

REDISCOVERING WOOD: THE KEY TO A SUSTAINABLE FUTURE
THE INTERNATIONAL CONFERENCE ON THE ART AND JOY OF WOOD

BANGALORE, INDIA

19 OCTOBER – 22 OCTOBER 2011



PROCEEDINGS

PART 1- CONFERENCE OVERVIEW

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Technical Committee: E V Anoop (KAU, Thrissur, India), T K Damodaran (KFRI, Thrissur, India), Sujatha Dhanapal (IPIRTI, Bangalore, India), Patrick Durst (FAO, Bangkok, Thailand), Sangeeta Gupta (FRI, Dehradun, India), Eric Hansen (OSU, Corvallis, USA), Mike Hou (IWCS, China), Jeremie Mbairamadj (FAO, Rome, Italy), Howard Rosen (Washington DC, USA), V P Tewari (IWST, Bangalore, India), Jukka Tissari (FAO, Rome, Italy), Adrian Whiteman (FAO, Rome, Italy) and Illias Animon (FAO, Rome, Italy).

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Organising Committee: Pankaj Aggarwal (IWST, Bangalore, India), Vipin K Chawla (IPIRTI, Bangalore, India), Su Jinling (IWCS, China), S C Joshi (IWST, Bangalore, India), C N Pandey (IPIRTI, Bangalore, India), A M Singh (MOEF, New Delhi, India), Jagadish Vengala (IPIRTI, Bangalore, India) Adrian Whiteman (FAO, Rome, Italy) and Illias Animon (FAO, Rome, Italy).

Photo Contest Judges: Kartiki Gonsalves (India), Tomasz Juszcak (Poland), Masakazu Kashio (Japan) and Marco Perri (Italy)

Painting Competition Judges: Jasmine Khanna and Shan Re

Poetry Competition Judges: Malathi Rao, Vimala Rao and L N Santhkumaran

Summary

This conference and exhibition was one global event to celebrate the International Year of Forests. This was organized to help the participants understand the outlook for wood products and contribute to develop strategies for future sustainable development. The main intention was to explore how socio-economic trends are affecting the use of wood products and what challenges and opportunities arise as the consequence of these developments. Underlying belief was that greater wood use can make a significant and valuable contribution to society's desire for a more sustainable future. Also, a sustainable and prosperous forest products sector is essential for sustainable forest management.

This conference attempted to explore how the changing expectations of consumers and society shape the future for wood products. It also intended to examine how producers and users of wood can respond to these changes to identify potential opportunities and strengthen sustainability in the sector. It partly focussed on the social, aesthetic, cultural and traditional aspects of wood use and how the strong linkages between wood and society could be used to support the future development of the sector as a whole.

The event comprised of four-day conference (including one day field trip) and exhibition. It was held at the J. N. Tata Auditorium Complex located at the Indian Institute of Sciences campus in Bangalore, India from 19 to 22 October, 2011. More than 60 presenters from 18 countries orally communicated their ideas and about 15 poster presenters showcased their stories. More than 278 attendees from 30 countries participated in the deliberations and discussions that spread into 17 sessions.

Alongside the technical sessions, on all four days, a commercial exhibition and wood products display was held adjacent to the conference venue. This provided hands on experience because it portrayed the art and joy of working and living with wood to the participants and the general public. Commercial exhibitors showcased their products or services containing a high degree of craftsmanship, artistic input and innovations to the conference participants and about 5,000 local visitors. Wood carvers and other artisans from China, India, Cameroon, Indonesia, Japan and Turkey demonstrated different wood carving styles and techniques. Videos of the presentations, exhibition, field trip, cultural events etc are available at <http://www.wood.info/artjoywood/?p=video>.

Take away points relevant to policy makers

1. Wood products that embrace culture and traditions are gaining popularity. These connect the past with the present through well designed wood products that suits the changing lifestyles of the society. This trend will benefit the small and medium wood-based enterprises in future. However, for achieving this, wood use should be integrated in national policies and green growth frameworks. Policies that discourage wood use should be reconsidered because sustainable production of wood presents new opportunities in many parts of the world to revive the wood culture.
2. Wood utilization policies should ensure sustainable wood supply to small and medium enterprises.
3. Adding as much value as possible to every m³ of wood through product and process innovations should be encouraged by policies and incentives. One aim should be to maximise livelihood opportunities while minimizing over-exploitation of wood resulting from mass production of low value products. Maximum value should be added before wood products are exported.
4. Policies should promote wood use considering its environmentally damaging substitutes with the new understanding of life cycle analyses (LCA). As green programmes outside the forests are expected to produce more wood, policies should govern how wood is used to pave ways for a sustainable future. Policy coherences regarding integrating wood use at intersectoral level is a great need. Standards and codes, regulations etc should be re-examined with better understanding on the wood's credential.

5. Policies should encourage the use of 'good wood' to benefit the economy, environment and society with the view of enhancing sustainable forest management (SFM).
6. The credentials of wood should be communicated well to potential wood users and general public. Celebrating National Wood Day and encouraging wood user networks could promote wood use. In order to address threats like deforestation and to build consumer confidence, certification measures that indicate 'good wood' should be promoted without significantly impacting negatively the small and medium wood-based enterprises.
7. Education on how to use wood should be promoted to inspire the young people and to address the skill shortage in many regions to work creatively with wood.
8. Alliances involving foresters, environmentalists, architects, designers etc should be encouraged to find new opportunities for wood and strengthen the links between the producers and users.

Take away points for wood users.

1. Product and process innovations that consider the socio-economic trends are the key to survive a crisis and stay well in business. The relevance of art and joy of wood concept is implied in attractive products that employ better designs and integrate sustainability into the products. They touch the heart and mind of people. The societal requirements for modern lifestyle products need to be integrated into the wood product itself. Customization of wood products and finding the right niche is essential for survival amidst increasing competition. Drawing inspiration from local traditions and culture is of great importance to innovate, diversify and design the products that suit the changing lifestyle needs.
2. To inspire the people who do not currently use wood, working closely with designers, architects etc is essential.
3. Limited raw material supply constitutes a challenge for many entrepreneurs, but shifting to unconventional species and production of high value products could address this partly. Recycling wood, designing hybrid products with compatible material, minimizing wastage and using every part of the tree etc are important to maximise resource use and profit.
4. Wood users should share knowledge through global wood networks to increase efficient wood use and enhance global wood use.
5. Actively communicating to the public (e.g. Wood Day, high impact events etc) is indispensable to convince how wood use can make a difference to our life.
6. Considering the new markets in the back drop of lifestyle changes, wood users should prepare themselves to capitalize further on the emerging marketing opportunities of social networking, internet technologies etc.

Take away points for general public.

1. Public perceptions towards wood use remain negative mainly stemming from the fear of deforestation and negative impacts on environments caused by exhaustive exploitation of wood for mass commodity production in the past. The art and joy concept of wood use propose turning the

old consumption model around and promotes use of 'good wood' for high end uses. So, it is relevant even in wood scarce regions.

2. Using 'good wood' from responsible sources is essential to benefit the society, economy, environment and SFM. Massive tree planting outside conventional forests provide new opportunities for production of 'good wood'. This would enable transition to wood from its environmentally damaging substitutes that replaced wood in the last two centuries. Unless the public understands well what wood can offer, this transition is impossible. Consequently, its potential contribution to support the livelihood of millions of people and a green economy will continue to be underexploited. So, it is relevant to change the unfounded negative societal perceptions towards wood.

Conclusions

The conference concluded that forestry, as a profession, has often failed to engage with people on an emotional level about the qualities and benefits of wood products, with most of the discussion about SFM focused on scientific and technical debates. Linkages existing between wood and society on social, aesthetic, cultural and traditional aspects were inadequately emphasized in the past. While people understand that wood products are preferable to non-wood products from an environmental perspective, they remain concerned about the environmental impacts of tree harvesting and are sceptical about progress in this area. The green credentials of 'good wood' need to be communicated more. Focusing on efficient wood use (e.g. minimizing wastage, recycling), attractive designs etc will result in eco-friendly and higher value wood products portraying the art and joy of wood. They will meet the environmental, artistic and cultural aspirations of the society while supporting the livelihood of people and SFM.

The art and joy of wood is an attractive concept and reflects the livelihood and artistic dimensions of wood. However, this needs to be popularised widely so that everyone gets inspired to take a piece of the forests to their homes and get connected to the nature and environment in more sustainable ways.

Objectives of the conference and intended impacts

Increase in wealth in many regions implies threats and opportunities to sustainable development. Wood that is produced sustainably and used wisely has a role to play here. Being a natural and recyclable material that originates from a renewable resource that stores carbon, wood and wood products possess many positive environmental attributes. Despite this, the public has not viewed wood use very favourably in recent years, tending to link this with bigger problems in forestry like deforestation and forest degradation. However, these perceptions may change as societies move towards a low-carbon or "green" economy and people move away from the dominance of mass-production in modern lifestyles. This event was therefore proposed in the firm belief that greater wood use can make a significant contribution to society's desire for a more sustainable future. The underlying conviction was that a sustainable and prosperous forest products sector is essential for sustainable forest management.

a. Relevance of the theme

In a green economy, the role of wood as a natural and renewable product needs more emphasis. Contextually, sustainable production and use of wood deserves more attention than ever before. This is indispensable for our sustainable future. The International Conference and Exhibition on the Art and Joy of Wood was organised as part of the International Year of Forests with this view to promote discussion and share ideas on how more widespread wood use could be encouraged, capitalising on the emerging social trends in the 21st century.

Even though wood products constitute an indispensable part of human life, the importance of wood production is sometimes overlooked in debates about forestry and forest management. This lack of

attention was the motivation to try to explore these issues, in particular how far the social dimensions of wood use (culture, traditions and aesthetics) can be integrated into the development of the sector.

The economic and environmental dimensions of wood product use have been discussed widely now, but the discussions on the socio-economic, aesthetic and cultural dimensions of wood use seem limited. The theme of art and joy of using, working and living has never been relevant in the past as of today. Their relevance is demonstrated by the innovations that blend art and joy theme with our modern life (e.g. Apple computers). Following this trend, high value wood-based handicrafts, building products, musical instruments, furniture, wood panel products, sports goods etc would gain more relevance to our life. The relevance of adding value per m³ of wood is gaining much relevance as wood is scarce in many regions. This added value implies numerous livelihood options, especially for the rural population. Creativity reinvigorates the 'art and joy' of using wood to pave way for innovations. Nevertheless, how the producers should reorient themselves to find innovative opportunities using the emerging trends have not been discussed widely. This conference intended to address this gap.

b. The objectives and deliberations' composition

The overall objective of the conference was to help the participants understand the outlook for wood products and contribute to develop strategies for their future development. The presentations and discussions were expected to shed new light on how wood use can continue to contribute to sustainable development and remain firmly connected to human life. They were expected to persuade the participants regarding the bright future of wood in a more sustainable World and to give away new ideas to benefit their work on the ground.

The specific objective of the conference was to explore how socio-economic trends are affecting the use of wood products and what challenges and opportunities arise as the consequence of these developments. Thus, the conference aimed to examine the following issues:

- How wood use can make a greater contribution to sustainable development and
- How wood producers and users can benefit from increased prosperity and the growing demands for more sustainable consumption and lifestyles.

The conference tried to examine the ways in which the production and use of wood products can contribute to sustainable development and how growing demands for sustainability might present new opportunities for the development of the wood products sector. This conference focused, on the socio-economic, aesthetic and cultural dimensions of wood use that will encourage more widespread wood use in the 21st century. The discussions surrounded the three themes below.

Emerging trends in economies and lifestyles: What are the main trends affecting wood use and how can these be utilised to strengthen the forest products sector?

Stories portraying the winds of change: Case studies showing how some wood producers and users have already developed strategies or innovated to build successful enterprises based on changing consumer demands and needs.

Wooden paths to a sustainable future: How can the linkages between wood use and sustainable development be strengthened and used to promote more and higher-value wood use?

Among others, the specific questions that the event tried to address are:

- What are the broad social and economic trends affecting the markets and end-uses of wood products?
- How are producers and users of wood responding to these trends and what more can be done?
- What is the scope to develop higher value wood products that capture some of the benefits of rising prosperity?
- Why do negative perceptions of wood use persist in some places and how can these be overcome?

- How can stakeholders in the wood products sector develop strategies to strengthen the linkages between wood use and sustainable development?
- What types of support are needed from policy makers, researchers, technical experts and industry associations?

The deliberations were expected to share views and experiences and enable better networking amongst the participants so that everyone will take away better idea on the outlook for the sector.

c. Intended impacts

The event was expected to improve our understanding on the linkages between wood and society that could be used to support the future development of the sector as a whole. Within this objective, increased visibility of wood in the International Year of Forests was one of the intended outcomes of the event. The success of the event was expected to be based on (i) the feedback of the participants (ii) the innovative ideas propagated and (iii) the benefits to participants' work on the ground.

The Structure and organization

A The building blocks

The event was comprised of four day conference (including one day field trip) and four-day exhibition. It was held at the J N Tata Auditorium Complex located at the Indian Institute of Sciences campus in Bangalore, India from 19-22 October, 2011. Videos of the presentations, exhibition, field trip, cultural events etc are available at <http://www.wood.info/artjoywood/?p=video>.

1. The conference: The conference spread into 17 sessions in three days including an opening ceremony on the first day and a plenary session on the last day.

Presenters and attendees: More than 60 presenters from 18 countries orally communicated their ideas (Appendix 1) and about 15 poster presenters showcased their stories. About 278 participants from 30 countries (see Appendix 2) heard innovative ideas from the experts at the cutting edge of the industry. The foreign delegates constituted roughly 50% of the participants (excluding the students). This event targeted not only foresters but also many innovators (e.g. designers) and practitioners (e.g. architects of wooden multi-storey buildings) who could play crucial role in wood's development on our journey to sustainable development.

2. The commercial exhibition: Alongside the technical sessions, on all four days, a commercial exhibition and wood products display was held in the exhibition ground adjacent to the conference venue. Forty booths occupied by diverse exhibitors (more than 100 persons) provided hands on experience because it portrayed the art and joy of working and living with wood to the participants and the general public. It synchronized well with the deliberations happened within the conference halls.

Exhibitors and visitors: Commercial exhibitors included those organisations specialising in products or services containing a high degree of craftsmanship, artistic input and innovations. The exhibitors occupied all the 40 stalls (3m*3m) and the diversity of the exhibitors was unique with 9 plywood and panel exhibitors, 4 equipment and service providers, 10 consumer goods and services, 7 institutions and organisations and 10 artisans (Photos 1-6). The musical instrument makers, furniture traders and artisan groups caught the attention of the visitors and media.



Photo 1. A snapshot view of the exhibition



Photo 2. Diversity of exhibitors- musical instruments



Photo 3. Diversity of exhibitors- handicrafts



Photo 4. Diversity of exhibitors- furniture



Photo 5. Diversity of exhibitors- souvenirs



Photo 6. Diversity of exhibitors- doors and windows



Photo 7. Artisans making handicrafts



Photo 8. Artisans showcasing their products

Ten groups of sponsored artisan exhibitors demonstrated a variety of handicrafts. Sixteen artisans who came from 9 Indian states showcased their crafts and a range of different wood carving styles and techniques (Photos 7-9). They presented, in a practical way, the art and joy of wood. Wood carvers and other artisans from China, India, Cameroon, Indonesia, Japan and Turkey demonstrated their skills and techniques to the conference participants and public (Photos 10 and 11). This attracted about 5,000 local visitors (including a large number of local students - Photo 12) who were also made aware of the relevance of the International Year of Forests.

Artisans' skill demonstrations: The artisans from 6 countries demonstrated a range of different wood carving styles and techniques to the participants and public at 30 minute intervals (Photos 13 and 14). This generated curiosity among other artisans and it turned out as 'learning from each other's' experience.



Photo 9. Artisans displaying their products



Photo 10. A Cameroonian artisan working with wood

Photos, photo stories, poems and drawings display: The winning entries of these competitions were displayed at the exhibition that attracted attention of the visitors.

The International Year of Forests T shirts and bookmarks- In order to generate awareness regarding the importance of the year to forests and wood, visitors were given a special IYF bookmarks produced by FAO-India office, New Delhi. Visitors were encouraged to state "why wood is good" in the feedback sheet selected 40 of which received the International Year of Forests T shirts provided by FAO, Rome.



Photo 11. Japanese artisan working with face masks



Photo 12. Students learning from the artisans



Photo 13. An artisan demonstrating his skill to visitors



Photo 14. Another view of skill demonstration to visitors

3. Social and cultural activities: Additionally, diverse social and cultural activities provided a practical and "hands on" experience of the themes of the conference.

a. Music from wood concert: The concert was given by the Laya Lahari Percussion Ensemble of the Ayyanar College of Music, Bangalore. Traditional wooden instruments were explained to the participants and local musicians played them during this concert that demonstrated the rich variety of musical styles found across India (see more at <http://sites.google.com/site/anoorshivu/layalahari>).

b. The field trip: On 22 October, after the conference, participants went on a field trip to a Sandal Soap Factory (instrumental for producing sandal soap in Karnataka state since 1916- <http://www.mysoresandal.co.in/aboutus.php>), Mysore Palace (a treasure house of artworks and exquisite carvings which was rebuilt in 1912 after the original palace that was made of wood got burned down in 1897- <http://www.mysorepalace.gov.in>) and Channapatna village (famous for the production of a particular form of laquered wooden toys and dolls whose traditional craft is protected as a Geographical Indication (GI), administered by the Government of Karnataka). These demonstrated the art and joy of wood and provided enriching experience to the participants.

c. Institute visit: Tours of the Institute of Wood Science and Technology campus not only exposed the facilities available at the Institute but also showed the fenced sandal trees indicating the hard realities of sustainable production of wood on the ground.

d. Networking opportunities: Conference dinner, cocktail reception and B2B meeting enabled better networking amongst the participants.

4. Competitions related to the event: Reflecting the theme and artistic contributions of wood to the society, competitions were organised for photographs (global), photo-stories (global), poetry (national) and drawing (local) on the theme "art and joy of wood".

