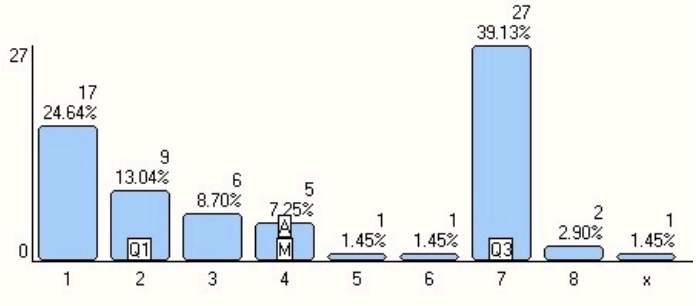
- **Forests as green spaces and shelterbelts:** new architecture and spatial solutions in urban environments for e.g. agricultural production, use of damaged or abandoned areas; pattern management and zoning for creation of shelterbelts for e.g. fresh water, reducing pollution and noise; fire management; preventing desertification, wind and flood damages.
- **Restricted forest areas for protection of landscape, biodiversity, flora and fauna:** limited access to biodiversity hotspots, new financing and payment mechanisms combining both taxes and voluntary payments.
- **Forests as carbon storage:** global network of green infrastructure; improvements in carbon storage features (e.g. tree breeding); new investment and financing schemes based both on regulation and voluntary payment systems.

Question 1: What are the **key drivers supporting emergence and development of these forest-based products and services**? Select two main drivers for each product / service heading from the list or add another factor:

Green spaces

- 1 = Rising public awareness
- 2 = Policy targets and international agreements
- 3 = Zoning of high-efficiency production areas apart from protection areas
- 4 = Increasing pace of biodiversity loss
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = Natural hazards
- x = Other, please specify:

n=69, A=34.00, M=34.00, Q1=17.00, Q3=51.00

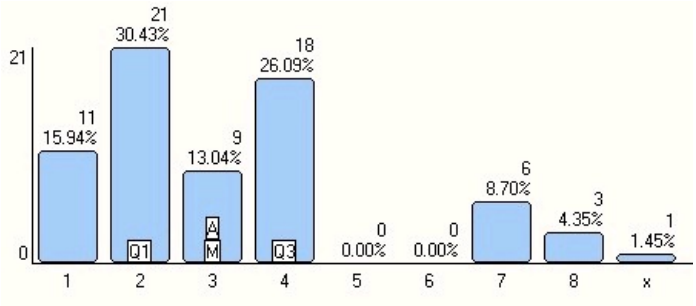


- Virtual reality' where nature is experienced indirectly through media - which will alter the way that priorites are set and decisions made.
- European perspective

Restricted areas

- 1 = Rising public awareness
- 2 = Policy targets and international agreements
- 3 = Zoning of high-efficiency production areas apart from protection areas
- 4 = Increasing pace of biodiversity loss
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = Natural hazards
- x = Other, please specify:

n=69, A=34.00, M=34.00, Q1=17.00, Q3=51.00



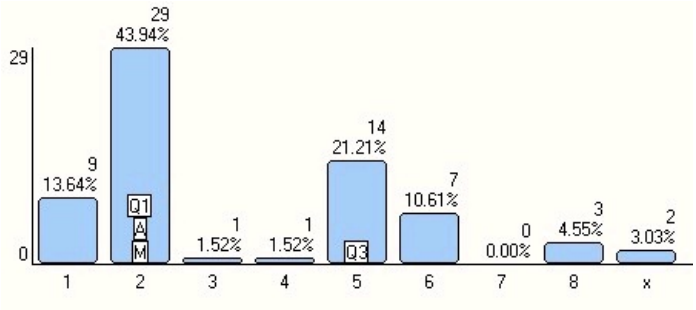
- Designations based on priorities derived from a media-derived understanding of the environment. Which will prioritise areas easily accessible to those media.

- Global perspective

- 1 = Rising public awareness
- 2 = Policy targets and international agreements
- 3 = Zoning of high-efficiency production areas apart from protection areas
- 4 = Increasing pace of biodiversity loss
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = Natural hazards
- x = Other, please specify:

n=66, A=32.50, M=32.00, Q1=16.00, Q3=48.00

Carbon storage



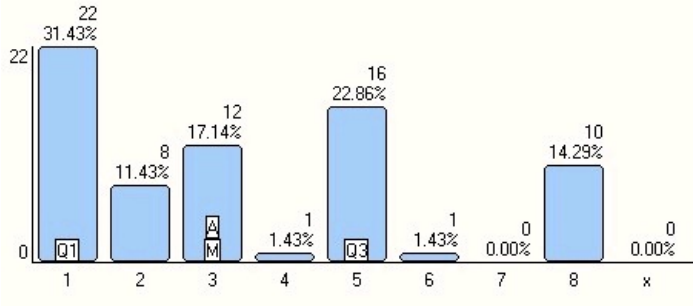
- Fiancial instruments deriving from international agreements and quotas.
- Business investment in carbon offsets

Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Competition for land use
- 2 = Lacking political agreements
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = No financing mechanisms
- 6 = Invasive species, increased vulnerability of forests
- 7 = Forced by law solution and services
- 8 = Competing commercial interests
- x = Other, please specify:

n=70, A=3.49, M=3.00, Q1=1.00, Q3=5.00

Green spaces



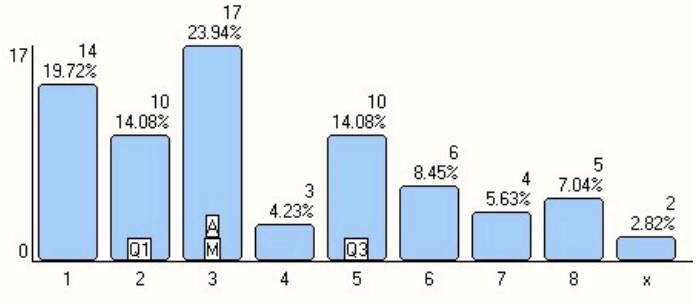
- European perspective

- 1 = Competition for land use
- 2 = Lacking political agreements
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = No financing mechanisms
- 6 = Invasive species, increased vulnerability of forests

- 7 = Forced by law solution and services
- 8 = Competing commercial interests
- x = Other, please specify:

n=71, A=35.00, M=35.00, Q1=17.00, Q3=52.00

Restricted areas

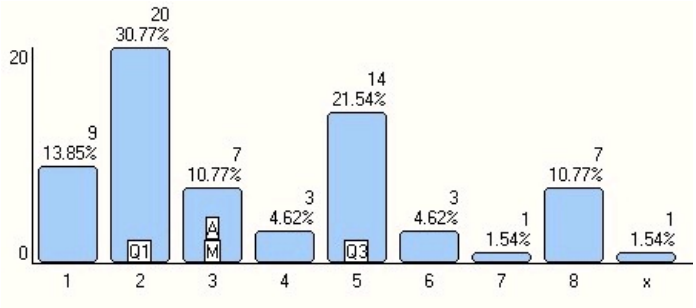


- Public understanding becomes divorced from direct experience and is determined by presentation in the media.
- Lack of reliable - working mechanisms to compensate forest owners
- Global perspective

- 1 = Competition for land use
- 2 = Lacking political agreements
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = No financing mechanisms
- 6 = Invasive species, increased vulnerability of forests
- 7 = Forced by law solution and services
- 8 = Competing commercial interests
- x = Other, please specify:

n=65, A=32.00, M=32.00, Q1=16.00, Q3=48.00

Carbon storage



- Restricted role of forests and HWP under Kyoto

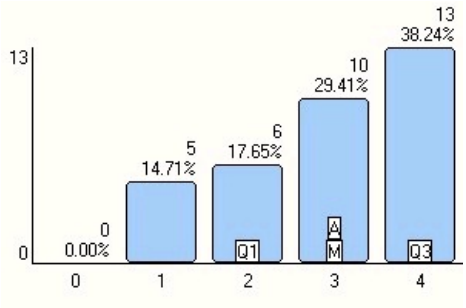
Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Of moderate importance
3 = Important
4 = Very important

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=2.91, M=3.00, Q1=2.00, Q3=4.00