B Event organisers, financiers, sponsors and supporters

This conference and exhibition was hosted by the Indian Ministry of Environment and Forests. It was organised by the Institute of Wood Science and Technology, Bangalore (India) Indian Plywood Industries Research and Training Institute, Bangalore (India) and Indian Forest Research Institute, Dehradun (India) in collaboration with the Food and Agriculture Organization of the United Nations (Rome) International Wood Culture Society (China) and International Union of Forest Research Organizations.

FAO provided major chunk of the financial requirements of the event. The Indian Ministry of Forests and Environment, Government of India sponsored the reception and IWST provided most of the logistic and organizational needs for the conference and IPIRTI for the exhibition respectively (including staff time). The IWCS sponsored considerable number of paper presenters, participants and artisans. FAO supported the travel and subsistence of the artisans came from different corners of India and supported the travel of a few presenters and participants.

The main sponsors were the American Hardwood Export Council and Programme for the Endorsement of Forest Certification (PEFC). The Commonwealth Forestry Association (CFA) partly supported the Students' conference. Other sponsors include Industrial and Laboratory Equipment Co. (Mysore), Bangalore and Elixir Technologies, Bangalore. The 'Wood News', as media partners for the event, popularised the event amongst its readers. Likewise, many organizations popularised the event through magazines or newsletters (e.g. Modern Woodwork, Teaknet Bulletin, Wood and Ply Digest, Non-Wood News, InfoSylva etc), email blasts and websites.

Synthesis of the presented ideas

Opening ceremony:

Mr S Suresh Kumar (Minister for Law and Urban Development, Government of Karnataka, India) inaugurated the Conference in the presence of Mr Jitendra Choudhury (Forest and industry Minister, Government of Tripura, India- who presided the opening ceremony), Dr P J Dilip Kumar (Director General, Indian Ministry of Environment and Forests), Dr V K Bahuguna (Director General, Indian Council of Forestry Research and Education), Dr Michael Martin (Director, Forestry Department, FAO, Rome), Dr Howard Rosen (IUFRO), Mr S C Joshi (Director, IWST, India) and Dr CN Pandey, (Director, IPIRTI, India) (Photo 15) .



Photo 15: Lighting the lamp to inaugurate the event- a local tradition

Most of the speakers talked on multiple perspectives on why wood are good. Mr Joshi described the current view of wood use as an environmentally unsustainable activity in India even though wood use has been prominent in the past and art and joy of using wood has been part of the culture. He explained how the policy makers and politicians are influenced by narrow views of conservation impacting forestry and wood use negatively which has

implications on the livelihood of people. Mr Suresh Kumar, while emphasizing the relevance of celebrating wood for art and joy, described the conference as one rare occasion where science, culture, art and joy meet on the same platform to commemorate and recognize wood's legacy. In urban environs, he explained wood brings natural beauty and 'woods and wood' cannot be separated from everyday life. Dr Bahuguna explained that the artistic view of wood use will bring back the glory that wood enjoyed in the past, before the substitutes emerged.

Mr Chaudhury described the International Year of Forests as an opportunity to reinforce the relationship between the mankind and forest ecosystem and to benefit our sustainable future. The shortage of hardwood in many places has led craftsmen to use previously unused alternative species. At the same time, due to lack of alternatives many people exploit hardwood as fuel for meeting the livelihood needs. Bamboo has been seen as an alternative to address the shortage of wood in Tripura state in India (with 23% of the area is under bamboo cover) production and consumption of which creates considerable local employment through value addition and product diversification. This model has changed the old perception of bamboo as poor man's timber. Likewise, rubber wood from plantations (used as firewood earlier) has also seen greater value addition by local artisans and product manufactures that has increased the export potential in recent years. These have implications on the livelihood of people and the revenue to the state. Further, the low embodied energy of these wood products (against non-wood substitutes) and insulation properties make wood much environment-friendly. The success lies in SFM and how one harnesses the potential through creative entrepreneurs. Ecotourism and provision of ecosystem services could grow as a by product of production of the raw material for this.

Dr Dilip Kumar highlighted the credentials of wood drawing from his past personal experiences especially from musical instruments which has been predominantly handicraft-based than produced in masses. He linked illegal removals of trees in India due to the overreliance on a specific species for a specific purpose. The demand for wood products could escalate at a faster pace due to rapid economic growth in India which is already a net importer of wood. Concurrently, the forests are expanding in the country (with the involvement of local communities). Tree cover is expected to spread mainly outside the conventional forest areas with the greening programmes like the 'Green India Mission', one of the eight missions of India's action plan on climate change. Expanding urban areas will require more woods, particularly for green spaces that maintain the health of the society and environment.

Dr Michael Martin explained that culture embraced wood in the past and we should connect it with sustainable consumption and production needed in the future to serve the needs of the impending 9 billion people. Dr Pandey suggested the relevance of 'breaking the ice' between various sectors to make wood available sustainably to manufactures of various products.

Why we are here? Different perspectives on the role of wood in sustainable development (Session I)

Dr Saara Taalas and Dr Dick Sandberg presented the relevance of looking in more detail the consumption patterns that will influence relationships with material culture. The consumption patterns change over time suiting to everyday life of that time at a locality. For instance, in Nordic countries, the same forests that served livelihood of people in the past are now important centres for recreation- a change of dimension from livelihood to sports. Thus, the relations with forests have dramatically changed. Many people are now secondary stakeholders (using its products) than directly depending on it for livelihood as people did 100 years ago. The same happened to the relation with the material originating from the forests. For instance, in Sweden firewood dominated harvest from forests (40%) in 1900, but is less than 8% now. On the contrary, pulpwood that was just 5% of the harvest in 1900 constitutes now 44%. Only sawmilling remained relatively the same. Visions for Finnish bio economy business levels reflect the increasing relevance of living trees and bio-energy in future. The wood products will be there but the requirements will change- from volume to specific requirements on properties (e.g. shape stability). The tactile of part of wood see more money but the traditional paper and pulp products are likely to lose its relevance in Northern Europe because of high prices, changing markets and long rotation of forest trees.

Thus, the pulp mills diversify with new products (e.g. textiles). Innovation in new processes will drive ways for new wood use in future (e.g. polymers and chemicals, bioenergy etc). Prioritising purpose will determine wood's value. For example, using wood for bioenergy (which gains relevance in Northern Europe) might negatively influence many other business levels. Increasing business value should be given emphasis as trees could be sold 100 times through process innovations.

Dr Michael Martin wondered why wood still continues to bear the consequences of negative perceptions of the society. He explained how wood use could help to take the forest to home and meet the aspiration of the modern society towards nature. Despite several advantages of wood to store carbon to mitigate climate change, the global forums seem reluctant to promote it. One reason for this is the approach of the wood products industry for satisfying the material needs that expanded from the artisan level to very large scale (e.g. paper and pulp). The demands of economies of scale (reducing costs and being competitive) led to expansion of large industries within short time span. Consequent ramifications of large scale exploitation (e.g. clearance of forests) were not coherent with peoples' sentiments concerning forests and did not correspond to their views of forests as a source of a myriad of things. Consequences of these actions combined with the internal value struggle amongst public regarding other uses of forests paved way towards negativism regarding wood products.

This is the right time to address this paradox for sustainable development using wood which is well embedded in the culture of many parts of the world. Wood use is part of relic of the past and still portrays high social and cultural value in many societies. Many countries try to move towards modern wood products today partly because wood products could capitalise on the efficiency of photosynthesis and replace the material that damages our environment. Considering the needs of the imminent 9 billion people, production and consumption of wood cannot be thought separately. The challenge today is how to bring back the positive attributes of wood by rescaling the concept of consumption model from commodity products to value added products. One way to achieve this is to work closely with the futurists and those who could provide inspiration like designers, architects etc. Such an alliance might pave way for the rediscovery of a series of products based on photosynthesis with a common perception of a sustainable future. It will create a product opportunity that is renewable and which captures and store carbon. Effective communication on the credentials of wood is needed to enlighten the potentials of wood use for sustainable development.

Contextually, there are lessons to learn from the craftsmen in many parts of the world who add value to wood by creativity. They practice value added production than commodity production. This implies turning the economic and consumption model around. One way to this is to concentrate on art, beauty and tradition to draw inspiration for future applications based on traditional designs and uses which has relevance in today's life. This will enable planting more socially preferred trees and set a legacy of using more 'good wood'. While deforestation remains as a big issue in some regions of the world, tree planters struggle to find good market for sustainably produced wood in some other regions. The challenge is how to give value to that wood where the 'art and joy concept' could draw its importance. For example, using only locally produced food products in some restaurants in Italy enhances the value and relevance for such products. Product differentiation and product distinction and naming them have advanced in agricultural sector where forest products remain to find its way. Therefore, a better alliance between futurists, architects, planners, designers, product manufacturers and foresters is crucial to make a difference in making a rational linkage between wood products sector and sustainable development.

Dr Balaram proposed the design needs of wood relating to spiritual connections between the society and wood. Artistic products constitute spiritual attainment for many handicraftsmen who make the wood live again. This powers the life of dependent people in their families. The cultural ethos like 'trees as god' existed in India where permission was sought from a myriad of creatures before trees were cut. Wood use continues to exist in many parts of the world catering to the diverse needs of the living or the dead (e.g. sandal wood or cremation by the rich) and the industry. In many cases, wood use implies that the past co-exists with the present because it takes traditions into the modern society. Despite having more than half of the world's forests, many developing countries export unprocessed/minimum processed wood. This

constitutes modern colonization in a globalised economy. The future for sustainability is better indicated by green awareness, green movements and green guarding which act against unsustainable industries. Designing could effectively help to tap its potential at three levels (a) planting more trees (b) processing of wood and producing end products that minimise wastage (e.g. using every part of the tree, not high grade timber alone) and (c) enhancing opportunities for reuse. Employing various qualities of wood has resulted in low cost products which are light and beautiful. Innovations emerge out of imagination, creativity and technology integrating the special qualities of wood. Thus, technologies shape wood and wood could suit modern technology (e.g. wood laptops). Mindful designs enhance value of the tree by using every part. Adding value by wood's reuse they discourage extravagant wood use and help in innovative policy interventions. These could contribute to SFM and poverty reduction through beautiful products that helps to nurture nature. However, local people do not get enough wood due to concessionaires who target international markets. Contextually, illegal logging, even though not desirable, offers livelihood at certain instances to a few people who do not have much alternatives. Laws remain unenforceable in some situations like this.

Dr Pascal Kamdem explained wood's role in sustainable development of Africa quoting the case of Cameroon where timber constitutes the main export product after crude oil and petroleum products. All the three sectors of forestry viz. (i) silviculture (production of wood) (ii) first level of transformation (logging and saw milling- low value added) and (iii) second level of transformation (furniture, construction, crafts etc- high value added), face problems. Artisans lack good quality wood because large companies export wood to cater the need of international markets. About 30% of artisans work in informal sector with low emphasis on sustainability. Their livelihood could be improved by better strategies. Export continues without much processing despite laws in the disguise of not commercially important species. The wastes are enormous due to absence of the industries that could use wood residues, small diameter logs and currently unused parts of the tree like branches. Currently, logging and sawmilling adds very little value and is very primitive. Secondary sector is underdeveloped and oriented towards export. Nearly 60% of the primary and secondary sectors are represented by the artisans (only half in the formal sector). There exists opportunities to advance in the secondary sector through training to add greater value which will enhance job opportunities. Only two species account for 55% of the total production because of international demand and no strategy exists to meet local demands. Interventions by technology, infrastructure and marketing strategy (that enhances local consumption) will improve the wood industry that accounts for 6% of the GNP. This will consequently increase job opportunities for people and increase national income. The taxes related to import of tools and equipments should not impose barriers to technology transfer. Likewise, financing local entrepreneurs will help to address the issues in the processing sector. Direct channels of communication with the local people (e.g. wood tours) will open ways to improve wood's status for sustainable development.

An introduction to wood culture: building on the past (Session II)

Dr Howard Rosen described the evolution of wood culture in the USA (the value and the way one uses wood in the society) where per capita consumption of wood and fibre products is four times the world average. Yet, growth dominated removals in recent decades in the US forests. Historically, wood dominated the life of early settlers who found myriad of opportunities with wood causing massive scale destruction of forests. The destruction of forests continued till the beginning of the 20th century till the idea of wise use of forests and making it open and accessible to all the people emerged. Most of the large trees gradually disappeared and products emerged using small size timber. Adoption of wood composites, wood plastic composites and carbohydrate economy (cellulosic biorefinery) is on increase in the USA.

Dr Sangeeta Gupta narrated the historical connections between wood and Indian life for the last 5,000 years some of which continues even today. She described how wood shaped Indian life with diverse wood use (based on scientific wisdom of wood) in temples, palaces etc that varied at different parts of India. Wood, excavated during archaeological excavations, gives links to diverse wood culture of the past. Local knowledge matches with modern day findings regarding wood's potentials that enabled its use for thousands of years. However, in India there is high demand for wood and supply is limited. This paves way

for illicit felling and inappropriate wood substitution damaging the environment. Removal of trees from natural forests is banned in the country. Likewise, wood use is banned for certain purposes (e.g. construction by government agencies). However, the relevance of locally grown wood enhances in India, with the emergence of new national programmes like the Green India Mission.

Dr Andrea Klein indicated the relevance of not discarding the wood that deviates from straight design. She explained the evidences of its use in the past ranging from wooden tools in the Bronze Age to ship building in the 18th and 19th century. Thus, the crooked tree or their parts which is normally discarded by many people could find better uses by employing design capabilities better for specific application and taking advantage of the natural shape. Thus, the value of the trees could be enhanced.

Mr V Ramakrishnan demystified the fourth dimension of wood as the indescribable feeling beyond the five senses which draws from the umbilical connection of humans with nature. For example, using wooden benches for Ayurvedic treatments provide a feeling of healing even before someone starts the treatment. Likewise, the casks providing special tastes to whisky constitute another example to the fourth dimension. It is the feeling of oneness or exhilaration with nature and tranquillity and eternity which is embedded in many cultures (e.g. seeking permission from the tree before cutting it).

The use of wood in different cultures (Session III and V)

Dr Michael Grabner narrated how to draw the ideas for the future based on historical wood utilization. For example, most of the traditional skills are being lost in Austria with disappearance of the craftsmen. He explained that current utilization of wood in Austria can benefit from the past history (e.g. producing of wooden bags instead of plastic). Sustainability is an issue (despite comparatively high forest cover in Austria) which indicates the need of using presently underutilised species and assortments. An interdisciplinary view is greatly helpful to this end.

Dr Kunhamu elaborated the wood legacy of Kallai, a suburban village and a historic wood trading centre in South India. He explained the upturns and downturns of the wood trade in Kallai which once dominated in south Asia. It was attributed by bountiful supply of diverse high quality timbers from nearby public and private forests to meet international market demands. Private forests (with little extraction control) supplied timber to sustain trade. The first organized saw mill in Kerala was established here in 1893 for wood processing. The domination could be attributed to the demand for specific timbers of certain dimensions for specific end uses (e.g. long teakwood planks for boats for the Royal Navy and in the Middle East). Most of the saw mills disappeared gradually due to diminishing raw material supply (due to ban on clear felling, nationalising private forests etc) and trade. Consequently, the tribes (Baramis and Khalasis) engaged in ship building locally lost the job opportunities. Gradually the traders who survive today diversified trade concentrating on lesser used species and catered to the needs of domestic small timber demands. Currently, boat building gains relevance stemming from its demand for tourism. About 63% of teakwood supply in Kerala is from the homesteads and forest department provides only 34%. The relevance of wood supply through trees outside the forests is therefore increasing. More attention and support to this could revive the local wood trade.

Mr Subramony and Mr Nripal Adhikari explained the potential of bamboos for housing programmes and the relevance of bamboos that occupy 3% of the world's forests, for environmental sustainability. Very short rotation nature of bamboo makes it as a sustainable and affordable material (30-50% cheaper than conventional material) for housing combined with its strength, insulating and earthquake resistant properties. Bamboo is gaining relevance as countries start changing building codes to enable its widespread use. It could help in post-disaster recovery also (e.g. Sichuan province, China) by addressing the shortage of raw material to rebuild.

Dr Victor Adekunle explained how wood has been part of human life over millennia and explained how wood, in form of boats, paved the way to Africa. He explained social, religious and magico-cultural aspects of wood in Nigeria and its versatility for sustainable national development. Wood is an integral part of the Nigerian society playing a significant role throughout the life right from birth to death. Myriad of wood

products suit societal culture and tradition (e.g. local music instruments, extracts from wood for local drinks, medicine etc) and provide job to rural people in Nigeria. Specially made coffins indicate value addition to wood based on the local culture. The role of wood in providing health care is increasing in Nigeria because of low costs, ready availability, proven performance and effectiveness to treat certain ailments, as local people believe, over modern medicine. As population increase the demands for wood also increases and it constitute as a challenge in forest management. The forest resources management in Nigeria fell in three phases viz. (1) the reservation phase between 1899 and 1930 (2) the exploitation phase between 1930 and 1960 and (3) the development phase from 1960 onwards. The first phase was led by colonial authorities (soon after the logging knowledge arrived in 1881 in Africa); the second phase was influenced by international markets and the third by large-scale afforestation. Considering the relevance of wood for GDP, national employment and export revenue in Nigeria, forests need to be sustainably managed. Sawn wood production constitutes the most active wood industry evolved from pit sawing since 1782 and the first mechanical saw mill by 1900. Plywood and particle board industry evolved from 1948 when the first plant was established (largest of that kind globally at that time) but most of them are moribund today. Diverse small scale wood-based industries are also scattered throughout the country. Provision of incentives for expanding their business and developing credit facilities to procure more efficient wood working tools will help this sector develop further.

Dr Jiang Xiaomei cited the relevance of Hongmu timbers (the woods used for the Ming and Qing Furniture like *Pterocarpus santalinus* in Qing dynasty and *Dalbergia odorifera* in Ming dynasty) which symbolise Chinese national culture. The artistic achievements of Ming and Qing dynasty are reflected in classic Chinese furniture (which has a history of more than 1000 years). The design of furniture and carvings on them are designed to carry the elements of Chinese culture. The human body engineering is also considered during designing (e.g. 'S curve' chair back). The 'tenon and mortise structure' (the soul of traditional Chinese furniture) makes the design unique. Hongmu culture also considers Chinese aesthetics. The timbers are sourced from various countries (e.g. *Pterocarpus santalinus* from India). The Chinese national standard 'Hongmu' tries to develop healthy markets since 2,000. While the living standards and the economy are fast improving, Hongmu culture is embraced by even common people. For better inheriting and developing Hongmu products, sustainable development of the resources (e.g. precious trees breeding project), utilising unconventional species and evolving designs that are rich in modern styles are important.

Dr Remadevi presented the wooden monuments in India that constitute as epitomes of beauty and portray local talent and traditions spanning centuries (e. g carvings in wood and architectural designs in palaces and temples). Wood played a great role in Indian society where one palace in 300 B.C. alone measured nearly 15 km long and 2.5 km wide. Diverse wood products manifest today the diverse local cultures that India inherited from its past. Even though the woods used for this varies across the country, they play a great role today in portraying the cultural heritage (e.g. Chariots) in India. She indicated the relevance of maintaining them by suitable treatments (e.g. wooden flag posts treated with oil before their use in temples) and preventive measures from all the agents of degradation. Conservation therapy needs development to enable appropriate interventions for this.

Dr Edmond Adjovi described the typology of wood sculptures in West Africa where wood resources vary highly between countries (from deserts to rain forests) that consequently shapes wood use in the society. The royal courts, traditional religions and agrarian rites were instrumental for developing sculptures, the main ones being statues and masks, statues, sculptures, furniture, tom-tom etc. These play a great role in the life of West African societies. They helped to express ideas in wood and reflect African culture which has been part of social life for 2,000 years (as in Nigeria). The craftsmen combined aesthetics and function within social, religious, cultural, political, economic, historic and therapeutic contexts. For example, masks represent specific circumstances of life and used for dance, marriage, funeral etc. Likewise, statues link the visible and invisible world (e.g. statues of twins in Benin).

Dr Stephen Tekpetey explained the lifestyles changes in a few urban centres in Ghana and showed the trends on substitution of wood in buildings. Export of wood products contributes significantly to the

national economy of Ghana. Wood has been a main ceiling material in buildings and residential complexes till the advent of substitutes recently and plywood dominates the scene currently. However, other material (e.g. plastic) are gradually replacing wood in urban centres because of lower levels of customer satisfaction on durability, attractiveness and design of wood-based panels. As people in Ghana are getting wealthier, durable wood supply is dwindling and information regarding availability of other material is growing. So, wood is likely to lose further. There is a need to educate people on the advantages of wood (e.g. thermal properties, carbon storage etc) over other material and address the impeding issues (durability, design, availability etc) with suitable interventions to retain and improve wood's prominence.

Artistic aspects of wood use and design (Session IV and VIII)

Prof Ranjan explained the aspects to learn from the design detailing in wood, particularly on the furniture design of Mr Gajanan Upadhaya, an Indian designer. A good furniture design evolves not by chance, but with a great thought process and fine detailing. Many a times the end product will not be known when the design process starts, but will be arrived at through experimentation and series of prototypes. He explained the fusion of ideas with other leading world designers that reflected in Mr Upadhaya's work. It indicates the relevance of designing with fine detailing to suit specific needs. It also involves an understanding of the geometry, structure, behaviour of the material used, world view regarding what will work etc. Future wood work and design has many lesson to learn from his works.

Mr Jirawat Tangkijngamwong emphasized the relevance of sustainable living as the key to a sustainable future. He portrayed the ways of wood use in Thailand where it has been an integral part of societal life. Only a small portion of the furniture industry is export oriented and most of them are small and medium enterprises. Most of these enterprises are slow, unproductive and uncompetitive who needs support. He emphasized the relevance to focus on certain areas like creativity and sustainability to add value to natural products. Thai design is a combination and contrast of material. It mixes traditional craft with new technology and aim for harmony of style and function and integrates the sense of Thai. It reflects nature because it draws inspiration from nature and everyday life. Deesawat (a company started as a saw mill in 1972) was shown as a good example of restructuring to small scale (with 200 staff) and innovate market opportunities to survive a crisis. Modular products suiting cosy lifestyles helped the company to survive the crisis. Low energy consumption and minimum wastes makes the process efficient. Design was the key element to manufacture the products that suit contemporary lifestyles (both indoor and outdoor). He discussed how this company minimizes energy consumption and turn wastes to wealth. He detailed the SOOK concept (small order O.K) in Thailand that helps wood industry to thrive.

Mr Achmad Zainudin explained how wood carving has been integral part of Jepara culture (in Indonesia) since the Stone Age. It continues to support livelihood of people even today (nearly 150,000 wood workers, mostly small scale businesses). Jepara represent the largest wood working cluster in Indonesia. Differentiation in terms of products and artistic creativity has been the key to its survival. However, the small scale industries face competition today against big players.

Dr Hakki Alma discussed various wood carving arts of Turkey and its historical relevance as one of the oldest arts of Turkey for thousands of years suiting to the local customs and culture. Distinct woodcarving in a few mosques in Anatolia, which dates back to the 13th century, portrays this. Animal motifs got gradually abandoned and replaced by vegetal and geometric motifs to suit the needs when the Turks adopted Islam. He explained how certain techniques learnt from the past (e.g. dovetail technique) and special tools could add value to the products today. He also stressed on the relevance of clustering small and medium enterprises.

Mr Kitazawa Hideta presented the relevance of Japanese traditional wood carving and its importance in Japanese culture. Wood carving has 1,400 years of history in Japan (started with Buddha statue carving). He explained diverse carving techniques he uses (following the heritage in the family) and showed the special tools he made. He elaborated his expertise in mask making with many woods (e.g. Hinoki or Japanese Cypress). Wood offers great potential for creativity and will last for long. The masks express various stages of life and states of mind. He explained how to keep the product as natural (e.g. using

natural paint from oyster shell powder). Demand for masks still exists. However, there are only a few wooden mask makers in Tokyo and he wanted to retain the tradition.

Dr Olga Sevan described the traditional and modern house paintings in Russia, particularly the relevance of drawing on wooden structures that reflect the traditions and everyday life which are unique to specific regions. She emphasized the relevance of restoring these monuments.

Dr Wang Guixiang stated that Chinese traditional architecture constitute predominantly wood-framed building system compared to its counterparts in many parts of Europe. Chinese architecture is a long and uninterrupted system, but changes evolved to buildings under various dynasties. Historically, wood has been an integral part of the buildings and many of them exists even today (for example, the Buddhist pagoda of 67 m high built in 1056 AD).

Wood architecture: What can be done? (Session VI and VII)

Mr. Michael Green proposed where the wood buildings will be going in future based on how wood has permeated to modern lifestyle of people in North America. He explained wood as the main solar building material available today, but has not reached to the breadth of the industry. He demonstrated how his firm MGB Architecture design with wood for multi-storey structures that suits modern societal needs. The architecture evolved from log cabins to Burj Dubai during the course of industrial revolution pushing the boundaries possible with new material (e.g. Eiffel Tower by iron in 1889). This spread the message of what is possible that helped to stretched imagination to high rise buildings. Steel and concrete innovations thus dominated the 20th century. Wood on the other hand confined as regional and limited to residential purposes with limited innovations. Consequently, wood largely remained at the stage before industrial revolution, even in many industrialised countries (e.g. Canada). For example, building codes allowed maximum 4 stories tall buildings made of wood in Western Canada till 2008. In 2009, pushing the boundaries resulted in 6 stories tall in 2009 in Western Canada while 9 storey building with wood has already been made in the UK. Thus, building codes limit the ability to innovate in wood. 19 storey building that was built 1,400 years ago still exists in Japan in a wet climate and a high earthquake zone, yet still survived over long span of time. Thus, imagination got limited in the last 100 years compared to that of 1400 years ago.

Climate change constitutes one predominant reason why wood should be used in buildings. Building sector contributes directly and indirectly to climate change. Wood can address this problem if it is sourced from sustainably produced sources and designed with more rapidly renewable wood solutions. Engineered wood products can provide a sustainable solution because 1 m³ of wood can store up to 1.6 tonnes of CO₂. It is technically possible to make even 30 story building with wood, with the possibilities created by innovations and new wood products. Mass timber (cross laminated timber, laminated strand lumber, laminated veneer lumber etc) allows rescaling the imaginations regarding buildings. A systemic change is needed than mere cosmetic ones for green buildings which address only part of the problem. In the next 20 years, roughly 40% of the global population will need affordable homes. Current models of construction to solve this need will cause a bigger human challenge through climate change. Nearly 70% of the world will be urban by 2050, especially in the fast growing economies like China and India. So, designing the right solutions to erect tall urban buildings is pertinent. He presented the concept of FTT (Finding Forests Through Trees) which is similar to steel frame construction, but done in wood with minimum steel use. The preliminary design experience indicates that it is simple, doable, adaptable and cost effective. The mass of the structure of a 12 storey building was about 3.5 times when concrete was considered instead of mass timber. Likewise, CO₂ released to the atmosphere was 398 tonnes when concrete was considered while 1,105 tonnes of CO₂ was prevented from entering to the atmosphere with mass timber use. The costs of construction did not differ significantly between the two types.

Dr Dustin Tusnovics presented how timber architecture can make a difference and build a better world with low energy consumption. He explained why Miesian architecture has to face a crisis today with a growing understanding of the impacts of the built environment on climate change. Quest is now for sustainable and energy-efficient architecture and how to deal with built environment as a system. Despite

the emphasis on sustainable development, slum dwellers increased substantially today and are likely to grow considerably in the nearby future. Here, the value of architecture becomes relevant. Today, added complexity to the system leaves the decisions to the specialists who do not necessarily improve the architectural quality which stresses the need for experimentation with alternate building technologies. Evaluation and assessment tools are likely to see a shift from short term to long-term observation periods where both the use of material during and after the life of a building will be considered where sustainably produced wood (that stores carbon and could be used after its use in building) becomes relevant. However, there is a dearth of people who specialize in timber use in buildings even in Austria where timber is integrated well in the industry and has long tradition of timber use in construction. This indicates the relevance of training young generation focussing on the technical, creative, economic and communication aspects to act as links between the industry and others (users, planners, municipalities, policy makers etc) to enhance acceptance of timber.

He explained the experience with a project (Skills Training Facility) using volunteers from Austria in the small informal settlement of Magagula, in South Africa with South African pinewood. Timber architecture was found to be a fast way to realise structures. Also, the project shared technology with 27 volunteers from the local informal settlement who helped in construction. The volunteers could transfer the skills to others. Slum-upgrading project with modular timber units in Mathare, Kenya also used wood as the main building element with a combination of other locally available material. Lesedi Nhahle Training Crèche project in Haenertsburg, South Africa aimed to showcase how good architecture could demonstrate sustainability (heating and cooling can be addressed without air-conditioning and heating and how locally available material could be used). Based on these experiences, the conviction has been that it is practically impossible to realise anything similar to constructing with wood in a limited time frame. He stressed that the value of architecture lies in its ability to enable involvement, generate awareness, deal with uncertainty, accept complexity, comprehend diversity and respect the needs of the future. There is a need to develop need-based designs and wood products (e.g. simpler and lighter that even the unskilled labourers/women could make use of) to bring key change to the building process and to improve the life of poor urban dwellers and disadvantaged sections of the society. Communicating the credentials of wood and considering the cultural dimensions are equally relevant. Likewise, the assessment methods (e.g. BREEAMS, LEADs etc) should consider the social dimension of sustainability, which is rather neglected now. Opportunities emerge today to increase the contributions of forests and wood products to the economy and society as evidenced by the timber industry in Austria. If a country which relatively smaller area of forests realise its potential, many countries with comparatively more wood resources could possibly realise it better.

Mr Andrew Waugh explained how he used cross-laminated timber with 'honey comb structures' to make a nine-story building (Stadthaus, the tallest modern timber structure in the world that stores 186 tonnes of carbon (<http://www.waughthistleton.com/project.php?name=murray&img=1>)) in London. The building structure was finished in 27 days (with four people). The design took care of shrinkage and creep (shortening due to compression under load), stability, acoustics, fire prevention etc. Wastes generated were negligible. Many related works were practically convenient (e.g. electric connections). The demand for the apartments was high when it was finished. He concluded that prefabricated wood products and software to visualise various aspects of construction (e.g. deflection) of high rise buildings could help the architects to better employ wood today.

Based on social housing in Curitiba, Brazil, Dr Ederson Zanetti explained the relevance of wood from sustainable sources in the mitigation of global climate change. Construction and forest sectors can play a major role on reducing the global climate change impacts. Both the sectors contribute to livelihood of a large number of people. As the environmental goods and services will hold a larger share in international trade by 2050, it is better to seek the potentials of complementarities of both the sectors. Shortage of housing in many parts of the world presents an opportunity for wood use, especially when incentives like carbon credits could encourage tree growth. The world stock of wood is increasing and SFM provides an opportunity to increase wood's potential to store carbon in buildings. Green construction solutions are

possible today with wood. Maximising wood residues use will minimise waste in the production chain while meeting the energy needs. Carbon credits for the houses could incentivise more wood use from sustainably managed sources. For enabling wider scale use, he proposed to establish a Global Wood Network.

Dr Emmanuel Appiah-Kubi presented why there is low interest for using wood in housing in Ghana and presented the psychological and technical barriers to wood use. Even though in Ghana wood is plenty, easily transportable and holding many advantages as a construction material, the popularity of timbers in house construction is decreasing (despite wooden houses portray timber's durability and its great potential as a housing material). Wooden houses are considered as old fashioned and many prefer alternative products (concrete, steel, plastic, glass etc). Structural use of wood is limited due to unfounded prejudice and lack of data regarding the properties (strength, durability etc) of a variety of wood available locally. A large part of the population has not seen timber houses or lived within them. The majority of the respondents will not consider using timber in buildings due to susceptibility to fire, floods, insect attack and decay, theft etc. Considerable number of respondents thought that timber houses are for the poor who cannot afford to construct with steel or concrete. However, a section of the respondents will still use wood because it is cheap, readily available, provides ventilation and suitable for hot and cold weather alike. But, the local supply of suitable wood products is low due to the high cost of production, export, dwindling timber resources etc. Lack of local expertise (e.g. architects, designers) in timber construction constitutes another impediment. More efficient processing methods, increased value-addition, more expertise in timber construction, planting fast growing species, promoting non-timber forest products (e.g. bamboo) etc should be considered to promote wood for housing along with education and sensitization of the general public to enhance wood's wider acceptability.

Mrs Roshan Shetty explained the relevance of vernacular architecture for sustainable development, based on experience from South Canara region, south India where vernacular houses have survived for more than 4 - 7 centuries. These adapted well to the local environment and culture. Locally available material (e.g. wood) has been used extensively here. Wood helps in the natural cycle of life of trees and the local resources can be better made in use than depending on resources from elsewhere. It also reflects the craftsmanship and serves as the decorating element of the houses. It indicates the richness of the persons (e.g. well carved doors/windows preferred by rich persons). The design and wisdom of the vernacular architecture needs to be better understood and adapted more widely to draw inspiration for modern architecture.

Mrs Neelam Manjunath's paper emphasized the relevance of bamboo from the status as the poor man's timber to a predominant building material. Three projects were presented as a testimony to its great potential. Prefabricated products enable construction of bamboo houses in weeks. It presented cost effective construction with minimum waste. Local availability of bamboo and emerging innovative designs are likely to promote use of bamboo in future for construction.

Selling the art and joy of wood products to consumers (Session IX)

Based on experiences from his family farm, Mr Jim Birkemeier presented on the full value forestry and how to create new jobs from dead trees. The loss of jobs comes partly as a result of heavy mechanization that will impact the people who depend on the industry. He uses only small machinery. He suggested the relevance to target the dead and dying trees and to select the ones not growing well first and add value to the wood by creativity. Adding value to low diameter logs is important to prevent them from other low value end uses. Adding value to wood that is out of expected shape is also relevant. Likewise, making use of all the trees irrespective of its commercial value is important to a forest owner. He suggested adding value to trees by targeting local wood and designing innovative products even with scrape wood to suit the tastes of the local customers. "Mega Value" products that take more time and skill to produce (like furniture, cabinets, countertops, stairways, etc.) can earn more money with less volume of better quality wood. Wood art creations like jewellery, boxes, ornaments etc can increase the value substantially. He felt that even though his business model seems old-fashioned and opposite of industrial forestry today, this

business model is universally adaptable because innovative high-value products can be manufactured and marketed on a small scale to create new jobs. This will enhance the per unit value of wood and create more jobs per unit area of forests/woodlands. Direct marketing of high value products in a local economy can make this feasible where earning is limited only by imagination. He felt that global certification is expensive with no significant benefit to their local business. On the other hand, providing excellent local service and earning word of mouth sales was the main growth force of their success.

Mr Giedrius Leliuga presented identifying customer needs and control of supply as the keys to success based on his experience with his three enterprises that use European Oakwood (which is declining at the same rate as of the tropical forests). Availability of high diameter Oakwood logs is dwindling and the quality declines. The preference of the Oakwood for particular end uses (e.g. flooring) compared to other species signifies the relevance of having more sustainable supply. They even survived economic recession because the demand is going up for Oakwood flooring and have control of the development chain (from the forests directly to the end-user) till the end product with minimum marketing costs. However, flooring with wood represents hardly 6% of the total flooring sector in Europe and therefore with better marketing strategies, wood can find better possibilities against its present day substitutes. Good quality products and intelligent marketing are crucial to be successful.