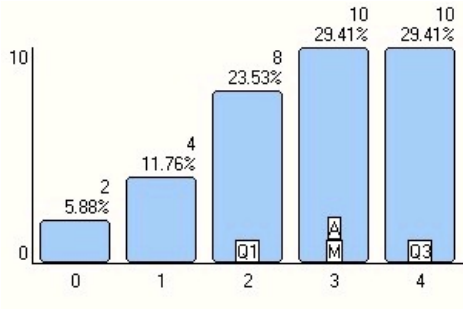
Green spaces



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=2.65, M=3.00, Q1=2.00, Q3=4.00

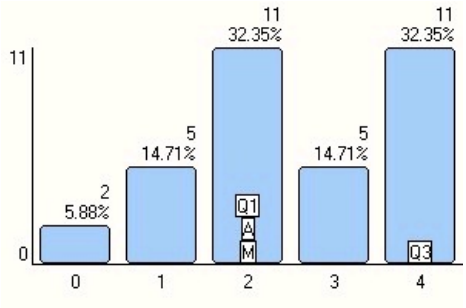
Restricted areas



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=2.53, M=2.00, Q1=2.00, Q3=4.00

Carbon storage



If you wish, you can explain your response here:

- more substitution than storage will be important in the long-term
- Carbon storage - not necessaritly in the forest, rather in products and its utilisation. lettign forests get older only shifts but doesn't solve the problem. In the contrary!
- In my mind carbon storage can't be the main aim of a forest. A forest meant for recreation, wood production or nature conservation will store carbon anyway.
- Carbon storage in forests will become discredited by lack of compliance and failure to deliver agreed outcomes by Governments and landowners.
- In Mediterranean countries, the ability of forest for carbon storage is limited and dependent on water availability, which is expected to decrease with climate change.
- While it is important not to destroy high value carbon pools, carbon sequestration is over rated! Substitution of non-renewable fuels and materials is far more important

Question 4. What is the **business potential** of these forest-based products and services by 2050?

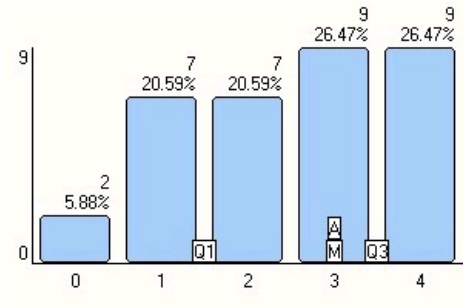
Scale:
0 = Very low
1 = Low
2 = Moderate

3 = High
4 = Very high

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=2.47, M=3.00, Q1=1.25, Q3=3.75

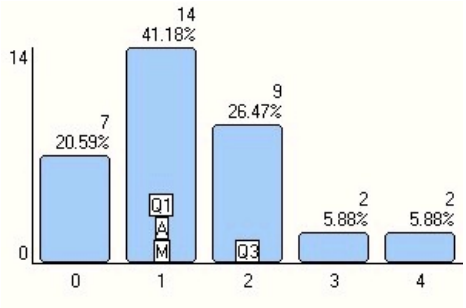
Green spaces



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=1.35, M=1.00, Q1=1.00, Q3=2.00

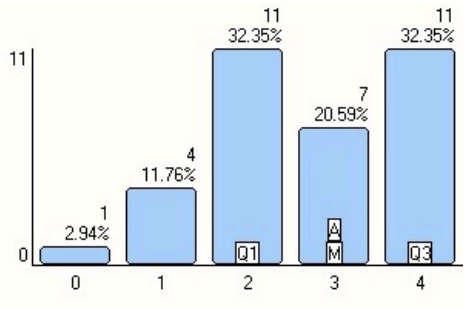
Restricted areas



- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=34, A=2.68, M=3.00, Q1=2.00, Q3=4.00

Carbon storage



If you wish, you can explain your response here:

- The problem with nature protection areas and forest for recreation is that it hard to compete with other land uses, which can be much more profitable. Forest for carbon storage may have some business potential in trading emission rights.
- In urban areas the potential for greenspace is high. In rural areas agriculture and mining will always take precedence.

Question 5. Here you can add any other viewpoint with regard to role of forests to green infrastructure by 2050:

- In my mind the role of forest in biodiversity preservation is much more important than in mitigating greenhouse gas emissions. Most species have the ability to adapt to changing climate conditions but they won't be able to adapt against

habitat destruction, fragmentation and degradation.
- The trees that 80% of people experience will be in parks and streets. Traditional paradigms of forestry are not adequate to deliver professional services and value and arboriculture will increasingly be seen as the most relevant tree-based profession.
- There can be many things to say, even more than was anticipated issues
- Should be regulated general mandatory requirements for public funding of such "green" projects, which by definition not haven "business" potential.

2.4 Role of forests to public health and wellbeing

Forests provide both physical and psychological benefits to human health and wellbeing. There is a trend of increasing emphases on Lifestyles of Health and Sustainability (LOHAS) and holistic approach to a meaningful living. Increasing urbanisation and increased access to virtual environments set new demands for humans, at the same time as connection to nature becomes weaker.

In 2050 the forest-based sector contributes to public health and wellbeing with for example the following "products and services":

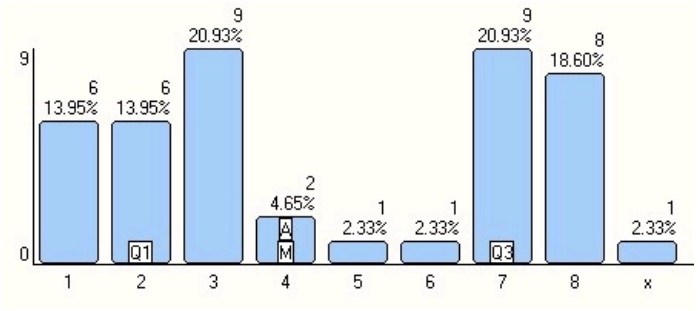
- **Forests as source of wellbeing;** harmony with nature and sustainability e.g. forest spas and rehabilitation centres; forests as a source of both nutrition and exercise, as well as recreation and therapeutic experience; urban and periurban forests designated for public health; new urban - wilderness frontiers for activities such as sports, hunting, art, spiritualism etc.
- **Biochemistry, forests providing chemical components** for health and wellbeing, e.g. enzymes, food additives, vitamins, cosmetics, pharmaceutics and medicines.
- **"Green packages" of forest related products and services,** including "virtual forests" providing forest experience for all senses (sound, visual); entertainment, educational, heritage activities (virtual forestry, education laboratories); new frontiers; "back to nature" packages for urban dwellers, such as green weddings, green funerals.

Question 1: What are the **key drivers supporting emergence and development of these forest-based products and services**? Select two main drivers for each product / service heading from the list or add another factor:

- 1 = New spatial planning and architecture approaches
- 2 = Increasing value of nature and biodiversity
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = New solutions for valuing public goods
- x = Other, please specify:

Source of wellbeing

n=43, A=21.00, M=21.00, Q1=10.00, Q3=31.00



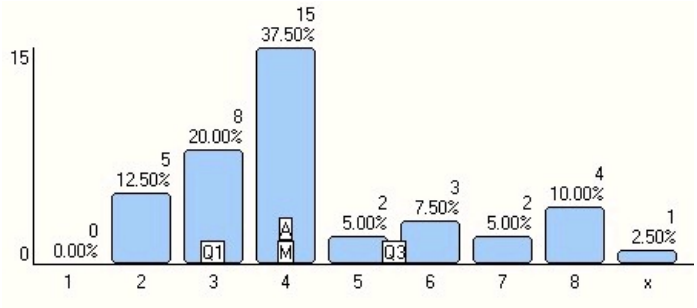
- Need for healthy environments

- 1 = New spatial planning and architecture approaches
- 2 = Increasing value of nature and biodiversity
- 3 = Consumer preferences

- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = New solutions for valuing public goods
- x = Other, please specify:

n=40, A=19.50, M=19.00, Q1=9.00, Q3=29.50

Biochemistry

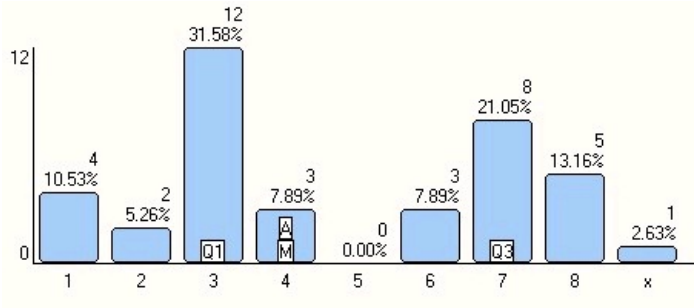


- Increasing costs of drug development leads to 'prospecting' in forests.