Mr M V Rao presented the centuries-old tradition of toy art in Etikoppaka, an Indian village in Andhra Pradesh where around 200 artisans produce beautiful toys and other handicrafts using mostly the wood of *Wrightia tinctoria*. The artisans switched over to other jobs when new opportunities arose. However, the involvement of a few institutions (Fine Arts Department of Andhra University, National Institute of Design and National Institute of Fashion Technology) in the development of new designs and innovative products attracted national and international customers. These combined with setting up of a design centre in the village reinvigorated the traditional art. Inspired by the success, people living in nearby areas also started following the paths of the artisans in Etikoppaka. However, export dwindled in recent years due to the inability to cope with the new export norms (e.g. forest certification, eco-friendly compliance labelling etc). Frequent power failures and lack of availability of local timber (of small diameter) pose constraints to toys production. The artisans started using rubber wood, but they are not locally available. They depend on inconsistent supply of wood from various sources and therefore sustainable supply of wood is crucial for their sustainable livelihood. The trees raised recently through Joint Forest Management could revive the industry, but the actions are yet to be taken by the forest department to provide this wood to the artisans.

Dr Sudipta Dasmohapatra presented the consumer purchase trends and perceptions of wood products in the USA. During recession the consumption of wood products declined, but it is likely to go up in future again. The likes and dislikes of consumers towards wood products vary with the type of product. What a consumer value is important (price, durability etc) for the industry. Diversity of the society connotes that different sections may have different requirements. Intergenerational preferences, especially when the life expectancy is increasing, will influence the consumer trends. Likewise is the effect of globalization with innovative products and knowledge passing boundaries quickly than ever before. The people in the US are going greener and considerable proportion of the population aspires for the products with green credentials (e.g. certified products). Consequently, the value of green building construction is rising and the preference for local products is on increase. Customization (instead of standardisation) and quick delivery is another emerging trend. Innovative marketing strategies use creativity to lure the customers to the retailers while technological revolution (e.g. internet) enables wider direct marketing. As people are getting richer, the industry also reorient towards the products that cater to the needs of luxury products. The local migration of people due to various reasons and the family composition (e.g. people living alone) implies that preferences may vary. So multitude of factors in the society will shape the wood product industry and the market strategies.

She explained how consumer purchase of wood products is driven by key attributes like price (matching with the quality), time of delivery etc and discretionary income (e.g. disposable income available for remodelling/improving home). Consumer value varies depending on the types of customers that can help in product differentiation. Expressed customer needs will help in incremental innovations. Likewise, latent

needs and desired outcomes also will influence the value. Price, quality, appearance and durability generally determine the value. However, origin (e.g. as in the case of wines), local sourcing (e.g. Wood from the Hood), customization and green credentials are likely to add value further. Customized products are likely to surpass the standardised ones in future. The customer survey they conducted indicated that durability, appearance and price were the most important attributes for wooden household furniture. Nevertheless, considerable proportion of the respondents expressed that they will buy local and recyclable products. Environmental attributes like low toxic emissions, where the wood comes from, how they can be disposed with minimum environmental impact after use etc were evident in selection of household wood furniture. About one-third of the respondents were willing to pay more for environment-friendly furniture. Preference for local products was largely evident in food products (because of local socio-economic benefits) which indicate the possible future trend for wood products also (e.g. nearly 50% of the respondents will pay more for locally produced furniture). Four different segments of customers were evident- bargain hunters (price as the main driver), quality conscious buyer (price neutral but cares for quality, durability and appearance), convenience oriented green buyers (preference for customer service and ease of use, local and environmentally products etc) and carefree green locavores (local purchase, customization, green products etc important). The production and marketing of wood products should consider the consumer segmentation and the factors that influence product selection.

Wood industry development in the formal sector (Session X)

Dr Jegatheswaran Ratnasingam explained how furniture industry clusters developed in Malaysia (one among the top ten furniture exporters in the world). The wood-based industry grew prominently in recent decades contributing to significant levels of employment and foreign exchange earnings. It surpassed even the rubber industry which was one economic powerhouse of the country. Export of value added products was low until 1986 when logs, sawn wood and plywood were exported. Greater value addition happened after 1986 due to the charges/restrictions imposed for export of logs and sawn wood. From 1996, value addition was greatly incentivised and from 2006, incentives were provided for innovations and marketing to ensure global competitiveness. Many consumers relocated to Malaysia after the restriction of export of logs and sawn wood. This combined with other growth drivers enabled rapid growth of the wood industry. Rubber wood played a great role because it ensured sustainable supply of internationally preferred wood for the industry. Today, 80% of the furniture produced in Malaysia is from rubber wood. Now the trials are going on with oil palm lumber, marketed as 'tiger wood' because of its characteristic texture. Labour is expensive now and 43% of the workers in the furniture industry are foreign (mainly from Indonesia, Myanmar and Bangladesh) with little skills retention possibility. Human resource development fund (generated through 1% contribution of the pay roll of the companies) is expected to improve the local human resource and retention. Investments for technology development are increasing. Domestic investments grew substantially (70%) over the foreign direct investments as the industry matured. Government policies (e.g. financial incentives, tariff, industrial estates, political and economic stability, infrastructure development etc) and factor inputs led to the success of the Malaysian furniture industry.

Furniture export jumped from US\$ 6 million in 1982, to US\$ 2.5 billion in 2008 which is mainly attributed by the furniture clusters that provided economies of scale, flexibility and product diversification. With about 3,500 furniture manufacturing enterprises, the Malaysian furniture sector provides employment to about 87,000 workers. The furniture industry is dominated by small and medium enterprises (85%). The diversity and flexibility provided by the clusters in the supply chain add value to this 'fashion' industry. These clusters that developed furniture industry also contributed significantly to the development of entrepreneurship in the rural economies. The clusters are benefited by the local conditions which spur value addition and industrial growth. For example, Muar furniture cluster is close to wood resource and ports and has well experienced and skilled carpenters with well built facilities and infrastructure. The number of skilled carpenters increased in the last decade as a result. Nevertheless, a few clusters fully supported by the government did not perform well indicating the role of the industry to maintain the growth. Networking and trade opportunities constitute one notable benefit of the cluster that greatly helps to enhance entrepreneurship, employment and livelihood options. It also helps in sustaining the wood-

working tradition. However, there are several challenges for the cluster (demands of economies of scale amidst little product diversification, low entry barrier, lack of innovation and diversification within clusters etc). The wood supply from forests is expected to stagnate and the forest plantations are yet to deliver wood sustainably to the clusters. Woodworkers suffer from '3D syndrome' with little interest amongst youngsters for wood working. Likewise, low wage economy and dependence on foreign contract workers pose challenges to the clusters. Moreover, capacity utilization is not optimum, reinvestments are low while innovation is stagnating. Yet, cheaper wood products from the Asian region may affect the competitiveness of the Malaysian industry in future. However, the furniture clusters have already created a competitive edge to face the emerging challenges.

Dr Satyanarayana Rao stated that demands for all the categories of wood outstrip its local supply in India. He argued that while technology-based plantations received attention in recent years (especially outside the forests) little attention was paid to technology-based utilization. Promoting technology based processing and utilization targeting small and medium-sized enterprises is important to develop wood as a sustainable material. Enhancing domestic resource base, augmenting supplies through imports and achieving resource efficiency in manufacture and use are crucial for sustainability. Tree growing programmes are taken up by the government of India in a massive scale to meet the national objective of greening 33 % of land area with tree/ forest cover. Many industries in private sector already became successful in technology-based plantation development. Imports of wood products, after trade liberalisation in 1996, steadily increased (mainly in unprocessed wood). However, imports have implications like the undesirable consequences in importing countries and the costs involved to get it right (e.g. certification or compliance with the laws). Use pattern is relevant rather than mere demand-supply analyses. Research output, technology packages and technology absorption are not well linked. Research and development should reorient to the changing needs. Technology absorption has been slow due to many impediments (e.g. wood preservatives use). A cluster approach with a multidisciplinary outlook could partly address this along with developing products that suit the needs and changing lifestyles of people (e.g. sleek designs). More emphasis on market, policy and social aspects are needed in research. Likewise, examination from different dimensions (e.g. environmental) for convincing evidences using Life Cycle Analysis is also needed. A favourable operational regime and processing are relevant to the wood industry which becomes mostly plantation dependent today.

Small and medium enterprises suffer from various issues- low levels of technology application, low recovery of waste, low quality output of timber (due to improper processing techniques and low degrees of modernization), low utilization of alternate timbers (despite successful suitability studies) and low quality products even from high value timbers. Even though utilization is recognized in the national forest policy, a roadmap to achieve rational utilization is not in place yet in India. Production forestry was encouraged in the past, but the focus remained on the 'how much is produced and removed' rather than 'how' they were used. Therefore, focus should be on technology – based utilization also. The Indian National forest policy prescribed development of substitutes to replace wood and wood products as one of the priority areas (for research and development to ease the pressure on wood resources) while the policy also identified 'utilization' as another priority area. Yet, many regulations disable the wood industry. Therefore, developing a National Wood Use policy would promote technology-based processing and utilization. Likewise, innovative approaches are needed to foster partnership models and provide technology and policy support to diverse stakeholders. Market already exists for a wide range of wood products and more opportunities emerge with changing lifestyles and higher incomes, which may lead to market-created product diversification and quality products for high end niche markets. Likewise, considering the emergence of short rotation and small dimension plantation timber in India, policies and incentives need to be developed to promote the growth of the value added processing and manufacturing industries, following successful examples (e.g. Malaysia) in plantation based industries.

Mr Shengfu Wu presented the struggles in Chinese woodworking industry even though forest area increased in the last decade. China has promoted forest plantations (Poplar, Eucalyptus, *Acacia mangium* etc) in recent years to cater to the needs of the industry which grew rapidly in the last 30 years. Industries

try to adapt to changed raw material supply (e.g. low diameter) in terms of machinery, technology, labour skills, residual use etc. Chinese Timber Traceability System addresses the sustainability of supply. The industry focuses on diverse products adding value manifold to wood and bamboo depending on the end use (for example high value furniture from residues added 40 times the value). Even the residues are well used today (e.g. tree bark). The efficiency has improved, quality was ensured (to suit the international markets) and innovative technologies were developed. Recovery rates in China constitute one of the highest in the world today. Diligent, disciplined and hard working wood workers partly contributed to this rapid development. However, increasing production cost (mainly attributed by increasing labour cost) raises question on maintaining the comparative advantage. Likewise, fluctuating foreign exchange rate, efficiency, regulatory measures (e.g. carbon tax) and recovery issues need to be addressed. Likewise, appropriate measures are needed to effectively deal with economic recession, trade barriers and decreasing export because many industries are closing down resulting in loss of employment raising questions on how to survive. The Chinese government encourages to target the expanding domestic market. Importance given today to biomass based and environment-friendly products (expanding plantations that capture carbon and products that store carbon over wood's life cycle) offer new opportunities.

Dr Arif Nuryawan presented the wood industry scenario and marketing aspects of small, medium and large industries in Indonesia. Primary and secondary wood industries grew rapidly in 1980s, after the government prohibited the export of logs and sawn timber. Industry is increasingly becoming plantation dependent which has implications on the products and wood processing. Only half of the small and medium enterprises (Panglong) in Madan, Indonesia have machines even though they are in this business for 30 years. He examined the four elements of marketing mix (set of elements to enhance marketing share) viz. product, price, place of distribution and promotion. Questionnaire surveys revealed that they differ between the small, medium and large industries. Promotion was limited in case of small scale industries (e.g. exhibition) while the advantage of technologies was better realised by medium and large enterprises.

Mr Nguyen Chien Thang presented the overall scenario of sustainable furniture in Vietnam (that will meet growing demands with less wood) using certified wood, recycled wood and combinations with other material (e.g. bamboo, rattan, water hyacinth etc or recycled aluminium, plastic, iron etc) to enhance durability and attractiveness. The source of wood was uncared in Vietnam in the past which changed in recent years. Of about 1,000 exporters in Vietnam, more than 200 are certified. The thrust is on effective design to avoid wastage, limited use of toxic chemicals and educating consumers about the green products. Design should adapt to the changing situations (e.g. material, social etc) and minimise wastage. Consumer acceptance needs to be considered as a priority and therefore enhance their understanding (e.g. minimising the waste to save the raw material). Vietnam saw rapid growth of furniture industry in recent years. It is the fastest growing industry in Vietnam making the country as its biggest exporter in South-East Asia and second largest in Asia after China. Wood for recycling is imported from different parts of the world (e.g. construction sites, old furniture etc). By employing suitable designs, attractive products are made from them. Even rejected scrape wood and residues (which were used for low value uses (e.g. burning)) are used to make value added products (e.g. particle board). Their imports consequently dwindled with the increase in local production. Combination with other non-wood material also contributed to fast development (e.g. rattans, bamboo, leaves etc). Aesthetic furniture could be made even in combination with the material from water hyacinth. The scrape metals (e.g. iron, aluminium etc) discarded from factories and the metals remnants of the war in Vietnam are recycled to make sustainable furniture. Expanding forests brings newer opportunities. Forest cover expanded from 32% in 1998 to 39.5% in 2010 which is targeted by the government as 43% in 2015. Expanding forest plantations helps to reduce the reliance on imports and promote industry and consequently contribute to 4.6 million rural jobs in the country.

Dr Aimi Lee Abdullah presented the likely changes in timber consumption in Europe related to the issues of regulations to prevent illegal logging. From where wood comes from is important to ensure that

consumption in one region does not lead to destruction of forests elsewhere. Efforts are currently made to prevent illegal timber entering the supply chain to continue to use wood while sustaining the resources. The Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan addresses this and Voluntary Partnership Agreement (VPA) constitutes the centrepiece of the Plan which will be legally-binding once it is signed. Six countries have signed already VPAs and many others are negotiating. Efforts are being made today to minimise the footprints of import in other countries and ensuring traceability of wood which is essential for a sustainable future. The European Union (EU) wide Timber Regulation to ban illegal timber and to require EU importers to exercise “due diligence” (in determining and assuring legality of timber imports) is adopted now. The legislation will be operational from 2013 which is a strong market instrument to improve forest governance and the legal and regulatory framework in timber exporting countries. This will affect all companies importing timber and timber products into EU member states. As per the new regulation, the timber importer must have information on the country of harvest, supplier, quantity etc for ensuring that the timber is legally harvested and comply with national legislation. They have to assess the risk of the timber import in terms of legality. The product manufacturers also need to keep proper records to this effect. All wood products like solid wood, flooring, plywood, pulp and paper etc need to fulfil EU procurement policy for export to EU by 2013. Handicrafts, recycled products, printed papers like books, magazines, news paper etc are, however, exempted at present from this policy.

Development of the handicraft sector (Session XI)

Dr Rajesh Bhowmik detailed how wood is intricately connected with the local culture amongst the tribal artisans of North-East India. The wooden crafts have a wider demand among the tribal groups and vary with each tribal group. Some tribes carve out images from pieces of wood which depicts their lifestyles and social structure. Mask is another popular product among tribes and used in traditional dances. Local musical instruments are also made of wood. Preservation of tribal culture is possible through maintaining a heritage of wooden crafts.

Dr Pankaj Aggarwal's paper dealt with the ideas for ensuring sustainability of the craftsmen in Chennapatna (a toy village in Karnataka, India) where more than 5,000 skilled craftsmen have long been involved in traditional wooden lacquered toys and ivory craft. The intervention of government helped the industry to survive against the cheaper toys from countries like China that threatened the industry. The demand of toys from this village is increasing now. Yet, the middlemen in the supply chain make profit like in other cottage industries. The lack of sufficient profit barely incentivises the artisans to continue the tradition. Likewise, traditionally preferred species suitable for wood turning (*Wrightia tinctoria*) is dwindling. Research institutes like IWST standardised alternative species like rubber wood, Acacias etc, but convincing the toymakers constitute a challenge that further research programmes should consider. Using sufficiently available and cost effective alternative species will help the artisans to upgrade their socio-economic status. Also, enhancing the skills of artisans in design, communication, marketing etc is essential. Exposing the artisans to national and international trade fairs is likely to develop their skills further. Artisans should be connected with related departments, research institutes etc and networking of artisans amongst themselves and with others should be encouraged.

Dr Ramakantha presented the need for strengthening solid wood based handicraft sector in Manipur, India where Cane and Bamboo products are more widespread. Manipur has a rich cultural heritage and an ancient but still thriving art and craft industry using diverse material. Manipuri dolls are famous in the region and the wooden handicrafts are examples of creativity and artistic excellence of the people of Manipur. More than 400,000 artisans find livelihood through the handicrafts sector where solid wood carving constitutes one major component. Solid wood is widely used for making toys, idols of gods, musical instruments etc. Supply of traditionally preferred local timbers for this has dwindled because of deforestation resulting from slash and burn agriculture and other factors which will influence the handicrafts sector. About 173 km² area of forests vanished between 2003 and 2005 alone in the state. More research is needed on the suitability of lesser exploited wood and growing of those timbers.

Dr Siddapa presented the relevance of self help groups (SHGs) for socio-economic transformation of Karnataka state in India. Credit and forest inputs play an important role in all sectors any part of the world. Even though many needs (e.g. energy and diverse food products) are met from forests, the percapita forest area in India is too low. This demands diversification of forest resources for domestic purposes through more efficient ways. Institutional credits have a role to play in value addition, but women and weaker sections of the society receive insufficient credits in developing countries. Bankers could help the poor through suitable bank loans which would return as deposit later. A large part of the rural people, especially women, does not have ideas on banking transactions which would be a challenge. However, many developing countries now try to bring the previously excluded population through SHGs or NGOs to encourage gainful production and employment activities by special programmes and subsidies. SHGs, especially women, could address problems like poverty. The women and children development department of Karnataka state gives emphasis for training of the women for integrating forest resources along with other production process. About 140,000 SHGs operate in Karnataka engaged in diverse activities and many SHG's are based on forest resources, including handicrafts. They save the profits derived from these enterprises and evidences portray the positive societal changes which could bring further socio-economic transformation.

Dr Mangala De Zoysa explained the heritage of wood-based handicrafts in Sri Lanka. The handicrafts industry, being largely a cottage industry, contributes greatly to sustainable economic development and the eradication of poverty in local economies. Wood-based handicraft represents one of the oldest wood based industries in Sri Lanka. Variety of species are used for handicrafts, masks, puppets, drums, carvings of Lord Buddha etc and are related to country's cultural heritage (e.g mask dancing with music from wood drums, puppet dancing etc). Traditional health practices (e.g. panchakarma in Ayurveda), that becomes popular with tourism development, also uses wood. The government is trying to sustain the traditional technology and cottage industry. For example, LAKSHALA (Sri Lanka's handicrafts board) provides support to 3,500 master craftsmen at cottage industries. Local raw material supply is dwindling that reduces the profit. As a result, wages are lowered by the entrepreneurs pushing the craftsmen into poverty. So, creating plantations to ensure sustainable supply is important. Training and support are being provided by the government to enhance employment through innovative handicrafts products. Many market promotion activities are also underway at the national and international level. The government initiatives reinvigorate the growth of the handicrafts sector and have relevance in value addition. With increasing exports, the demand for wood-based handicraft products is on increase (e.g. wooden toys). Tourism development encourages the handicrafts production which follows international quality standards. These will promote cultural heritage, improve rural livelihood and expand exports.

Mr Srinivasan Raghavan presented diverse seasoning processes and their challenges. The benefits of seasoning include stability for wood's end use manufacturing process, minimising warping, bending, cracking and shrinkage and ingraining of good polishing and finishing attributes. The decision for seasoning are influenced by investments, lands for drying, boiler, operation staff, boiler inspection certificates etc.

Promoting wood culture in the future (Session XII and XIII)

Dr Gabriel Hemery presented the efforts to revive Britain's lost wood culture which lost its forests primarily for agriculture and economic development. He stated that the forest cover in UK is too low (12%) compared with many other European countries (e.g. Finland with more than 70%). It is the second least wooded country in Europe. Two-third of the forest area is either neglected or not managed effectively. The woodland cover increased substantially in recent decades. Yet, growing trees for wood is very rare even though timber constitutes Britain's sixth largest import. About 82% of the forests are under private ownership (63,000 owners). Public perception on forestry stems from the mistakes that are made in the last century regarding the selection of the species (e.g. exotic species for plantations in Britain), lack of consideration for landscape or social elements (e.g. exploitation of the natural woodlands) etc. Forestry is more connoted with cutting trees than planting them and influenced by the negative public perceptions regarding deforestation, especially in the tropics. He contrasted this with livestock. People visit lamb farms and appreciate its beauty while they eat the same next year on their table without significant issues as the

slaughtering process is not obvious to them. With the same analogy a beautiful tree is turned into diverse wood products. The exploitation process needed for this is so visible. As a consequence, many of the general public find it difficult to comprehend. People in modern world are increasingly disconnected from nature (nature deficit disorder). Sustainable forestry is not easily comprehensible for the general public like how cutting down a 100 year old tree could be sustainable. Forests are more attributed to recreation, biodiversity, aesthetic values etc than wood. Many NGOs concentrate on planting more trees, but cutting trees and using them efficiently is rarely talked. Yet, wood is as popular as ever in today's society and sales boom for various wood products that are integral part of our life even though many users are not generally aware of where the wood comes from. Forestry is changing according to the changing focus of new role for trees in climate change mitigation and ecosystem services. Certification schemes provide assurance regarding sustainability of wood used. The concepts of 'wood miles' and 'wood security' will deliver the benefits for home-grown wood. However, evidences suggest that lack of management may adversely affect woodland biodiversity and therefore some form of management of tree resources is needed. One great challenge for this is how to communicate this to the public and professionals. Communicating the benefits of SFM has been one important complexity of forestry today.

He presented the wood culture initiatives of the Sylva Foundation like wood land mapping/inventories, wood land management plans etc to help the woodland owners who could explore for financial assistance using these. Efforts are also made to connect the user and producer by wood marketing. Likewise, public perceptions were influenced by activities like 'a single Oak tree initiative'. Students debated on cutting a tree. They learnt various aspects of that tree like its age (222 years- using dendrochronology), physical characteristics like height, weight (14,385 kg) etc. They understood the carbon storage (3.93 tonnes of carbon) as well. Artists, photographers etc captured their creativity from the tree. The tree was felled in front of 450 people. The processing of the tree was also seen by the students. Different people including students were involved in designing the products. Students collected seeds from the tree before it was felled and they replanted in the felled area. Thus, a tree was used to tell the story of wood.

Communicating the potential of trees and wood is important considering their increasing relevance for bio-economy, climate change mitigation, ecosystem services etc. "Nature deficit disorder" which is prevalent in today's urban life need to be addressed by reconnecting the society with nature. SFM should partly aim to recover wood culture by rebuilding understanding and trust in the society. Contextually, adopting close to nature forestry practice (for example continuous cover) would minimise landscape and environmental impact. This will consequently minimise public ill-feeling towards forestry, while leading to more sustainably managed forests. He explained the Sylva Foundation's activities intended to recover Britain's lost wood culture by helping people to understand more about sustainable woodland management, allowing experts to have a say in policy development, developing a closer relationship for members of the public with trees and supporting and encouraging woodland owners to undertake SFM.

Dr Yang Ping presented the promotion of wood culture in Japan where 66% of the land is under forest cover. Many temples, statues etc (made of wood) constitute as national treasures. Japan encourages promotion of wood culture through various ways. Wood education to inspire the young (to appreciate wood culture and wood products) is part of the Japanese national strategy. It is led by Japan Wood Products Information and Research Centre. A lifelong learning has been designed to educate adults and children on wood culture which will deepen their understanding of wood's properties and advantages, the environmental significance of wood use etc. Wood education in schools follows a stepwise approach- touching with sensitivity, understanding the potentials and learning through application. Needed educational material is developed where different dimensions of wood education are covered for communicating the credentials of wood. To meet the goals of wood education, platforms for enabling information exchange on wood education are set up. Wood education forums and workshops are led by the Japan Wood-Products Information and Research Center. Instructors are trained on several aspects of wood (including wood working) who trains the school students. Off school workshops teach students about the credentials of wood using hands on activities, graphics and toys. Making strip activities enable the students to experience the properties of wood and students make different shapes employing their

creativity. Such wood working experience at an early age will make children as wood enthusiasts. The National Championship of Woodworking skills (continuing for more than a decade now) also attract students who portray their wood working skills. This 'idea to product competition' imparts education and nurture wood enthusiasts who are essential to serve the needs of green consumers and sustainable development.

Mr Joshi presented the need to rethink on forestry sector in India where most forests are in public sector. He detailed wood's relation with culture and history (e.g. temples), various religious activities, health systems (e.g. sandalwood in Ayurveda) and modern life (e.g. musical instruments, arts, toys, crafts, boats etc). He felt that colonial legacy influenced forestry practices concerning which species to grow as plantations (e.g. Teak) and how to control wood extraction (e.g. permits). Large numbers of native species were neglected and the species needed to sustain livelihood were not given adequate importance during colonial periods. While reserving forests to meet the state's interests, the needs of the local communities, who depended on forests, were barely considered which influenced local wood use. Dwindling wood resources negatively affected craftsmen, artisans and other traditional wood users to continue their rich tradition. Likewise, negligible support from the state discouraged the communities and threat to livelihood security forced many of them to move away from wood working profession. Thus, diverse culture of art and craft declined gradually. After India attained independence, the perception of wood as an inferior material compared to steel, aluminium, glass etc also influenced craftsmen who were traditionally related with such professions. In addition, the efforts to supply preferred wood to these communities remained neglected due to lack of holistic forestry practices. Exhaustive policies lacked integrated approach and implementation tools. The environmental movements in recent decades resulted in further severe restrictions on providing wood products to the society from forests and instead substitutes were encouraged to avoid tree felling.

At the same time, wood as a raw material, contributed greatly to development of many presently industrialised nations while in India wood use dwindled due to the problems stemming from the policies and influences from the environmental movements. The NGOs and environmentalists raised scepticisms regarding the ability of foresters to meet the aspirations of the society in managing forests. Their views gained more visibility compared to that of foresters. Wood use gained negative image in society and even foresters did not do enough to reverse this. Even in massive tree growing programmes like the Green India Mission, wood use is not adequately addressed. The industries and local communities face problems of inadequate supply of needed wood today. In such a situation, 'art and joy concept' is a challenge in India while many developed countries can afford to conserve the forests and develop niche areas of wood use. Lack of accurate data (e.g. demand and availability of wood) and need-based research adds complexity to this. Policies that lack integrated approach and methodologies to implement constitute another problem. Indian forestry is at the cross roads because of combination of all these.

Conflicts arise more frequently between conservation and development because of demand for resources due to economic growth. Concurrently, a section of Indian society is increasing its wealth and their increasing demands of modular products are largely met through imports. New opportunities emerge for wood, especially from the need of minimising climate change inducing non-wood substances. Thus, the need for greener products, climate change benefits of forestry etc provide opportunities for growing more wood. Therefore, communicating the advantages wood and changing the mindset of the environmentalists and general public is essential. Propagating the 'art and joy concept', showcasing successful examples and communicating the green credentials through concerted efforts are needed to bring back wood use that has disappeared in India to enrich modern homes with wood. Bringing together various stakeholders including the environmentalists is important to get the wood sector to be heard more in green programmes.

Ms Ying Lin Hung presented on the wooden paths to a sustainable future in terms of a cultural approach. Wood is well embedded in language and culture in China and its relevance is well depicted through various ways in the society. Why 'wood is good' is a question that need to be approached with caution because of potential dangers of deforestation or misuse of wood. Answering this question depends how well wood is

managed by the modern society. Cultural perspective has relevance here which includes civilization, lifestyles, set of values and attitudes etc. Wood culture is influenced by these elements. IWCS emphasizes this cultural approach and communicates it through various ways and provide a platform for information exchange. Sedan chair in Taiwan was a historic mode of transport. But the belief of gods seated in Sedan is deeply printed in people's mind and therefore has a religious significance. The craftsmen who carry out the wood work beyond generations take wood culture forward. She cited the example of Mr Makoto Kuroda in Japan who represents 13th generation in a wood crafts family. He dedicates his life to preserving traditional craftsmanship. Wood carving contests (e.g. Baham, Cameroon in 2011) encourage the craftsmen. Also providing hands on experience to people to produce some local products is done during some exhibitions in China. She explained the relevance of celebrating World Wood Day on 21st March to communicate wood's possibilities. Mr Morris Lin detailed the experiences of 'Elegant Living' on how culture is being integrated into the products and innovative wood products are being designed using creativity. About 4 million ha of plantations are also managed by them to produce wood.

Mr Criswell Davis presented on designing with Sustainable US Hardwoods. Trees are unique and designers and architects can make wonders with it. Destruction of wood was part of early settlers' life in the US as wood served diverse human needs for housing, transportation, tools, energy etc. Forests were cleared for agriculture also. Many of these areas were reforested later. The volume of US hardwoods has doubled in the past 50 years. The forest area increased by 18% because of sustainable forestry and selection harvesting practices. Today, about 90% of the hardwood producing land in the US is owned by over 4 million private land owners who sell hardwood logs only once or twice in their lifetime. However, most of them are unaware of certification and those who are aware perceive it as expensive, complicated and of no great benefit. There is little demand for certified wood and 75% of all US hardwood lumber produced are consumed domestically. Despite having only 8% of the world's hardwood forests, US are the largest hardwood lumber producer in the world with about 24% share. He portrayed beautifully designed structures with US hardwoods in different parts of the world. In many cases, hardwood was found to be better than steel. He explained the advantages of hard wood over other material including beauty. Wood is a natural product and there is variation in colour and designers could take advantage of this. The hardwoods were found to perform well in humid environments also. Designing with hardwoods yields great environmental benefits.

Dr Nobuaki Hattori presented the state of life cycle assessment (LCA) and carbon footprint assessment (CFP) in Japan which is needed to visualise eco-friendliness of wood. Carbon footprint must be calculated based on LCA. Life cycle Impact assessment Method (LIMI) is already available in Japan and a version applicable for Asia is coming soon. It helps in calculation of all potential damage costs. Potential damage costs for wooden houses were found to be the lowest based on economic input-output LCA compared to other material. CFP, same as process based LCA, is gaining relevance in Japan. The carbon footprint was labelled in eco-products and many non-wood products are now labelled in Japan following the trends in UK and France. This is now being extended to wood products.

Dr Maria Riala presented how to map customers' minds with respect to housing needs and preferences in Finland. Using a mind map method, based on means-end theory of consumer research, they assessed Finnish customers' housing needs and wants. Preliminary findings indicate that consumers are more concerned of other attributes of housing than building material. However, ecological values were found to gain importance which has implications for timber construction. The findings suggest that façade material is more important than the frame material and good soundproofing was not that important. As a building material, wood has closeness to nature, peaceful living environment etc that possibly creates a positive image of wood among a section of the respondents. Timber construction industries should concentrate more on houses that are practical, attractive and of high quality with good architecture. These will enable the industry to gain more share of the market because, as previous studies indicated the Finnish construction industry struggles with quality issues.

Sustainable wood supply: the key to success (Session XIV)

Dr Rathore presented the status of wood consumption in the handicrafts industry in Jodhpur, India that was assessed by questionnaire surveys. Wood handicrafts industry (mainly at cottage level) in India is labour intensive and offers employment to 6 million artisans. The industry supports the socio-economic development of weaker section of the society who produces toys, furniture, other decorative articles (e.g. gift items, photo frames, paintings, carvings etc) which are exported to many countries which enhances national and state revenue. Jodhpur Handicraft exporter Association (JHEA) registered in 1998 (comprising 226 members) represent 300,000 artisans and craftsman. In the desert state of Rajasthan, despite the paucity of the raw material, wood work is well known with many unique artistic features (e.g. the lattice-work on wood). The industry, however, concentrates on a few selected species (sourced only through agro forestry) and recycled wood material (e.g. railway sleepers) which reduces pressure on forests for their needs. Most of the industries (90%) are small or medium and uses less than 0.1 million cubic feet of wood annually. Exports of finished products gradually rose except towards the end of the last decade. All the wood used by the industry are treated and seasoned even though 79% of the industries do not own seasoning and preservation treatment facilities. The demand for wood is increasing but the supply is decreasing. Therefore, substitutes are being tried by Arid Forest Research Institute to screen the potential for utilization by the handicraft industry. Data is being generated to enhance the acceptability of the substitutes by successful seasoning and treatments of lesser used species (to enhance the shelf life of wood products). There are several strengths of the industry like aesthetic and functional qualities, cheap labour, low capital needs and high value addition, uniquely designed products which are handmade (with low competition) and ability to serve small orders etc. At the same time, there are weakness like inconsistent quality, insufficient marketing, insufficient facilities and infrastructure (e.g. seasoning and treatment, wood testing), untimely delivery schedule, lack of skilled labour, failure to ensure international standards etc. These weaknesses need to be addressed to survive against the threats raised by better quality products elsewhere (e.g. South Asia, South Africa etc) and stricter international standards. Considering the lack of quality of wood provided by some plantations, willingness exists to raise plantations with support from Research Institutes and State Forest Departments for their needs (like the pulp and paper industry) if the land is provided by the government. The industry needs to be helped with certification related issues in the near future.

Dr Anoop presented the current wood supply crisis in Kerala, India despite having about 45% of its land under forest/tree cover. Kerala was earlier a wood surplus state and still a greener state. Yet, the wood supply from forests is negligible today and only salvage felling is allowed in forests (green felling has been banned for decades). Consequently, plantations and state forests account only 9% of total industrial round wood supply in Kerala while 76% comes from the homesteads and estates, as previous studies indicate. Thus, trees outside forests, particularly from homesteads, agroforestry and plantation resources, satisfy Kerala's increasing wood demand. The remaining gap is met through imports from various continents. The demand for timber is increasing with economic growth while wood is getting scarce (e.g. booming construction industry). He cautioned about wood security as increased dependency on imported timbers, which is likely to increase in near future, could increase the ecological footprint. Shift to bamboo has already happened and he suggested using palm wood also to meet the supply gap. Timbers grown in homestead/private estates like rubber wood, silver oak etc are potential resources of the future. Currently, lesser used species also need to be explored to substitute dwindling popular species. Because, wood supply influences negatively the sustainability of the industry (e.g. match wood industry in Kerala), efforts should be made to grow more trees in farms to address the wood scarcity. However, certain regulations discourage planting of trees in farms which indicates the relevance of a farm forestry policy and a separate department other than agriculture and forestry mandated for farm forestry within the state. Likewise, forest departments should relook the species encouraged in their popular tree planting campaigns to include the trees that provide timber in addition to the other benefits.

Dr Shashidhar presented the changing trends in timber usage in Nagaland, India where 52% of the land is under forests. About 88% of the forests are owned by communities and individuals and only the remaining

are with the government. This limits the policy implementation of the Indian government which is generally intended for publicly owned forests. Slash and burn cultivation is part of the socio-cultural activity in Nagaland which affects the forest negatively, especially with the reduction of cultivation cycle. Communities used timber for genuine domestic purposes earlier and the exploitation was well controlled by the communities. Demand was less and the timber was used in construction, carving and handicrafts with little commercial dimensions. Now, the demand from outside the state gives economic and commercial dimension to timber extraction, that too without proper planning. This results in massive timber removal from forests despite the national legislation banning timber removal from natural forests. Forest composition changed and plantations were established in recent years. The increased demand and less availability of commercially important species increased their price suddenly since 1980s. One of the reasons for this was sudden appearance of wood processing units in the state who exported timber to nearby states. Many wood products gained popularity in recent years (e.g. furniture). Handicrafts are also being produced, but cater mainly to needs of local market. Wood carving is unique to the tribal communities and part of their culture. Plantations of short rotation timber species with technological interventions like engineered wood products would help in managing the forests sustainably.

Mr Madan Mohan Jalan described the green credentials of bamboo. Bamboo sequesters more CO₂ compared to timber and has several other ecological advantages. In a fast growing economy, the demand for various human needs like energy, construction etc cannot be met only by timber because India is already a net wood importer. In this context, bamboo can play a role. Traditionally, bamboo was used for handicrafts, but today they have greater roles and provide jobs to a large number of people. The National Bamboo Mission intends to provide technology, marketing support and expand bamboo cultivation. Till 2002, bamboo was unknown for fabricated houses. But today, many buildings are constructed with bamboo products. The government is planning to encourage the industry and the policy favours growing and removal of bamboo unlike timber.