- 1 = New spatial planning and architecture approaches
- 2 = Increasing value of nature and biodiversity
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Urbanisation, urban lifestyles
- 8 = New solutions for valuing public goods
- x = Other, please specify:

n=38, A=18.50, M=18.00, Q1=9.00, Q3=27.00

"Green packages"



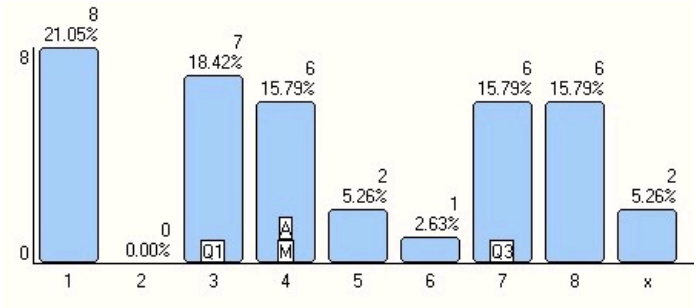
- Need for healthy environments, forest products will also be used in the built environment

Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Access to resources
- 2 = Lacking harmonisation of norms (e.g. IPR, gene patents)
- 3 = Lack of willingness to pay
- 4 = No tradition to develop products and services with consumers / users
- 5 = Regional differences, too narrow markets for commercialisation
- 6 = Risks in new technologies
- 7 = Competition for forest resources
- 8 = Alienation from nature
- x = Other, please specify:

n=38, A=18.50, M=18.00, Q1=9.00, Q3=27.00

Source of wellbeing

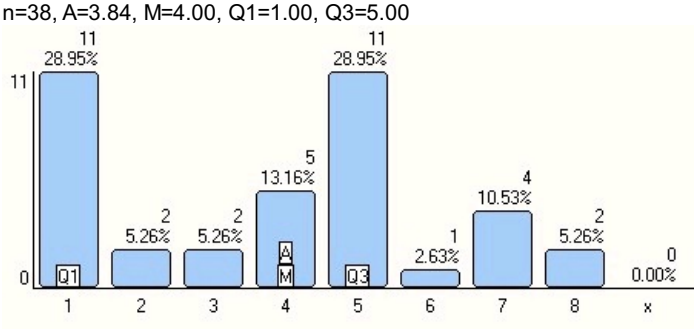


- Trajectory-dependence in exisiting sectors e.g. medical solutions preferred over public health.
- Inconsistent public policies, too little focus on providing multiple functions from forest land

- 1 = Technology investments in other energy sources and solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Environmental constraints
- 7 = Competition for biomass
- 8 = Market distortions (e.g. due to subsidies)
- x = Other, please specify:

n=38, A=3.84, M=4.00, Q1=1.00, Q3=5.00

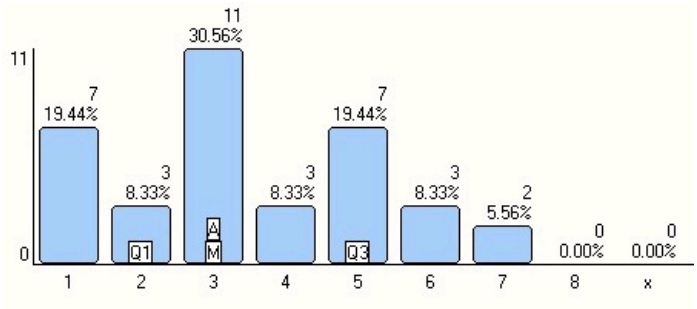
Biochemistry



- 1 = Technology investments in other energy sources and solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Environmental constraints
- 7 = Competition for biomass
- 8 = Market distortions (e.g. due to subsidies)
- x = Other, please specify:

n=36, A=3.47, M=3.00, Q1=2.00, Q3=5.00

"Green packages"



- Again, trajectory dependence in existing sectors.

Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services

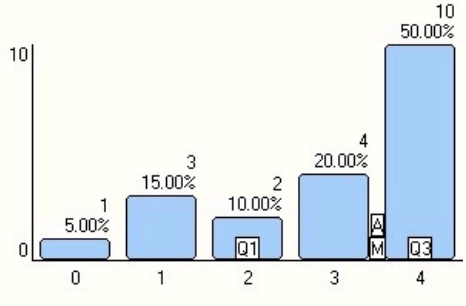
to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Moderate
3 = Important
4 = Very important

Source of wellbeing

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

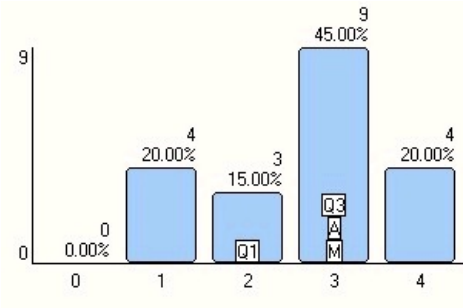
n=20, A=2.95, M=3.50, Q1=2.00, Q3=4.00



Biochemistry

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

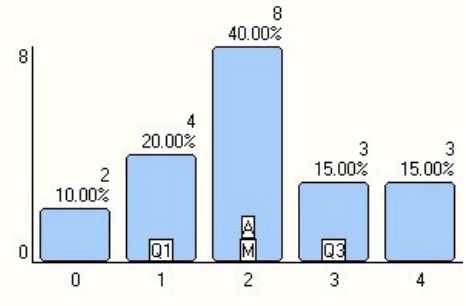
n=20, A=2.65, M=3.00, Q1=2.00, Q3=3.00



"Green packages"

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=20, A=2.05, M=2.00, Q1=1.00, Q3=3.00



If you wish, you can explain your response here:

- Biochemistry: Development of medicines is important of course, but I don't see any point in those enzymes and food additives what you can also get from normal healthy food. However, there is a huge business potential in all those additives and people seem to buy them.
- The costs of new drug development is increasing exponentially, pharma companies will increasingly look to forests for new products. 'Green' will always be seen as a luxury so long as poverty is a problem - that means forever.
- Green packages are important only primarily if they can add to wellbeing and environmental education

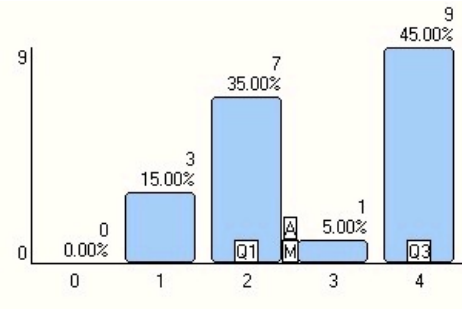
Question 4. What is the **business potential** of these forest-based products and services by 2050?

Scale:
0 = Very low
1 = Low
2 = Moderate
3 = High
4 = Very high

Source of wellbeing

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

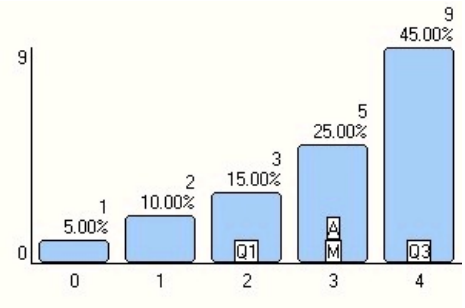
n=20, A=2.80, M=2.50, Q1=2.00, Q3=4.00



Biochemistry

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

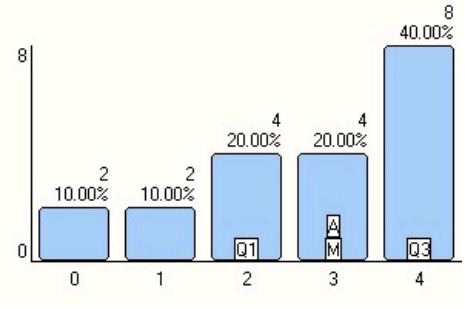
n=20, A=2.95, M=3.00, Q1=2.00, Q3=4.00



"Green packages"

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=20, A=2.70, M=3.00, Q1=2.00, Q3=4.00



If you wish, you can explain your response here:

- Very coinsiderable potential to develop consumer services based around forests - forest schools, kindergartens, personal fitness, mass fitness, psychological regeneration etc.The oldest trees survive attacks from saprohytes for huge periods of time. We don't know how & there is sure to be commercial value in finding out.