Focus on Sandalwood and Teak (Session XV)

Mr Venkatesha Gowda explained that natural sandalwood need not be grown for 35-40 years as thought earlier. The gestation period in plantations can be reduced to 12 - 15 years. Even though the annual sandal production declined, the price of sandalwood increased. Many of sandal wood resources face over exploitation and many countries presently take steps towards commercial cultivation. India was producing the largest quantity of sandalwood oil earlier, meeting over 80% of world demand. Due to over exploitation and other reasons, production declined drastically during recent years. So, many states in India attempt to encourage sandalwood cultivation. Karnataka and Tamil Nadu state forest departments amended legislation to make the tree grower as the owner of Sandalwood. 'Grow more sandalwood' campaign was launched by the Karnataka Soaps and Detergents Limited, India and nearly 250 growers were brought under this in Karnataka. Various state agencies assist farmers for growing sandalwood. Considering the high financial returns, more farmers should be encouraged to cultivate it.

Mr Ananthapadmanabha stated that Sandalwood production in India is declining and no concerted efforts were made to grow sandal. Synthetic substitutes were tried since 1960, but were never identical to the natural material. Most of the species are over exploited, but the demand for sandal is increasing while the supply is declining. Inconsistent supply resulted in escalating prices, making it difficult for industries to obtain the raw material. Industries emerged after 1990 resulted in overexploitation of this species globally. Therefore, sandalwood should be produced commercially as a short-term rotation crop. Many misconceptions exist regarding the ecological boundaries of growing Sandal. Many countries (e.g. Australia) grow sandalwood to meet global demands. India also attempts to grow it to bring back the past glory.

Mr Ramesh Chandra Mishra presented the relevance of concentrating on planting trees in farms and his works on promoting its cultivation. He emphasized the relevance of Sandal and stated that it can grow anywhere. The disincentives of the past regulations (e.g. declaring it as a royal tree since 1792 in Karnataka, India) still continue in many places. Yet, enough potential exists to grow sandal as it can come

up in a variety of lands. Therefore, forest laws should be made conducive to grow and utilize Sandalwood in households in India.

Dr Jayaraman presented about TEAKNET, an international network of institutions and individuals interested in Teak. Teak, a high quality timber, holds promise to meet the demands for hardwood. It is already successfully cultivated in many countries, but its cultivation needs to be extended to more regions. He outlined the relevance of networking for optimization and sharing of resources. He stated that this network acts as a virtual research and development organization for Teak. There have been recent changes in teakwood production like increased forest ownership of the private sector, smallholders becoming major producers etc leading to planting teak in non-traditional areas.

Thoughts emerged on where to go from here

The closing statement from Dr Eduardo Rojas-Briales, FAO's Assistant Director General and Mr Petri Tuomi-Nikula, the Ambassador of Finland to Italy reinforced the relevance of 'art and joy of wood' theme to the society and emphasized why it should be taken forward.



Photo 16: Panel discussion

The facilitated discussion on the outcomes of the event was led by Dr Joshi, Dr Michael Martin, Dr Pascal Kamdem, Dr Gabriel Hemery, Mr Jim Birkemeier, Dr Saara Taalas, Dr Ranjan, Dr Hakki Alma, Dr Jegatheswaran Ratnasingam and Mr Thang (Photo 16). Dr Michael Martin urged the delegates to share their experiences and take away lessons learnt during the conference to reflect through collective action the social and cultural dimensions of wood in our lives. A few participants explained how the knowledge gathered during the event will be taken forward in their own countries (e.g. bamboo use in Nigeria). A few young participants raised the basic question of what

constitutes sustainable development and sustainable future when the consumption is growing fast in some places. A few participants demanded that definition of what constitutes sustainability related to wood should be further examined considering the benefits of wood use to the society and environment. Because alternatives to wood (mostly extracted underground) are either becoming increasingly scarce or limited in supply by regulations, biological resources like wood, that one can grow and use sustainably, is likely to attain more relevance. Contextually, sustainability concept should be made clearer by more practical ways related to wood (e.g. a Single Oak tree initiative- session 12). Innovative utilization, minimizing wood wastage, recycling of wood etc are good examples of wood use to build a sustainable future which is already demonstrated by many presentations which needs to be technologically transferred to elsewhere to promote such ideas through efficient networking and information sharing. However, many institutions for wood education cease to function in many countries (e.g. US). So, there could be a dearth of professionals to deal with the challenges of technological development and transfer. This needs to be addressed if wood has to be used sustainably across various sectors.

The credentials of wood against consumption of its alternatives need to be better communicated especially in terms of quality of life as wood at its whole life cycle (from tree to till its last possible utilization as a product) could support a good environment within and outside our homes. Participants felt that negative societal perceptions towards wood use should be eliminated by all possible means. The benefits of wood use should be communicated to the general public in a way that touches the heart and mind of people. The concept of 'art and joy' is a good way to address this. Dr Ranjan stated that this concept is generally forgotten. He suggested reversing negative perceptions of people towards wood by demonstrating product prototypes to get the feel of products and making efforts to expand the

imagination and traditional wisdom (e.g. competitions on what diverse products could be made with wood of just one tree). Using

traditional wisdom to use the stem wood assortments (session II) is a good example where the knowledge of wood use in the past could lead to creative ideas. Dr Saara Taalas stressed that the links with wood users should be strengthened further to inspire them for using wood. It is difficult to push the need for wood products. Rather, the usefulness needs to be integrated into the wood products. Designing affordable and acceptable products that suit the future needs of different sections of people is important. Dr Gabriel Hemery suggested that inspiring people, especially by demonstrating, is the way forward to promote wood.

Dr Joshi suggested that the young people should be educated more about the positive impacts of wood use in a holistic manner (e.g. positive impacts of wood use against its alternatives) rather than approaching it partly. Dr Pascal Kamdem suggested that public perceptions are important in this context and they should make connection between wood and everyday life. Educating the public, especially the children, about why wood is good through practical activities, exhibitions etc is important. Social scientists should be involved more to effectively promote wood use.

For promoting wood, as a key to sustainable development, forests should be managed scientifically and not merely by a romantic approach. However, illegal timber removal is a major concern in many countries and certification measures should be in place to make sure that 'good wood' will not suffer from the negative perceptions and the guilt consciousness of using wood. Avoiding logging in biodiversity areas and reorienting more towards production forestry outside the conventional forest areas could also benefit to remove the negative perceptions. Participants felt that if people like wood, they will grow more trees and use them sustainably provided there is a good policy and legal environment. Encouragement should be given to tree growers by the government (e.g. wood credit card). Enough wood should be produced to widen its sustainable use considering the long rotation of trees. Also, policies should govern how to use wood raised through the green planting programmes (e.g. The Green India Mission).

Dr Michael Martin suggested that the art and joy of life could be achieved through multiple ways. So, moving together with collective ideas will make our life much more meaningful. But communicating successfully the credentials of wood and inspiring its widespread use is the key to promote sustainable development with wood. Foresters have not been greatly successful yet with this. Foresters were fractured amongst themselves (e.g. scientists, practitioners etc) and various important players were not involved much in the discussions (e.g. architects, designers etc). Likewise, various useful communication themes were neglected (e.g. social and cultural dimension). Communicating our common vision for the future depends on how we address these issues. People should be encouraged to grow and use the forests sustainably and take forests home through wonderful wood products. As extension of the forests and cultural heritage of our past, these wood products will help to keep our life very close to nature and cultural traditions.

Summary of the deliberations

Some of the ideas presented at the conference are summarised in to three themes below viz. emerging trends in economies and lifestyles, stories portraying the winds of change and wooden paths to a sustainable future.

1 Emerging trends in economies and lifestyles

Changing consumption patterns: Consumption of wood was greatly influenced by industrialization and consequent mass commodity production in the last century. Better value addition is the emerging trend in the 21st century, which is partly building upon the artistic and cultural elements because the society is increasingly embracing local traditions and culture as it progresses. As people become rich, reorientation towards luxury products occur. Societal demands of modular products increases and lifestyle changes provide greater opportunity for wood. Along with traditional parameters like Price, quality, appearance

and durability, other factors like origin, local sourcing, customization and green credentials increasingly influence customer preferences (session 9). Green consumerism encourages the products with green credentials like wood. Preference for quickly delivered local customized products increases over standardised products by mass production. Wood product manufacturers innovate themselves through customization of locally produced wood for encouraging widespread local use. Thoughts like 'wood miles', 'wood security' etc encourages products from home-grown wood. Tourism development encourages handicrafts production with international quality standards. These promote cultural heritage, improve rural livelihood and expand exports. Traditional health practices using wood (e.g. panchakarma in Ayurveda) also becomes popular as tourism expands in many regions. As exports increase, the demand for wood-based handicraft products (e.g. wooden toys) increases (session 11).

Increasing relevance to small and medium enterprises: With their lower ecological impacts but greater support to livelihood of people and multiplier effects in the local economy compared to large industries, small and medium enterprises gain relevance (sessions 4 and 8).

More importance to domestic markets: Wood industries are increasingly exposed to the threats like the international financial crisis in some other countries. To counteract the consequent negative impacts of the crisis, governments encourage the industries to target the expanding domestic markets (e.g. China) to prevent industries from closing down and resulting in loss of employment (session 10). Direct marketing of high value products locally gains relevance to add per unit value of wood and create more jobs per unit area of forests (session 9).

Changing marketing opportunities: Market-created product diversification and quality products for high end niche markets appear increasingly. Social and community entrepreneurship and increased connectedness by information technology enhances marketing opportunities. Globalization process enables innovative products and knowledge to pass boundaries much more quickly. Innovative marketing strategies and new communication technologies enable wider marketing (session 9).

More wood, less substitutes: While wood is gaining popularity in some regions to compete with its substitutes that replaced wood in the last century, it is losing out in some other regions due to various issues (e.g. Ghana, sessions 3 and 5). However, increasing global importance to biomass based and environment friendly products is likely to sustain the wood industry because expanding plantations will capture carbon and products will store it over wood's life cycle. Increasing awareness of carbon benefits of wood substitution in buildings encourages wood-based construction in many regions while other natural material (e.g. bamboo) is gaining relevance as a construction material in many wood scarce regions (session 14). Fast growing construction sector presents new opportunities for wood because of emergence of prefabricated engineered wood products, shortage of skilled labour, declining supply of wood's substitute material etc (session 6 and 7).

Increasing wood stock, use of unconventional species and recycling: Wood production is gearing up with the expanding role of trees in climate change mitigation and ecosystem services. Concurrently, the relevance of certification schemes increases as an assurance for sustainability. Industries are adapting to the changes in raw material supply (e.g. low diameter logs). Emerging massive tree growing programmes to green the countries (e.g. Green India Mission), tree growing in farms and technology-based plantation development (e.g. Sandal production, session 15) are likely to enhance wood's availability in near future. Emergence of new uses of plantation timber (e.g. rubber wood for handicrafts and furniture instead as firewood), unconventional species (e.g. palms) and recycled wood reduces the supply gap in many regions. These provide new opportunities for innovative wood products consistent with lifestyle changes.

2 Stories portraying the winds of change

Many stories presented at the event portrayed how wood products remain in business by being competitive and innovative following the above-specified trends. For instance, the furniture export grew rapidly in Malaysia and contributed to developing entrepreneurship in rural areas (session 10). Exports of the handicrafts industry in Jodhpur, India grew quickly in recent years directing benefits to the local economy, employment livelihood using local creativity (session 14). Likewise, the desire for green products

that suit the new lifestyle changes and efficient use of available resources was the key to sustainable furniture development in Vietnam. It portrayed how to meet the growing demands using certified wood, recycled wood and combinations with other material to enhance durability and attractiveness of wood products. Effective design could avoid wastage and enable adapting to the changing situations. They turn wood wastes to attractive products again (session 10). Using timbers sourced from legal or sustainable sources has been a key factor for Deesawat (sessions 4 and 8) which survived a crisis by changing the structure and product types by appropriate designs that suit the contemporary lifestyles. Turning wastes into wealth through employing creativity and sustainability concepts in practice helped it to be successful. By linking commercial, social and ecological aspects, they produce innovative wood products that embody the 'art and joy concept'. Producing high value furniture from residues in China added up to 40 times the value (session 10). Likewise, Timber Green Farm produces high value products from every part of the tree and found it as a successful model (session 9).

Appropriately identifying customer needs and control of supply helped the industries to surpass even recession and stay well in business and expand it further. Demand exists for good quality wood products (e.g. Oakwood flooring in Lithuania, session 9). With intelligent marketing strategies, better possibilities could be found. Providing excellent local service and earning word of mouth sales was found to be very useful for the marketing of wood products of the Timber Green Farm (session 9).

As noted in Finland, ecological values gain importance which is relevant to timber construction (session 13). MGB Architecture designs multi-storey structures with wood that suits modern society needs using creative designs that tries to push the boundaries of wood to sky limits. Staudthaus (a nine story building) portray a good example of how modern buildings could be constructed with wood suiting to customer expectations. The social side of construction with wood also gains relevance to improve the life of the poor as observed in Kenya and South Africa. Simpler and lighter products that even the unskilled labourers/women could use will bring key change to the building process (section 6 and 7).

Wood continues to support livelihood with the development of new designs and innovative products that inspires others to follow the sustainable paths (e.g. toy art in Etikoppaka, session 9). 'Elegant Living' portrayed how culture could be well integrated into the products and innovative wood products could be designed using creativity. It also demonstrated how the raw material needed could be produced by the wood product manufacturers themselves (session 13).

3 Wooden paths to a sustainable future

Reviving wood culture: Efforts are needed to revive the lost wood culture in many parts of the world. The cultural approach to a sustainable future needs to be promoted. Despite the increase of tree cover, the scar left by the mistakes of the last century concerning the selection of the species (e.g. exotic species for plantations), lack of consideration for landscape or social elements etc contributed greatly to the negative attitude towards forestry. Cutting trees is viewed negatively by the public, but wood products are becoming integral part of our modern life with growing understanding of its credentials. There is a need, therefore, to revive the lost wood culture. SFM should partly aim to recover the wood culture by rebuilding better understanding and trust towards wood products (session 12).

Increasing wood supply to small and medium enterprises: Despite having enough forest cover, many regions are facing wood scarcity (e.g. Kerala, session 14). This indicates the relevance of trees outside forests. Sustainable wood supply is crucial for small scale and medium industries because demand-supply gap of preferred species raise questions on the sustainability of the industry (e.g. handicrafts in Etikoppaka, session 9). Popularising trees outside forests (e.g. agro forestry) could be one solution (e.g. Rajasthan, India where most of the industrial demand is met from sources outside the conventional forests, session 14). Many wood resources face over exploitation (e.g. sandal wood) and incentivising growing wood in farms or by private small-scale entrepreneurs is important. Communicating the high financial returns of growing wood would attract more tree growers to ensure sustainable supply of wood. But discouraging policies and legislation need to be suitably amended (session 15) and congenial policy environment and incentives need to be provided to encourage tree growth. Plantations seem to provide

new opportunities to address raw material shortage through substitutes (e.g. rubber wood) which demands adequate research support. Also, wood user communities could be helped to raise plantations with support from research institutions and forest departments to produce their desired raw material. Community forestry programmes could address the inconsistent supply of wood, especially linking with tree planting programmes for greening the countries. Because increased imports could increase the ecological footprint, green planting programmes should select the preferred short rotation species to address the supply gap. Also export policies of wood needs a relook because wood is insufficient for local use in many places (e.g. Cameroon, session 1).

Certification measures: Fear of overexploitation is rooted in the society based on the past experiences of mass exploitation at large industrial scale. Even foresters do not encourage wood for local use fearing illegal exploitation in some regions. Certification could address this. Yet, it was not found to be much popular in many countries, especially for domestic timber (e.g. US, session 13). Certification needs to be enforced especially for tropical timber trade to build consumer confidence. Wood products consumption will see positive changes if the fear of illegal logging could be removed by appropriate regulations that ensure legality. These will not only minimise negative consequences of consumption but also will remove the negative perception towards using wood. However, those measures are likely to affect the small scale industries (e.g. handicrafts industry) and necessary support should be given to them to minimize the negative impacts.

Wood utilization policies: Along with ensuring consistent supply of wood through SFM and tree planting programmes outside the forests with encouraging policies, wood utilization policies are required to develop wood as a sustainable material employing the 'art and joy concept'. In the past, efforts to supply preferred wood to the local communities were neglected and severe restrictions stemming from demands of conservation did not often match well with the livelihood needs of people in many places. Overexploitation of the resource for large scale industrial purposes often results in price hike of the raw material which has negative implications on the livelihood security of the poor people, especially in rural areas. Who constitutes the beneficiary of wood produced by the green programmes and how it will be utilized (value addition) should be governed by proper utilization policies which is lacking at present in many countries (e.g. India, session 10).

Full utilization of wood: 'Full value forestry' could create new jobs. The dead and dying trees and the discarded ones (underutilised species and low diameter logs) should be better utilized by adding value. Using all parts of the trees to add value through "mega value" products using artistic creativity will earn more money with less volume of wood (session 9). Even the crooked parts of the tree could be used well with appropriate designs (session 2). Recycling of wood should be promoted to minimise the natural resource wastage and extend wood's life cycle (session 10).

Contemporary, mindful and sustainable design: The design with the cultural touch (session 4) is one way forward to stay in business and prosper. These will touch the heart and mind of the society and influence the wood use at large. Innovations on creating alternative products using creative imaginations from whatever the wood material available are the need to proceed forward.

Product and process innovations with wood: Using the art and joy of wood theme, these innovations are needed to compete with other material. Wood, with its special characteristics holds much greater potential especially because it has been part of the culture and tradition in many regions. Diverse products that meet the quality standards and design needs are likely to encourage wood use. Competitiveness should be focused to face emerging challenges for enhancing livelihood/entrepreneurship options (session 10).

Designing wood products for a greener society: LCA and carbon footprint labelling (session 13) is likely to encourage wood use positively. It will influence customer preferences for wood. Society's desire to be green could benefit the wood sector provided diverse products that consider the special societal needs are produced. Product and consumer segmentation will shape the wood products' future. Increasing relevance of biomass based and environment friendly products will sustain the wood industry because of carbon

capture and storage over wood's life cycle. Providing excellent local service and addressing local customer needs is one way forward to provide green solutions to homes.

Wood to new heights through greener homes: Prefabricated products will provide opportunities for increasing the potential of wood in the construction sector and shortage of housing in many parts of the world will present an opportunity to construct with wood much faster, quicker and with the involvement of local communities (session 6). The positive image of wood stemming from its closeness to nature, ability to offer peaceful living environment etc could expand wood use in construction. The art of constructing multi-storey building with wood is gaining popularity. The joy of living within these wooden homes will encourage more attempts in green construction. The emergence of new understanding of the potentials of wood, emergence of suitable engineered wood products etc will take wooden buildings to new heights provided that quality is given adequate emphasis with good architecture (session 13).

Enabling environment and actions: Information sharing through networking (e.g. World Wood Network), innovative technologies, innovative marketing strategies and congenial policy and legal environments will yield positive results for the growth of wood products in the near future. The innovations need to be shared more within the industry to foster a faster growth which could be adapted to a variety of environments for sustainable development. As evidenced by the rapid growth of Malaysian furniture clusters (session 10), successful wood-based industry should be built by the right policy interventions and factors of production to benefit the society through different dimensions. Value addition requires financial assistance because weaker sections of the society receive insufficient credits in developing countries. Microcredits that suit the entrepreneurial requirements are therefore important (session 11).

Enhancing expertise to work with wood: Architects and designers are rarely trained to work well with a variety of timbers. For example, timber Engineering is not taught well in Ghanaian institutions (session 7). This will limit the creativity and options for wider utilization of wood. Adequate capacity need to be developed to promote wider wood use.

Strengthening technology absorption and sharing: Considering low technology absorption by the small and medium sector in terms of using unconventional species, seasoning, wood processing etc, links between research outputs and technology absorption need to be strengthened. Research should seek solution to the changing societal and environmental needs. Financial, technical, research and policy support is crucial to favour a sustainable small and medium scale wood industry. Knowledge and technologies of successful enterprises needs sharing through formal and informal networks to enable transfer of technologies to benefit the local economy and environment.

While artisans were found to take the traditional and skills across generations, they are going extinct because of lack of interest, low wages etc. Adding value requires human expertise and therefore engaging artisans in business is relevant through up scaling technology absorption by proper engagement, capacity development and communication.

Effective communication and education: The distinction between 'good wood' (sustainably produced) and 'bad wood' (resulting in endangering forests) should be better communicated to remove negative public perceptions about wood and widen its use to enable transition to a wooden path to a sustainable future. Minimising public ill-feeling towards wood is important for wood's future and continued success of sustainably managed forests. Some people perceive wood as an inferior material due to lack of understanding of its credentials and the cultural beliefs. However, communicating the benefits of wood and SFM to the public and professionals constitute a great challenge. Necessary steps are needed to bring back the awareness among the young people about wood and enhance their wood working skills. Formal and informal education, as done in the UK and Japan, could be expanded to other countries to inspire the young people with the potentials and credentials of wood. Efforts like 'a single Oak tree initiative' will be worth emulating because it changes the attitude towards trees for wood (session 12). Wood carving contests and providing hands on experience to people to produce some local products will inspire people for wood carving. Increasing the visibility of wood through various ideas (e.g. celebrating World Wood Day) would also help to communicate the credentials of wood (session 13).

Propagating the 'art and joy concept' of adding value, showcasing successful examples and communicating the green credentials are essential to enrich 21st century homes with wood. Communication should also stress the role of wood to minimise the use of climate change inducing non-wood substances. Bringing together various stakeholders like designers, architects, artists, innovators, environmentalists etc is important to communicate better wood's potential for green growth. Better alliance of foresters with environmentalists to communicate the climate change benefits of wood use will also remove negative perceptions towards wood use.

Wood for livelihood: Wood use provides a unique combination of integrating social dimensions with environmental and economic to benefit the society and environment in long term. Wood is well embedded in language and culture and has relevance in modern lifestyles. Therefore, building on the cultural and traditional traits and green thinking, promoting wider wood use will benefit the livelihood of millions of people through value addition. That will take wood culture forward and help to preserve traditional methods to suit modern day needs. Considering this, wood should be increasingly promoted by governments to support the sustainable livelihood using the best value addition modes possible.

The ideas to ponder for the enablers of the journey to sustainable development

Wood production is increasing in many wood scarce areas due to greening programmes and wood is already surplus in many other regions. But the conventional mass commodity production model is unlikely to sustain the industry. Therefore, careful use of wood at small and medium level employing creativity gains relevance.

a. For policy makers

1. **Encouraging high value innovative products:** Making an alliance with futurists, architects, designers etc is likely to result in innovative products that suit the changing requirements of the society. These products, which embrace the local culture and traditions, enable product differentiation corresponding to customer segmentation. Promoting high value products and redefining the consumption model is likely to change the perception of wood use.
2. **Communicating to the potential wood users:** Popularizing wood through prototypes, case-studies, competitions etc will enable better learning. Thus, communicating credentials of wood to stakeholders and general public (especially who avoids wood for environmental reasons), is important to change the perceptions. Renewability and recyclability with minimum wastage will give wood a greater preference over others. Looking wood use through the lens of art and joy reflects another view of conservation of natural resource by sensible use that meets the needs and aspirations of the 21st century society. The cultural barriers and the lack of confidence on wood by certain sections of the society need to be addressed through proper interventions. Combined efforts of the governments, private and public sector agencies and industries are needed to increase the visibility of wood (e.g. celebrating 'National Wood Day') to generate more awareness amongst potential wood users and thus promote wood use.
3. **Strengthening linkages between wood producers and users:** Sharing knowledge and expertise through professional and social networks is pertinent to enable technology transfer to foster the growth of the small and medium scale industry across international borders (e.g. establishing a Global Wood Network).
4. **Human resource development and retention of skills:** Training artisans and educating children on working with wood is essential to carve a good future with wood. In order to address the dearth of professionals who could push the boundaries of wood with imagination and creativity, more practical aspects on using wood should be integrated in the courses on architecture, design etc. Wood education should be provided in schools focusing on how to use wood better considering that more timber resources are likely to be available in coming years. Incentivising the people who work with wood and developing their capacity to face the likely challenges is essential because they carry the tradition and creativity forward across generations.

5. **Building on the green awareness by addressing information gaps:** Wood has a promising future considering the environmental credentials because the modern society aspires to be greener. However, the information gaps (e.g. LCA) need to be addressed to convince the wood users.
6. **Sustainable wood use as the key to SFM:** This is important because in some parts of the world, tree growers find it difficult to market sustainably produced wood. While wood production is likely to increase in recent future, the distinction between 'good wood' and 'bad wood' should be made clearer to the society to encourage SFM.
7. **Enabling policies for value addition:** Adding maximum value possible before wood products are exported is essential for the growth of the economy and to provide employment opportunities. In order to gain the benefits of economies of scale, clustering the small and medium enterprises is very useful.
8. **Encouraging wood for transition to a green economy:** Widespread use of 'good wood' should be given more attention in policy decisions because it will enable a meaningful transition to a green economy. Policy coherences regarding integrating wood use at intersectoral level is a great need. Standards and codes, regulations and policies etc should be re-examined with better understanding on the wood's credential revealed by the LCAs.
9. **Wood utilization policies:** Wood use policies should be formulated to supply sustainably wood which is crucial for the survival of small and medium enterprises.

b. For the producers of wood products

1. Producers should communicate well wood's green credentials to the public for gaining competitive advantage.
2. Industries should draw inspiration from local traditions and culture to innovate and differentiate their products to gain comparative advantage. Innovating and diversifying to suit the changing lifestyle needs is of great importance.
3. Serving customer needs by creativity and adding value per unit volume of wood is the way forward. Minimizing the wastes and recycling to the fullest extent possible to design the trendy lifestyle products is relevant.
4. Wood products manufacturers need to increasingly connect with designers, architects etc to create the wood products to inspire the people who do not currently use wood.
5. Learning from others and sharing success stories through networks will benefit the industry and enhance wood use.

c. For the general public who remains sceptic on wood use

Turning to wood has several advantages especially to embrace the greener concepts. However, differentiating between good and bad wood is relevant to ensure its sustainable use. Planting more trees and adding value to the wood lays the stepping stones to a sustainable future where the public, as the sensible customer, hold the key through increased wood use.

It is essential to stop thinking of avoiding wood and change the perception that cutting trees is bad (if it is sustainably produced). Wood offers umpteen opportunities to go green and therefore embracing a lifestyle predominant with wood products will save our environment, incentivise better management of forests and support livelihood of millions of people.

Feedback

The feedback from about 90 participants is shown in Table 1. They found the event as very useful and well organised. They gathered useful information and considered it as a great networking opportunity. They expressed interest to attend in similar events. According to many participants, artisan shows portrayed why wood is good. Therefore, integrating them in wood-based events will give hands on experience and portray the theme practicality. The participants expressed high support for developing the 'art and joy' concept and to propagate the ideas gathered in their countries.

Table 1. The feedback of the conference participants

Aspect	Rating ¹
Organisation (registration, payment, logistics, etc.)	4.1
Quality of the presentations, posters, demonstrations	3.9
The content of the technical programme	3.7
The structure of the technical programme	3.9
The cultural/social programme	4.1
I got information that is useful for my work	4.1
It was useful for meeting new people and networking	4.4
It gave me ideas about new projects, business, etc.	3.9
The "art and joy" concept is useful and should be developed	4.3
I would be interested in attending more events like this	4.3

¹On the Likert scale 1-5, 1 being the least liked and 5 the most liked.

Conclusions

The paradigm shift from large scale commodity production to high value products that embraces culture and tradition has a long way to go. The conference attempted to look at this from various angles from production to full value use. It encouraged discussions on how to get there by practical means. High level of participation indicates the relevance of the theme. Innovative ideas shared were useful for increasing the visibility of the wood products sector in the International Year of Forests. However, success lies in how such thoughts are carried forward for future endeavours on the ground and how these will reflect in similar events in future.

The conference emphasized the relevance of diverse value added products that suit the modern lifestyles by keeping wastes to the very minimum, mainly at small and medium scale because of its livelihood and multiplier benefits. The negativity attributed to wood due to large scale industrial use in the past need to be addressed by communicating effectively to the public the credentials of wood (that the foresters often failed to do in the past). Taking a piece of forests to home (as wood products) and getting close to nature within homes is gaining importance in modern hectic life. Contextually, the 'art and joy concept' will be increasingly relevant in near future.

Side events

The two side events organized by the WWF-India and Forest Research Institute, Dehradun attracted the attention of many delegates.

1 Responsible wood trade- challenges and opportunities

Global Forest and Trade Network (WWF-India) led the side event "responsible wood trade- challenges and opportunities" with support from the EC-SWITCH Asia programme, European Union on 20 October 2011. The event was open to all registered participants at the conference and exhibition. Dr Sejal Worah welcomed the participants. Mr Angel Llaverro presented the global challenges in responsible forestry and trade. Dr T R Manoharan presented on India's role on the global forest products industry. Mr H K Sen presented the shifting legal landscape and how key markets are waking up to illegal timber. There was a group discussion at the end on how exporters can respond to recent changes in the US, Europe and other countries and how it will affect the global trade. All the presentations are available at <http://www.wood.info/artjoywood/?p=video>.

2 Students' conference on career in wood science and technology

The Forest Research Institute, Dehradun organised this event with the support of the IWCS, China on 20 October 2011. Commonwealth Forestry Association provided partial financial assistance to this event. This event was open to young researchers and students of wood science and technology worldwide. It provided

an opportunity for them to interact with their peers and broaden their horizons. The side event reflected the opportunities available both in research and job, conditions for research/job, career of a researcher/employee, the obstacles faced, the institutional and organizational prerequisites etc. About 50 delegates (40 students) from India, China, United States and Turkey participated in the event and shared their experiences through presentations, posters and discussions.

Dr Howard Rosen welcomed the participants. Dr Sudipta Dasmohapatra, and Dr S S Negi, presented various facets of career in wood science and technology in US and in India respectively. Dr Pascal Kamdem presented on the myths and reality behind heat treatment. After these invited keynote speeches, Mr Eyyüp Karaodul presented on research, education, industry and consumer regarding wood in Turkey. Mr Amar Jyoti Nath presented on current status of wooden handicraft industry of India with special reference to Western Uttar Pradesh, India. Mr Shravan Kumar presented the challenges and future of plywood industries in India. Finally, Ms Ankita Nandi presented on reed used in the musical instrument – Saxophone. Two posters detailing medicinal woods and wood biodiversity in India were also presented. The presentations are available at <http://www.wood.info/artjoywood/?p=video>.

Photo-competitions held in connection with the event

In order to generate public awareness about the event and wood use in general three competitions were held. At global level, the photo-story and photo competition was organised. At national and local level, poetry and painting competitions were held.

International photo competition

A photograph competition was held as part of this event to popularise the idea behind the art and joy of wood. The competition was open to professional and amateur photographers and entries depicted wood's character and its vital place in people's lives under the following themes.

Living with wood: Wood surrounds us everywhere and constitutes an integral part of our lives. Creative interpretation of "living with wood" was expected.

Working with wood: From large-scale manufacturers to artisans and hobby woodworkers, wood is used by numerous people for a variety of purposes. How one sees "working with wood" was expected.

Wood as never seen before: Wood's character is protean. It is versatile and is used in so many different ways. But wood is also unique - no two pieces of wood are identical. The creative images of "wood as it's never been seen before" were expected.

The winners were invited to receive their prizes in person at the Award Ceremony during the conference at the expense of the conference organisers. The winning entries of the photo and photo story competition are shown in the following pages.

Photo- living with wood

Somenath Mukhopadhy, India, 2010

This canoe built with driftwood helps this polio affected youth to go to sea everyday for fishing and earn his living. The photograph was shot at Ennore beach in Chennai



Photo-working with Wood

Somenath Mukhopadhy, India, 2010

This portrait of an artisan as he makes low-cost furniture with wood for villagers was shot while he was busy making a dressing table in a roadside forest. It illustrates man's relationship with his environment



Photo-wood as never seen before

Mochan Bhattarai, Nepal, 2011

When I'm alive I serve directly. Even when I decay I'm aesthetic. Can your eyes see me?



Photostory- living with wood

Title: **Bozos Tribe**

Photographer: **Joey Anchondo**

Mali, 2011

Bozos are nomadic tribes who live along Mali's Niger River. For millennia, they have lived off the river, and at first glance it is obvious that it is their lifeline. Their lives are spent in camps or semi-permanent strung out along the Niger and they navigate up and down the waters in a perpetual pursuit of fish. Yes, on the surface, it seems that this river is what they rely on most for their livelihoods. However, after looking deeper, it becomes obvious that their lives revolve just as much around the trees and foliage that line the banks of the river as the river itself. In fact, the word Bozo is actually a Bambara (the dominant tribe in Mali) word meaning bamboo house, referring to the portable huts that the Bozos carry with them along the river.

When it comes to wood, the most important item to the Bozos is their boats. In modern times, due to deforestation and desertification, the large hardwood trees that provide the lumber for the boats are no longer available locally. Instead, they are transported from southern Mali. Because of their reliance on boats, they have developed a strong tradition of woodworking, and construct all of their boats with simple hand tools. Their paddles are also carved out of the same type of wood, although bamboo poles are more commonly used to punt the boat along the river.



Young boys carry bamboo poles to a boat in Segou. For fishing, the Bozos use a variety of wood products to assist them. Most important are their fishing traps, made from flexible green sticks and netting. They are used to catch small fish used for food or as bait to catch larger fish.



Boat builders in Nouhoun-Bozo shape wood to be used in the construction of large boats. While Nouhoun-Bozo is a very small village, they are a major supplier of boats to the large river port town of Mopti, about 75 km down river.



A young girl carries a bundle of wood near Djenne



Fish traps sit in the water near a small Bozo camp on the Niger River. In the background, portable Bozo huts made from woven palm fronds can be seen. Although the Bozo's dietary staples are fish and rice, those who live in the more southern parts of the river often replace rice with millet, which is locally grown. Without the use of a mill, the millet must be pounded in a large wooden mortar and pestle. This is a daily chore for many Bozos.



Amadou Mohamed prepares to repair a hole in a boat that he built three years prior in Koulikoro. The repair is made using a small axe, a piece of wood, and no measuring.



Women carry bundles of wood that they have collected in the bush to be transported across the river to their village near Tamani. The significance of wood, however, is not just related sustenance for the body; it is also important as sustenance for the soul. The Bozos are a predominantly Muslim people, and the mosques that they pray in are of the mud and stick style emblematic of the Sahel. Typical of the region, where people are always moving, things are always changing and nothing is permanent, this style of mosque is not the most long lasting. The walls must often be re-surfaced and the large sticks often replaced. Without the use of these logs for construction, building mud mosques large enough for large villages would be impossible.



Men arrive for afternoon prayers at the mosque in Nouhoun-Bozo.



Girls perform the daily task of pounding millet to be used in the dietary staple of tuo, a millet porridge, in Koulikoro. For cooking, as in many parts of Africa, everything is done over charcoal. While the men are out fishing for the day, one of the women's main duties is wood collection. Young and old, they walk deep into the bush, scouring the arid landscape for dead trees and dry wood. The wood will be further dried, and eventually converted to charcoal for cooking.

Photostory-working with wood

Title: **Woodmill**

Photographer: **Dimpal Pancholi**

India, 2010

The head saw, head rig or primary saw, breaks the log into cants (unfinished logs to be further processed) and flitches (unfinished plank with a smooth edge). Logging fells the trees and log bucking cuts them to length. Decking is the process for sorting the logs by species, size and end use (lumber, plywood, chips). Debarking removes bark from the logs. Depending upon the species and quality of the log, the cants will either be further broken down by a resaw or a gang edger into multiple flitches and/or boards. In the twentieth century the introduction of electricity and high technology furthered this process and now most sawmills are massive and have expensive facilities in which most aspects of the work is computerized. Small gasoline-powered sawmills run by local entrepreneurs served many communities in the early twentieth century and specialty markets still today.