Question 5. Here you can add any other viewpoint with regard to the role of forests to public health and wellbeing by 2050:

- This is esentially an urban issue as people do not travel to greenspace except on special occasions such as holidays.
- Im my opinion, the descriptions of forest as source of wellbeing and "green packages" are very much alike. Both have to do with the re-conection of people with nature values. Anyway, it is a bit sad to me the way this reconnection is addressed solely through the market. The forest has become another consumption good and service. Hence, it should provide innovations constantly so as the consumers don't get tired of it.
- The role of forests to public health and wellbeing is most important in highly urbanized areas

2.5 Role of forests to food and water security

Increasing population puts pressure on land use. Agricultural land is a valuable resource and attracts foreign investments. Sustainable resource use is targeted with technology innovations, new solutions, and increased efficiency in agricultural production. In the beginning of the 2000s forest lands were converted to agricultural land, especially in the tropics. At the same time forests' role in protection of soil, water and air has become visible through e.g. extreme events and natural hazards causing risks for food and water security.

In 2050 the forest-based sector contributes to food and water security with for example the following "products and services":

- **Forest protective functions** for food supply and water security: shelterbelts, regulation of ecosystem services (such as erosion prevention, nutrient sequestration, and local and regional climate regulation), new solutions for soil and water protection, fresh water supply, air and microclimate protection, as well as protection of flora and fauna.

- **Forest-based biochemistry,** chemical components for securing food supply and water security: wood and other forest resources based raw materials for e.g. fertilizers, pesticides, anti-microbiological substances for agriculture, as well as components for food additives, synthetic food and new sources of protein (substitutes for meat production).

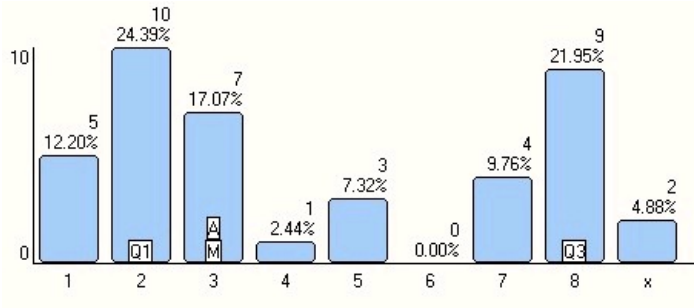
- **Non-wood forest products and services (NWFPS)** for food supply: e.g. berries, mushrooms, herbs and game; management, cultivation and certification of these resources, products and services including "food is not just nutrition" packages, in other words NWFPS sector providing organic/natural products, but also experiences and source of self-fulfilment.

Question 1: What are the **key drivers supporting emergence and development of these forest-based products and services**? Select two main drivers for each product / service heading from the list or add another factor:

- 1 = Increasing productivity of agricultural land
- 2 = Policy targets and international agreements
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Switch from petrol-based economy to bio-based economy
- 8 = New solutions for valuing public goods
- x = Other, please specify:

n=41, A=20.00, M=20.00, Q1=10.00, Q3=30.00

Protective functions

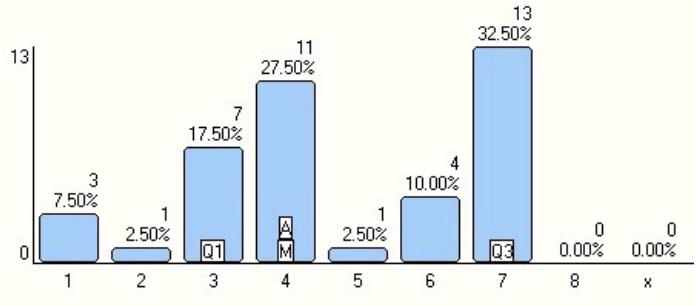


- Dear need of forests protective functions to allow population of the area and linked cities
- The need to secure the proper functioning of ecosystem services

- 1 = Increasing productivity of agricultural land
- 2 = Policy targets and international agreements
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Switch from petrol-based economy to bio-based economy
- 8 = New solutions for valuing public goods
- x = Other, please specify:

n=40, A=4.75, M=4.00, Q1=3.00, Q3=7.00

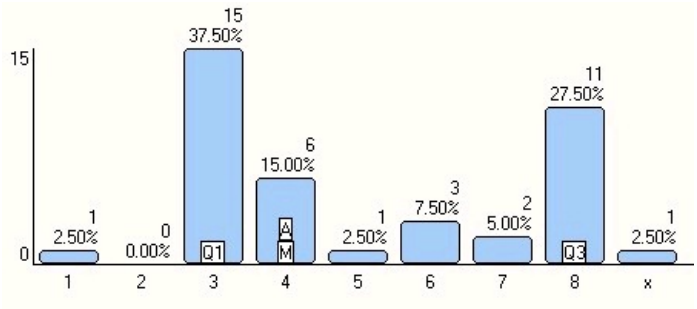
Biochemistry



- 1 = Increasing productivity of agricultural land
- 2 = Policy targets and international agreements
- 3 = Consumer preferences
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Switch from petrol-based economy to bio-based economy
- 8 = New solutions for valuing public goods
- x = Other, please specify:

n=40, A=19.50, M=19.00, Q1=9.00, Q3=29.00

NWFPS



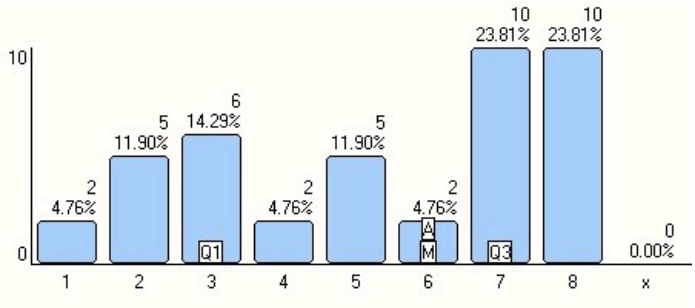
- Increasing problems in food production and distribution

Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Technology investments in other than forest-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Inappropriate forest management
- 8 = Competing commercial interests
- x = Other, please specify:

Protective functions

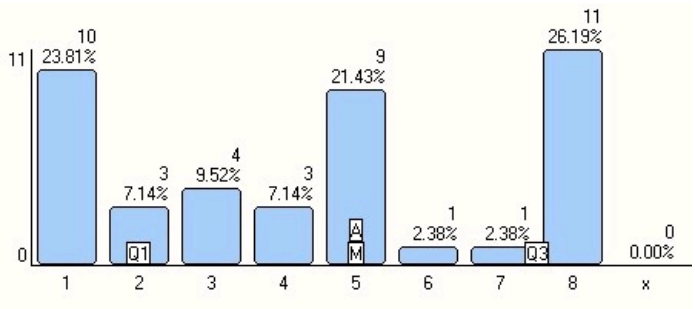
n=42, A=5.36, M=6.00, Q1=3.00, Q3=7.00



- 1 = Technology investments in other than forest-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Inappropriate forest management
- 8 = Competing commercial interests
- x = Other, please specify:

Biochemistry

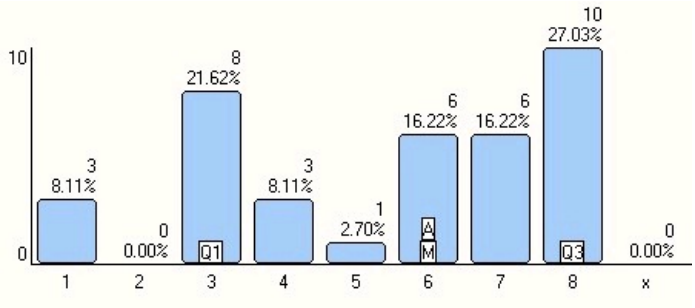
n=42, A=4.43, M=5.00, Q1=2.00, Q3=7.75



- 1 = Technology investments in other than forest-based solutions
- 2 = Lacking harmonisation of norms, standards, regulations
- 3 = Lack of willingness to pay
- 4 = Lacking cooperation between value chains
- 5 = Lack of funding for risk investments
- 6 = Regional differences, too narrow markets for commercialisation
- 7 = Inappropriate forest management
- 8 = Competing commercial interests
- x = Other, please specify:

NWFPS

n=37, A=5.46, M=6.00, Q1=3.00, Q3=8.00



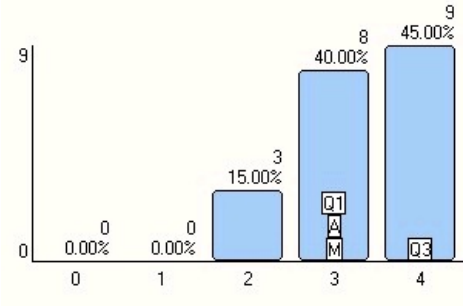
Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Moderate
3 = Important
4 = Very important

Protective functions

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

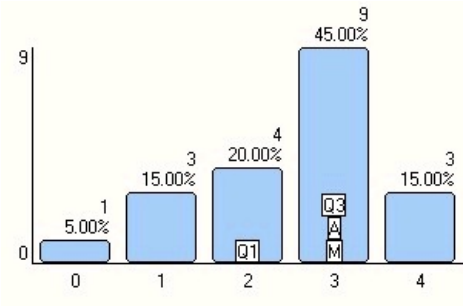
n=20, A=3.30, M=3.00, Q1=3.00, Q3=4.00



Biochemistry

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

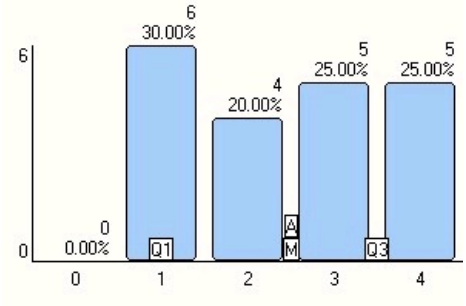
n=20, A=2.50, M=3.00, Q1=2.00, Q3=3.00



NWFPS

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=20, A=2.45, M=2.50, Q1=1.00, Q3=3.25



If you wish, you can explain your response here:

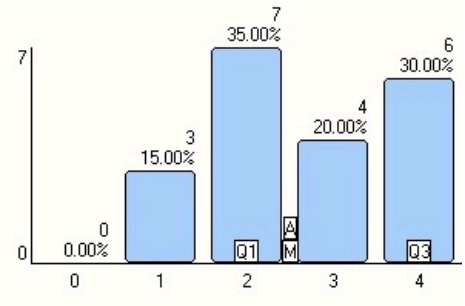
Question 4. What is the **business potential** of these forest-based products and services by 2050?

Scale:
0 = Very low
1 = Low
2 = Moderate
3 = High
4 = Very high

Protective functions

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

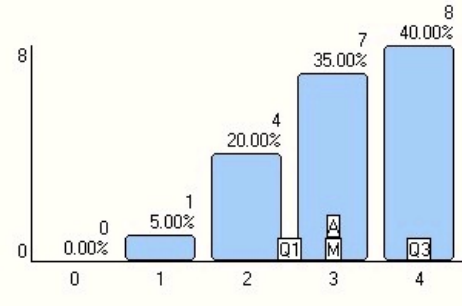
n=20, A=2.65, M=2.50, Q1=2.00, Q3=4.00



Biochemistry

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

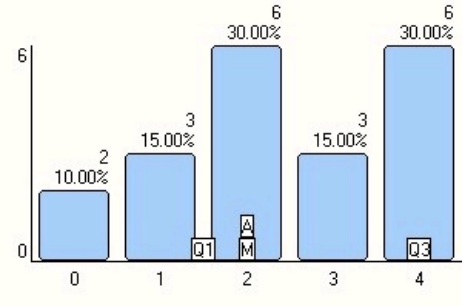
n=20, A=3.10, M=3.00, Q1=2.75, Q3=4.00



NWFPS

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=20, A=2.40, M=2.00, Q1=1.75, Q3=4.00



If you wish, you can explain your response here:

Question 5. Here you can add any other viewpoint with regard to the role of forests to food and water security by 2050:

- Preservation of genetic resources could be a important role of forest in future also.

2.6 Role of forests to conflict resolution

The role of forests in the international policy arena has increased due to the international negotiations and agreements on e.g. climate change, biodiversity, desertification, reduction of emissions due to deforestation and degradation of forests, illegal logging, trade of endangered species flora and fauna. Natural resources planning and management approaches are developed using new ICT solution for example for wider public participation and stakeholder involvement.

In 2050 the forest-based sector contributes to conflictresolution with for example the following "products and services":

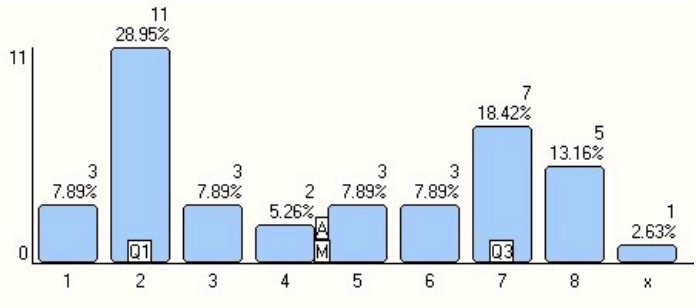
- **New funding and finacing schemes:** new trading, payment and investment systems for e.g. emissions, biodiversity, forest protection functions, ecosystem services and other public goods; stock exchange of soft values and other pilot solutions applicable to many natural resources sectors
- **Resource planning and management systems:** coherent strategies for dealing with conflicts between different uses of natural resources, including sustainability indicators and criteria; new solutions for data and information collection, monitoring and alert systems, wood and non-wood verification and tracking systems, decision making tools using ICT, social networks and virtual communities, instruments for forest policy and governance, and e.g. regional agenda building.

Question 1: What are the **key drivers supporting emergence and development of these forest-based products and services**? Select two main drivers for each product / service heading from the list or add another factor:

- 1 = Example set by voluntary-based measures
- 2 = International processes, agreements
- 3 = Rising awareness, active consumer and stakeholder groups
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Increasing role of forests in policy and political arena
- 8 = Commitment for financial solutions at international level
- x = Other, please specify:

n=38, A=18.50, M=18.50, Q1=9.00, Q3=27.00

New financing



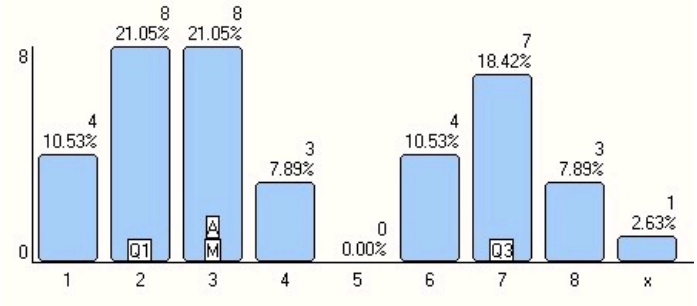
- Growing resource scarcity makes forests and thei services important

- 1 = Example set by voluntary-based measures
- 2 = International processes, agreements

- 3 = Rising awareness, active consumer and stakeholder groups
- 4 = Technology development
- 5 = Green economy targets in emerging markets (BRIC)
- 6 = Economic growth
- 7 = Increasing role of forests in policy and political arena
- 8 = Commitment for financial solutions at international level
- x = Other, please specify:

Planning and management systems

n=38, A=18.50, M=18.00, Q1=9.00, Q3=27.00



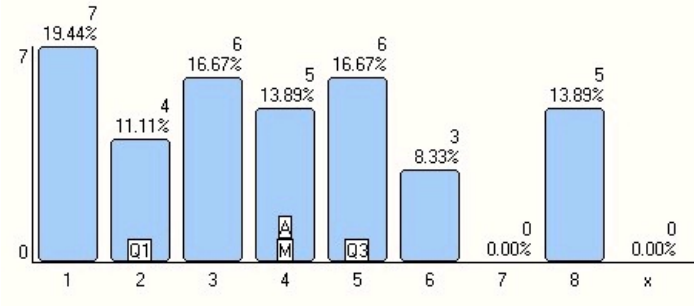
- The need for instruments and indicators in resolving conflicts

Question 2: What are the **barriers hindering emergence and development of these forest-based products and services**? Select two main barriers for each product / service heading from the list or add another factor:

- 1 = Other sectors more powerful than the forest sector: framework conditions defined outside the forest sector
- 2 = Regional differences, no common goals
- 3 = Lack of willingness to pay
- 4 = Sectorisation of interests, no coherent policy
- 5 = Lack of political interest
- 6 = No evidence of solutions which forests provide
- 7 = Lack of data and data access
- 8 = Competing commercial interests
- x = Other, please specify:

New financing

n=36, A=3.92, M=4.00, Q1=2.00, Q3=5.00

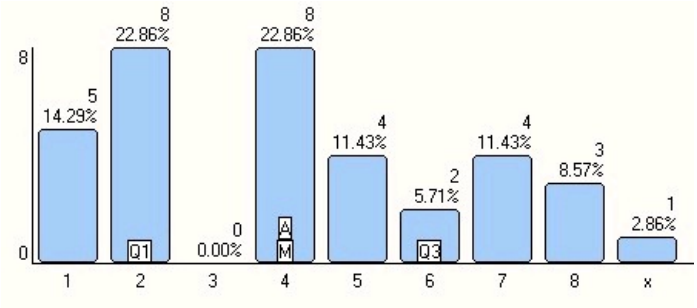


- 1 = Other sectors more powerful than the forest sector: framework conditions defined outside the forest sector
- 2 = Regional differences, no common goals
- 3 = Lack of willingness to pay
- 4 = Sectorisation of interests, no coherent policy
- 5 = Lack of political interest
- 6 = No evidence of solutions which forests provide
- 7 = Lack of data and data access
- 8 = Competing commercial interests
- x = Other, please specify:

Planning and

n=35, A=17.00, M=17.00, Q1=8.00, Q3=25.00

management systems



- Technical adn political matters, difficult to have globally meintainable and readible system

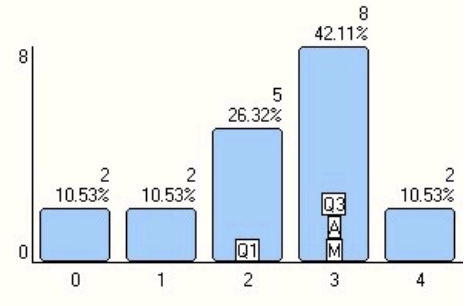
Question 3. What is your perception, **how important is the solution** provided by these forest-based products and services to global challenges by 2050?

Scale:
0 = Not important at all
1 = Of low importance
2 = Moderate
3 = Important
4 = Very important

New financing

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=19, A=2.32, M=3.00, Q1=2.00, Q3=3.00



Planning and management

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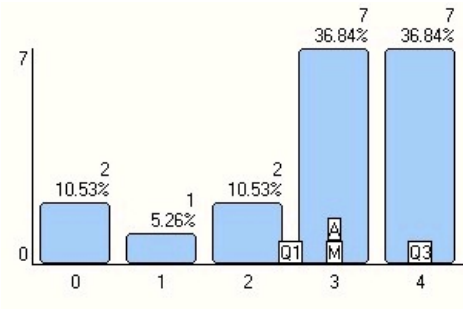
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=19, A=2.84, M=3.00, Q1=2.50, Q3=4.00



If you wish, you can explain your response here:

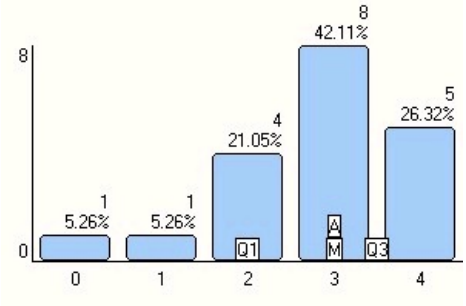
Question 4. What is the **business potential** of these forest-based products and services by 2050?

Scale:
0 = Very low
1 = Low
2 = Moderate
3 = High
4 = Very high

New financing

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

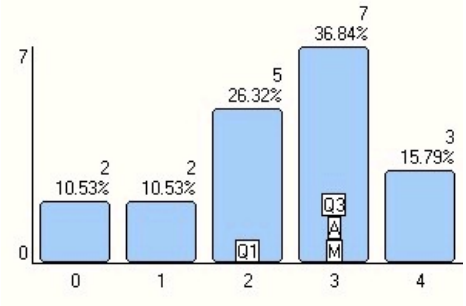
n=19, A=2.79, M=3.00, Q1=2.00, Q3=3.50



Planning and management

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4

n=19, A=2.37, M=3.00, Q1=2.00, Q3=3.00



If you wish, you can explain your response here:

Question 5. Here you can add any other viewpoint with regard to the role of forests to conflict resolution by 2050:

- It can be envisaged that the regional differences will be huge in these matters, especially before these solutions gain ground. as long as these products and services are rather expensive and complicated to use or grasp, they will not be in large use globally. But if poorer countries with large forests see their potential and can make use of them, their importance might grow substantially.

3. Additional remarks

Are there any other viewpoints you would like to express with regard to this survey and the future demand for forest-based products and services by 2050?

- Excellent questions.

Internet Survey 1: questions based on the survey results

"Foresight on Future Demand for Forest-based Products and Services"

We cannot predict the future, but we can investigate alternative futures. This exercise is about exploring different development paths, identifying changing factors and their links with forest-related responsibilities, rights, market potential and interests.

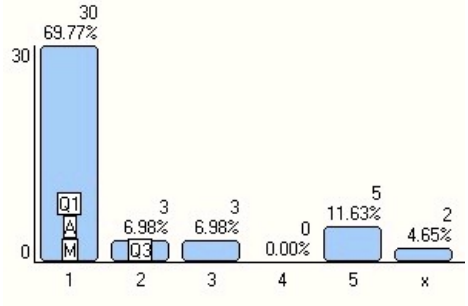
The Internet Survey 1 for "Foresight on Future Demand for Forest-based Products and Services" responses already illustrate that there can be many different pathways how the future of the forest-based sector evolves. The target horizon 2050 is a long way to go – just to look back how much the world has changed during the past 40 years. Below you can find five additional questions based on the survey results to challenge our thinking about the futures. In the end you can leave feedback and comments for the Internet survey.

Question 1: The survey responses show strong belief in technology solutions. On the other hand the responses also indicate that development of the forest-based products and services is affected by technology investments channelled to other sectors. Furthermore, urbanisation, population changes, changing lifestyles and social factors are among the factors mentioned in the survey responses which will affect the future needs and demand for forests as well as for the forest-based products and services.

On your perception where will we see a major technological (either high-tech or low-tech) breakthrough by 2050 which will affect people's everyday lives in a manner that it has a major impact on the demand for forest-based products and services:

- 1 = Energy generation and energy saving
- 2 = Food production and distribution
- 3 = Construction and housing
- 4 = Mobility and transportation
- 5 = Information and communication
- x = Other, please specify

n=43, A=21.00, M=21.00, Q1=10.00, Q3=31.00



- forest rawmaterial for production of polymers, chemicals and material
- Energy generation is one of the main problems of humanity. If we can save energy and become more efficient, this will have a huge influence in the other sectors. Second aspect of development is I&C.
- probably in all of them, but especially in food production there has to come major breakthroughs
- halting biodiversity loss, environmental protection
- The energy production and consumption field will change radically, because oil is running out, energy use must become more efficient and the need for low-carbon energy is growing. ESpecially solar energy technology will develop very much, partly replacing also biomass-based energy. Forest biomass will be used for many purposes, but relatively less for burning (in stoves or power plants).

Question 2: In the survey responses the economic factors (e.g. economic growth or the green economy targets of BRIC countries i.e. Brazil, Russia, India, China) were not emphasised as the two most important factors for development and emergence of the forest-based products and services. **On your perception are there other economic factors forseeable, e.g. emergence of new emerging markets, new economy targets which will be important for forests and for the forest-based products and services by 2050?**

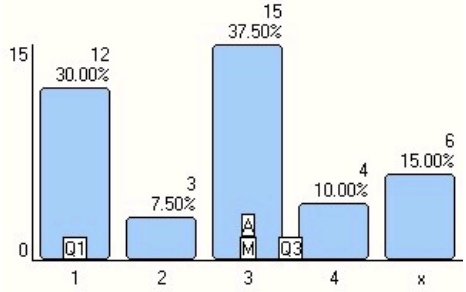
- energy
- ? (If so, then probably economic developments in sectors other than forestry may have strongest influence)
- I don't see the future are a trend with forseeable events, emergence and progress towards targets but an evolution in a very fluctuating and uncertain world. In combination with a change in the energy mix, we will probably have several energy crises and economic crises as well. I think that crises and their effects should be given more emphasis in parallel with trends. What will be the impact, for the forest sector, of an ecocnomic crisis generated by an energy crisis? The energy crisis should benefit to the forest sector but the economic crisis should impact the whole economy. What would be the combined result of these two consequences for the forest sector?
- Increasing value of land
- Economic fluctuations in the future will occur with shorter intervals and the downs and ups are steeper than expected

- The rise of Africa will influence the sector by then greatly. Forestation with plantations will influence the balance of available raw material. A more radical opportunity is the utilization of seas in production of biomass.
- Changest (most likely an increase) in demand for building materials.
- I think the energy market will play a very important role, especially when fossil fuel gets scarcer
- The development of the energy sector and its economy
- As the average level of wealth and education increases hopefully customers will become more aware of their choices. I think in the future customer preferences will be important in the development and consumption of forest-based products and services in the future. The customers in those economies which are now emerging will become very important in the future.
- The large demand for sustainable energy production from woody biomass and the large demand from emerging giant economies like China and India will have a major impact on forest management and will result in major chalanges.
- Oil based as well as non renewable materials will decrease and the pressure to replace them with renewable material will boost the forest sector.
- scarcity of other raw materials and ensuing high prices may stimulate substitution of forest-based products for these, i.e., bio-plastics for these raw materials
- The use of forest base products is clearly related to the living standards of the countries; wood for construction is not as important in Europe as it is in the USA, Australia, etc. Innovative products and the education of the population to the use of forest base products is thus important. Emerging markets such as energy and environmentally friendly products (certification) will have a large influence in consumption of forest base products.
- 1. Increasing a need from forest-based product and services2. Developing a new markets and trading new forest product and services
- Beside economic growth population growth will still be the most important basic socio-economic factor.
- Products from lignin and extractives from plants for new uses and instead of fossil fule based pharmacuticals
- undisturbed areas, eco-tourism, needs for clean water resources
- Having run out of oil, and in absence of serious alternatives that will allow society to overcome its dependance from fossil fuels in the rather short-term timespan of 40 years, energy and food will dominate the priorities list more than any other issue. I hope I'm terribly wrong on this.
- It is difficult to foresee about economic factors by 2050, when the current crisis was not officially forecasted. In the future, the economic weight in the world by 2050 of countries such as China, Brazil or India, with a strong demand on energy, will have effects on forestry at a global scope. Natural resources planning will be a key issue for such economies + the current ones (EU, NAmerica, etc.)
- ICT for development will certainly have an effect on Africa and other very poor countries. This should be considered also from the viewpoint of fibre based materials and any services related to them
- Emerging clean green energy (Biodiesel, wind energy, etc). In this field, among others, Morocco is an emeging country to ben taken account of.
- I consider slow economic growth globally as a main factor affecting forest-based products. The backgrond reason for this is in hign indebtness in the west and high export dependence in new economies and, in the longer run, in rising prices for food, energy and other vital resources. These developments will affect forest-based products strongly: the consumption of traditional products will globally increase rather slowly and decrease clearly in the west. With rising food prices, more forest area will be taken over by food production, which will affect forest-based production.
- new economy targets including a climate change perspective will grow in importance. The view of trees save the earth will grow in importance
- India and China are expected to have a strong impact by the enlargement of their internal market. Brazil and Russia I think that in terms of consumption of forest-based products are reaching a threshold (less growing expectations).But I think that other markets can have some impact as the African market (i.e Angola, Mozambique and South Africa).
- Emerging energy and packaging markets. ICT development will lead to decreased demand for paper.
- No
- Green turism
- chemical industry of renewable carbonorLocal use of biomass energy
- new emerging market could be in relation to the commercialization of transgenic plant

Question 3: In the responses also the sustainability of the renewable project forestry was addressed. **On your perception what will be the main means in 2050 to ensure that forests will be allowing a sustainable supply of a wide range of forest-based products and services in the long-term future?**

- 1 = Forced by law and regulations
- 2 = Agreed by voluntary agreements
- 3 = Measures based on demand and consumption patterns
- 4 = Measures based on strong interest groups
- x = Other, please specify

n=40, A=19.50, M=19.00, Q1=9.00, Q3=29.50



- Economic interest (i.e. sufficient market prices) when suitable institutional frame is given
- The question is not very clear. For example, where are incentives (I think that an itel on incentives should be added for

completion)? Anyway, I think that a mix of all these instruments is necessary. For example, some regulations may be useful together with voluntary agreements.
- Market-based policy instruments
- I think all measures mentioned above are important. We need some government rules and laws to safeguard nature and access to resources but it's equally important that the people agree with those laws and see the clear needs and benefits that their surroundings are managed in a sustainable way. Also consumers of forest-based products and services will hopefully demand that they come from sustainable sources.
- Voluntary agreements are not enough to control large markets. Standards have to be agreed and be established in the form of regulations to which countries must comply.
- ecological subsidies and financial reliefs
- If voluntary agreements refer to FLEGT VPA: these are bilateral trade agreements between the EU and third countries.
- Good and reliable communication between the industry and consumers. People should not feel bad about using paper based products, but they do as the information they get is not good enough
- In 2050, food, energy and climate concerns are so big and acute, that they will influence forest use and regulation strongly through a big variety of mechanisms, such as climate policy, land use policy and food/energy security measures.

Question 4: In the survey responses there were references made to new players entering into the field: new producers or service providers, new consumer and user groups, as well as new interest groups gaining importance in the field of governance. **On your perception, who could these new players be and where can we expect them to appear?**

- ./.
- Perhaps I have not enough imagination but I see the same players as now in the future. The main difference will be the weight of each of them. The relative weight is however difficult to predict because forest goods and services could experience, in general, an increase of interest, as well in social, economics and ecological fields.
- New business e.g. related to health and well-being
- Current energy companies eg. Exxon, Shell etc. Construction companies
- These players will emerge most likely outside of the current scope of supply and production. There will be wholy new players and players that step into this from other fields. The big energy companies will maybe be the ones in commodity that will rule the markets and new players that have niche expertise will enter the high end markets with an expeption of big medical companies being players in molecular utilization of the forest raw material in drugs.
- A larger share of renewable energy will be produced from forest biomass. Energy producers will become more important in the forest sector. Global demand for building materials will increase, hence actors on the global market will become stronger.
- biofuel producers, and better organized consumer NGO's
- They can be existing players today in the energy and chemical sectors or/and companies with new products and business models
- Oil and energy companies could be the new players. You can already notice nowadays that some big oil companies are investing heavily in bioenergy and they have much larger financial resources than forest companies. It is possible they will take over some of the activities of the forest sector
- Wood will in the future be used for the production of bioplastics and transportation fuels. So the producers of these products will become important players.
- In general the big players will stay the same but they will change their focus from bulk low added value towards high added value products. One important player in the forest ownership of 2050 could be governments buying forests outside their nation (e.g. as China is already doing).
- energy companises, such as (former) oil companies, will most likely enter the field, e.g.,investing in bio-refineries.
- health related stakeholders, in very populated countries
- Asian market, especially China, will generate high demand for wood based raw materials and will flood the market with wood based products
- Sorry, I did not fill the first survey and I do not know what this question refers to.
- mainly these will be new services provider and they will appear at the international markets
- Could be the interest in water security and in chemical components of the wood fibre.Or, however less likely, demand for fibre based on nano-technological development
- biofuel based energy production based on new wnzym technology
- eco-tourism groups, civil initiatives, intergovernamental panels, common development strategies based on biodiversity and environmental issues
- IF developing countries do not undermine their economic growth, then also their consumption patterns will change with time: their consumers will have higher demands. THUS: China, India ... and maybe an emerging Russia as biggest players.
- In accordance to my previous answer, big interest groups, economic groups willing to control natural resources as a "new" source of benefits. They might have already appeared in developing countries with a lot of forest area and natural resources.
- -
- In the developing word: China, Morocco, South Africa, India
- They are both companies from other branches of industry and consumer/citizen groups with different stakes and interests. They will appear both locally and globally, both as local interests and as global networks using electronic communication. New players will appear more in areas with plenty of forests, a lot of possible uses and many inhabitants. Inner parts of Russia or Canada will not be focus for intense activity and interest.
- I think that the forest can be used for a much larger variety of products which means that other players will come in and competet with the traditional forest industry. Can mean that the forest industry might have to redefine what they really are. Forest industry, packaging industry, information industry etc.
- ----------
- Entrepreneurs in nature-based tourism, appearing in all kinds of forests.
- Any kind of stakeholders. They will able to dictate the basic rules of forest maangement
- eco -turism
- "Green chemistry" industry
- Local residents inproximity with forestRégional institutional powerEnergeticians

- GMO commercializarion

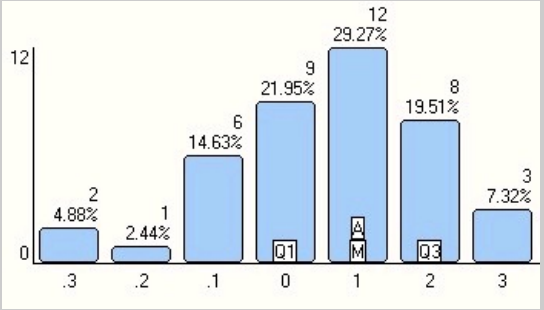
Question 5: In the survey responses the multiple needs and demands for forests and forest resources came apparent - that is the needs of today as well as the needs in the future. **Are forests more of a source of contlicts than source of solutions, and how do you expect the situation to change in the next 40 years?** (0 = "neither a source of conflict or source of solution").

2010

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=41, A=20.00, M=20.00, Q1=10.00, Q3=30.00

Forests as a source of conflicts



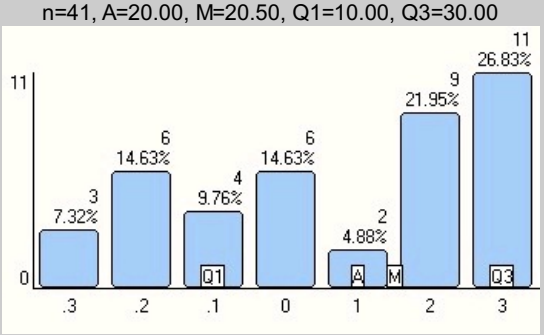
Forest as a source of solutions

2050

- .3 = 3
- .2 = 2
- .1 = 1
- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3

n=41, A=20.00, M=20.50, Q1=10.00, Q3=30.00

Forests as a source of conflicts



Forests as a source of solutions

If you wish, you can explain your answers - please indicate also the geographical scope of your response:

- (Question seems too vaguely defined for me)
- This question is debatable and I probably don't answer very well. My problem is that I see the future with forests both as a source of solutons and of conflicts. Let me say that conflict are bigger when solutions are more attractive. In fact, the question is debattable because conflicts are not in opposition with solutions. My wish would have been to answer, for 2050, 2 on the conflict side and 2 on on the solution side. The geographical scope will be for the temperate zone (meditterranean region excluded).
- Europe only!
- I don't like how you put this. I think they are a source of solutions, but that utilization of forests will still cause conflicts. I would vote 3 for both axis.
- Of course there will always be conflicts but the benefits of having forests are so much larger than the conflicts caused over forests. We need forests for biodiversity, food, building material, etc. Which building material is more renewable than wood?
- climate change iand biodiversity ssues will put more pressure on forest protection, while the demand of land use for food, non-food and energy crops will increase
- Pressure will increase on forest resources and therefore inevitable conflicts will get more pronounced.
- Forest will by 2050 provide a much wider range of services: (new) material, energy, medicine and general health benefits and thus better serve the needs of mankind.
- the need of harmonization of uses will be clear. The role of forest as renewable provider of goods and services will make it a source of solutions (at least in europe)
- Pressure on forests will increase due to rising demand for forest products, climate change effect and loss of

biodiversity, and the need for land use change by increasing populations.

- I believe that forests are not a source of conflicts or solutions at the moment. The only conflict, which cannot be attributed to forests, is deforestation and illegal logging. Once this is solved or minimize, forest will be solutions to many of the demands of the modern society.
- 2050 Europe: competition between different land uses become more apparentWood as a renewable material will be fought upon
- As it is today it will be in 2050 that conflicts are often based on unstable or unsecure governmental laws/regulations.
- European forests and forestry has moved towards a sustainable management of natural resources, therefore it might be suspected that their public conception would move into direction of being viewed as a solution to climate change, water, soil, biodiversity conservation solutions.
- conflict for land and resource use
- For sure the pressure on forests will only increase. But that is exactly BECAUSE the forests will be more and more a source of solutions. When demand increases and offer reduces, prices will be under much pressure and risk for conflict will be higher.
- Whether forest is a source of conflicts and solutions, is depending on the region and the people. I am from the mediterranean area, and I guess that here they will be more conflictive. Maybe in less populated countries of northern europe, with stable and important movement of wood, the perception will be likely to be a source of solutions.
- Better communication is possible
- At now, diminuation of forest area and quailty is the easiest example of conflict. The conflict has many roots, but in essence it is social and political: which interests dominate land and forest use and which groups of people are marginalised in the process? The situation might develop in a better direction only if present and future forms of one-sided and short-sighted excessive forest use is heavily sanctioned and social forestry in sustainable and socially inclusive forms is strongly promoted.
- The carbon market is growing and Forest plays a important role in it. Today this market is only residual (mostly used to fulfill the goals of some political agenda) but It is expected that forest can grow its environmental importance in terms not only of the carbon market but also due to the protection that forest can bring to the quality of water and the protection of natural watercourse
- Spain
- Forest sensibility to climate change Consequences of evolution toward a more intensive management of forest, landsacpes changes and conflict with residentsEvolution of the rural territories where are located forests

Here you can add any other viewpoints to the role forests and the forest-based products and services in 2050 or leave feedback to this survey.

- See comments above !
- A tree is a product of about 70 million years of natural development. The mechanisms that enable the trees to grow and survive in most extreme and versatile environments are not yet understood and maybe will never be understood fully. There will be two majors aspects to the development of the industry: the source of raw material and the understanding and utilization of it. I think the latter will rule the economy development.
- I think forest will become more important as society evolves and gets better educated on the role of forest and what they provide to the society.
- Nice questions! Particuralry the question number 5
- The role of forests and forest-based products and services will increase in 2050 and theire share will be more than now.
- The questionnaire should include several ready-prepared biodiversity, environmental oriented questions aimed at public - general needs, not a primarily private-based sector of forest and wood technologies, short rotation forestry and similar outcomes which can be seen as predisposed from the current questionnaire, including these five additional questions in the survey.
- My feedback should be anonymous.
- An international meeting would very welcome and very needed to discuss these kee issues. An electronic survey is far far less efficient than a real meeting whers professional scientists / foresters could exchange their views and discuss them, with the other xolleagues. Please, thing about it!
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