Photostory-wood as never seen before

Title: **Tree of Knowledge**

Photographer: **Brian Hooper**

Australia, 2009

The ideas for this project are generated by observations into the way human beings create and relive memories. The outcome from this observation is not a traditional building but an interactive place that allows us to remember the tree and the space around it. As a new experience in its own right the memorial also has the capacity to create new memories for its visitors.

The scale of the structure and the form created by the hanging timbers is based directly on the extent of the tree's canopy from the period around the 1890's. The external timbers are "charcoaled" to create a veil around the memorial space. This finish and its form reference a place of memory and mourning. The "veil" provides hints to the form and movement inside but it does not fully reveal the impact of this space. This experience is saved for the visitor as they enter the shade of the "tree" and the technique personalizes the experience for the visitor because it is something of a secret revealed. The veil and the glass roof also provide the very practical protection from long term direct exposure to wind driven rain and direct sun, which is required for the relic tree. Inside, the sculptural forms of the canopy extents create a vaulted effect appropriate for a place of memorial. For some, this spatial experience will also resonate as a form of veneration to the relic tree and the memory of the events associated with it.

The Tree of Knowledge Memorial is constructed of over 4,913 individual timber members (comprising 3,449 for the suspended canopy and 1,464 for the external façade or "veil"). All the timber is recycled with chain of custody certification, verified by an authorized third party. The root ball was salvaged intact with the trunk and is displayed through a glass floor. This design feature gives the unique and dramatic effect of suspending the viewer above the root ball whilst they are surrounded by the suspended timber above. The structure, including the suspended timbers, is rated to a 50 year maintenance free period, effectively minimizing long term maintenance costs for the Council and community. The design sets out to re-instate the amenity of the original tree and the spaces around it. With the ochre of the original soil re-instating the public plaza, the extent of the original canopy re-defined, a gentle movement once again visible overhead the relic tree and with shadows on the ground, the amenity of the original tree is remembered. This is once again a place where old stories can be told and past events remembered. It is also a place where new ones are created.



Appendix 1- List of oral presenters

Name	Country	Paper
Achmad Zainudin	Indonesia	Jepara: Mirror of Indonesian art wood
Adjovi Edmond	Benin	Typology of wood sculptures in West Africa
Aimi Lee Abdullah	Malaysia	Changes in EU timber consumption
H S Anantha Padmanabha	India	Sustainable supply of Global sandalwood for the industries
Andrea Klein	Austria	The treasure of special stem assortments - Lost knowledge of the past
Andrew Waugh	United Kingdom	A short talk on tall timber buildings
Anoop E V	India	Kerala's withering wood security - the way forward
Arif Nuryawan	Indonesia	The description of marketing mix at three level furniture industries in Medan area, North Sumatera, Indonesia
Brian Hooper	Australia	Tree of knowledge
Criswell Davis	USA	Designing with Sustainable U S Hardwoods
Dustin Tusnovics	South Africa	Building for a better world: how timber architecture can make a difference
Ederson Augusto Zanetti	Brazil	Wood from sustainable sources and the mitigation of global climate change – case study of social interest housing in Curitiba, Parana, Southern Brazil
Emmanuel Appiah-Kubi	Ghana	Wood for housing in Ghana: Why the low interest?
Gabriel Hemery	United Kingdom	Reviving Britain's lost wood culture
Giedrius Leliūga	Lithuania	Customer needs and control of supply and are the keys to success
Guixiang Wang	China	Impression, comparison and understanding: Chinese wood-framed architecture in history
Hakki Alma M	Turkey	Wood carving in Turkey
Howard Rosen	USA	The evolution of wood culture in the USA
Jegatheswaran	Malaysia	The development of furniture industry clusters in Malaysia
Ratnasingam		
Jim Birkemeier	USA	Full value forestry: New jobs from dead trees on the family farm
Jirawat Tangkijngamwong	Thailand	The way of wood: Finding green pieces in Thailand
S C Joshi	India	The need to rethink the forestry sector perspective in India
Kadiroo Jayaraman	India	TEAKNET – International R & D network on teak
Kanuri S Rao	India	Promoting technology based processing and utilization by the small and medium-sized enterprises (SME's) - the key to develop wood as a sustainable material in India
Kitazawa Hideta	Japan	Enjoyment of Japanese traditional wood carving
T K Kunhamu	India	The wood legacy of Kallai: lessons for the future
Madan Jalan	India	Bamboo – A natural vehicle for the protection of the planet
Mangala De Zoysa	Sri Lanka	Rediscovering traditional wood product industries in Sri Lanka: Promotion of cultural heritage, improvement of rural livelihood and expansion of export earnings

Maria Riala	Finland	Mapping customers' minds with a new technique: the case of housing needs and preferences in Finland
Michael Grabner	Austria	Understanding historical wood utilization - Ideas for the future?
Michael Green	Canada	The future of urban structures
R Michael Martin	Italy	Wood is good
Neelam Manjunath	India	Saga of the poor man's timber
Nobuaki Hattori	Japan	The present state of life cycle and carbon footprint assessment in Japan to visualise eco-friendliness of products including wood
Nguyen Chien Thang	Vietnam	How to develop sustainable furniture
Olga Georgievna Sevan	Russia	Traditional and modern house paintings and arts of everyday life in wood
Pascal Kamdem	USA	Can wood play a role in the sustainable development of Africa?
Rajesh Bhowmik	India	Preservation of tribal culture – a heritage of wooden crafts world: A case study of north-east corner
Raghavan Srinivasan	India	Decision drivers in wood seasoning (due to energy and economics)
V Ramakantha	India	A road map for strengthening solid wood based handicraft sector of Manipur, India
V Ramakrishnan	India	The fourth dimension of wood
Ramesh Chandra Mishra	India	Sandalwood the saviour of ecological balance and super wealth creator
M P Ranjan	India	Design detailing in wood: An appreciation of furniture design by Gajanan Upadhaya
M V Rao	India	Etikoppaka - An Indian village perpetuating the joy of wood through the tradition of toy art
T S Rathore	India	Status of wood consumption in handicraft industries of Jodhpur
O K Remadevi	India	Wooden monuments in India, epitomes of beauty and talent, need protection from a biological perspective
Roshan Shetty	India	Vernacular architecture for sustainable development - A case study of South Canara region
Saara Taalas	Sweden	Bridging life at home and sustainable production
Sangeeta Gupta	India	History and current status of wood culture in India
K S Shashidhar	India	Changing trends in timber usage in Nagaland, India
Shengfu Wu	China	The struggling Chinese woodworking industry: Challenges and solutions
B Siddappa	India	Efficiency resources (forest and credit) use by SHG's for socio-economic transformation of Karnataka economy
Singanpalli Balaram	India	Designing with wood for development
Stephen Tekpetey	Ghana	Lifestyles changes in some urban centres in Ghana: What are existing and potential impacts on wood use in 2011 and beyond?
T P Subramony	India	Bamboo as a modern construction material
Sudipta Dasmohapatra	USA	Consumer purchase trends and perceptions in the USA
V S Venkatesha Gowda	India	Global emerging trends on sustainable production of natural sandalwood

Victor Adekunle	Nigeria	The social, religious and magico-cultural aspects of wood and its versatility for rural and sustainable national development in Nigeria
Xiaomei Jiang	China	The inheritance and development of Hongmu culture in China
Yang Ping	Japan	The promotion of wood culture in Japan
Ying Lin Hung	China	Wooden paths to a sustainable future

Appendix 2 - List of participants

Abhilasha Guleria
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Achmad Zainudin
Secretary
APKJ Jepara
Gedung JTTC, Jl. Raya Kudus-Jepara, KM11 Rengging
Pecangaan, Jepara 59462, Central Java, Indonesia
pengrajinkayu@yahoo.com

Adjovi Edmond
Lecturer
University of Abomey-Calavi, 01BP 2009, Benin
adjed2001@yahoo.fr

Adrian Whiteman
Senior Economist
FAO, Viale delle Terme di Caracalla, 00153 Roma, Italy
adrian.whiteman@fao.org

Ahmad T
J.J.Industries Private Limited, Peenya, Bangalore, India
ahmad.uf@gmail.com

Aimi Lee Abdullah
Policy Analyst
EFI FLEGT Asia Regional Support Programme
5th Floor, Wisma Chinese Chamber, 258
Jalan Ampang 50450, Kuala Lumpur, Malaysia
anne.anantom@efi.int, aimi.lee@efi.int

Ajay Karmarkar
Scientist E
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore -560003, India
ajay@icfre.org

Amar Jyoti Nath
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Amit Singh
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Anand Nandanwar
Scientist C
Indian Plywood Industries Research and Training
Institute
PB No. 2273, Yeswanthpur, Bangalore- 560 022, India

Anantha Padmanabha H S
Forestry Consultant
BSK, 31, 2nd Main, Poorna Pragna, BSK 3rd Stage
Bangalore-560085, India
ananthap@hotmail.com

Andrea Klein
University of Natural Resources and Life Sciences
Peter Jordan Strasse 82, 1190 Vienna, Austria
andrea.klein@boku.ac.at

Andrew Waugh
88 Langbourne Mansions, Langbourne Avenue
London N6 6PU, UK.
andrew@waughthistleton.com

Angel Llaveró
Responsible Purchasing Coordinator, GFTN
allaveró@wwf.panda.org

Anil Kumar
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Anindita Bhattacharyya
WWF India
172 B, Lodhi Estate, New Delhi, India
absarkar@wwfindia.net

Ankit Chikara
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Ankita Nandi
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Anoop E V
Associate Professor
College of Forestry, Kerala Agricultural University
Vellanikkara, Thrissur, Kerala, KAU Post, India
anoopev@yahoo.com

Antony Emmanuel
General Manager - Sales
Indian Window Products Industries, 338
Babusa Palya Kalyan Nagar, Bangalore, India – 560043
antony@indianwindow.com

Anupam Chaudhary
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Arif Nuryawan
Teaching Staff
Dept. of Forest Products Technology
University of Sumatera Utara
Jl. Tri Dharma Ujung No.1 Kampus USU
Medan 20155, Indonesia
arifnury@yahoo.com

Arsenio B Ella
Wood Scientist
Forest Products Research and Development Institute
Department of Science and Technology (DOST)
College, Laguna 4031, Philippines
arsie_ella@yahoo.com

Arun
Artisan, Shilpa Trust, Bangalore, India

Ashish Ramesh Raut
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Ashuthosh Srivasthava
Scientist C
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore, India-560003
ashutosh@icfre.org

Asrafuddin Ahmed
Artisan, Narayan Pure, P.O. Mukalamur, Assam, India.

Bahuguna V K
Director General
Indian Council of Forestry Research and Education
New Forest P.O, Dehradun, India
bahugunavk@icfre.org

Bansal A K
Assistant Director General (FC)
Ministry of Environment and Forests
Government of India
Paryavaran Bhawan, CGO Complex, Lodhi Road
New Delhi 110 003, India

Beena Pankaj Patel
Head, Research & Development
Abellon CleanEnergy Ltd, Sydney House
Premchand Nagar Road, Bodakdev, Ahmedabad, India
beena.patel@abelloncleanenergy.com

Bhomik Shah
WWF India
172 B, Lodhi Estate, New Delhi 110003, India
bshah@wwfindia.net

Brian Hooper
5 Normanby Street Yeppoon Q, 4703 Australia
bharch@bigpond.com

Bui Thi Kim Yen
Thang Loi Enterprise
189 Thanh Nhan - Hai Ba, Trung Dist, Ha Noi, Vietnam

Cemil Durdi
Carving Workshop Technician
Mugla University, Menderes District 40, Street number 12
Circle 2, 46040 Kahramanmaras, Turkey
cemil_km@hotmail.com

Chen H K
TRAFFIC International

Chengqing Guo
General Manager
Fujian Provincial Court Fine Antique Furniture Co. Ltd.
3339 Licheng Street, North Baofeng Community
Xianyou, Fujian, China
773941590@qq.com

Chennayachari S
Artisan, Etikoppa, Visakhapatnam-531082, India

Chia-Yin Yao
Photographer
International Wood Culture Society- Taiwan Division
3F.-3, No.75, Ruiyuan Rd., Qianjin Dist.
Kaohsiung City 801, Taiwan.
annyyao @iwcs.com

Chien-Wen Lai
Carpenter
National Pingtung University of Science and Technology
Department of Wood Science and Design, 1
Shuefu Road Neipu, Pingtung 912, Taiwan
Vwt4il@yahoo.com.tw

Christophe Bosset
Japan International Cooperation Agency
3rd Floor, Dr. Gopal Das Bhawan
28 Barakhamba Road New Delhi-110001, India
sachimoku@hotmail.com

Criswell Davis
Mighty Oaks Consulting
4541 Bigger Road, Kettering, Ohio 45440, USA
criswell.davis1@gmail.com

Dang Cong Quang
Forexco Quang Nam
Dien Ngoc, Dien Ban, Quang Nam, Vietnam
quangdc@forexco.vn

Debasish Biswal
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Devendran S
Elixir Technologies
29 Ground Floor 1st Cross, Micolayout
Mahalakshimpura Bangalore, India 560 086
sales@elixirtechnologies.in

Dharini Parthasarathy
National Communications Associate
FAO India, 56 Lodhi Estate, New Delhi 110 003, India
dharini.parthasarathy@fao.org

Dheerendra Kumar
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Dick Sandberg
Professor
Linnaeus University, School of Engineering
Växjö, SE-351 95, Sweden.
dick.sandberg@lnu.se

Dilip Kumar P J
Director General of Forests & Special Secretary
Ministry of Environment and Forests
Government of India
Paryavaran Bhawan, CGO Complex, Lodhi Road
New Delhi 110 003, India

Dimpal Pancholi
B-199, Siddharth Bunglows, Amitnagar Savli Road
Vadodara, Gujarat - 390022, India
dimpalpancholi@yahoo.in

Dong Van Dam
NAFOCO
Km 04, Loc Hoa, Nam dinh, Vietnam
nafoco.namdinh@gmail.com

Duong Duy Khanh
WWF Vietnam, D13, Thang Long
International Village, Cau, Giay Dist., Ha Noi, Vietnam
Khanh.duongduy@wwfgreatermekong.org

Duong Quy Linh
Tran Duc Group
Binh Phuoc A, Binh Chuan, Thuan An Dist.
Binh Duong, Province, Vietnam.
linhdq@tranducgroup.com

Dustin Tusnovics
Architect
Space Matters Architecture and Urbanism
235A Jan Smuts Avenue, Parktown North
2193 Johannesburg, South Africa.
dustin.tusnovics@archcom.at

Ederson Augusto Zanetti
Federal University of Technology of Parana
Av. Prof. Lothário Meissner
900. 80210-170, Curitiba, Paraná, Brazil
ederzanet@yahoo.com

Elizabeth Remedio
Director
Zonal Research Center, University of San Carlos
Main Office of Research, Room 403
P Del Rosario Street, Cebu City 6000, Philippines
emremedio@gmail.com

Emily Fripp
Managing Director & Consultant
FLEGT Asia Regional Support Programme, Efeca
3 The Square, Puddletown, Dorset, DT2 8SL, UK
emily.fripp@efeca.com

Emmanuel Appiah-Kubi
Research Scientist
Forestry Research Institute of Ghana
PO Box UP 63, KNUST, Kumasi, Ghana
eappiahkubi@csir-forig.org.gh

Eri Kakuta
Programme Specialist
Japan International Cooperation Agency, 2nd Floor
Dr Gopal Das Bhawan, 28 Barakhamba Road
New Delhi-110001, India
Kakuta.Eri@jica.go.jp

Eric Appau Asante
Lecturer
Kwame Nkrumah University of Science and Technology
PO Box UP 79, KNUST, Kumasi, Ghana
eaasante.cass@knust.edu.gh

Ernst Kuersten
Wood Report GmbH
An den Papenstuecken 2, Hannover
30455 Niedersachsen Germany
kuersten@holzfachschule.de

Eyyüp Karaoğul
M Sc Student in Wood Art
University of Kahramanmaras Sutcu Imam
Faculty of Forestry, Avsar Campus, 46050
Kahramanmaras, Turkey
e.karaogul@ksu.edu.tr

Foong Sheong Hoong
Senior Manager
Maeve Furn Co., Ltd, An Phu Village, Thuan An District
Binh Duong Province, Vietnam
hoong@maevefurn.com.vn

Fwu-Lih Lin
General Manager of R&D
Baroque Timber (ZhongShan) Co., Ltd
2nd SuiAn Industry Zone, GangKou Town
ZhongShan City, GuangDong Province
elwoodart@yahoo.com

Gabriel Hemery
Chief Executive
Sylva Foundation, Manor House, Little Wittenham
Oxfordshire, OX14 4RA, UK
gabriel@sylva.org.uk

Gaikwad Jayesh Waman
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Ganga Visalakshy
Senior Scientist
Indian Institute of Horticultural Research
Division of Entomology and Nematology
Hessarghatta Lake Post, Bangalore-560 089, India
gangavpn@gmail.com

Geeta
Scientist
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
geeta@icfre.org

George Mathew
Programme Coordinator
Forest Health Division, Kerala Forest Research Institute
Peechi-680 653, Trichur, Kerala, India
gmathewkfri@gmail.com

Giedrius Leliūga
Managing Director
Medžio Stilius (Wood Style), Lithuania
giedrius@eco-wood.net

Gordon Paterson
Wood Technologist
Forestry Department, Ministry of Agriculture
Queens Park, St. Georges, Grenada
massaiman2004@yahoo.com

Guangjie Zhao
Professor
Beijing Forestry University, 35 Qinghua East Road
Haidian District, Beijing, China
zhaows@bjfu.edu.cn

Guixiang Wang
Professor
Tsinghua University, Tsinghua Yuan, Haidian District
Beijing, China
wanggx@tsinghua.edu.cn

Guoming Zheng
Chairman
Winbond Classic Furniture Co., Ltd.,
168 Fengting Zhen North Road, Putian, Xianyou
Fujian, China
fjhbjj@163.com

Hairatjeet Kaur
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Hakki Alma M
Professor
University of Kahramanmaras Sutcu Imam
Faculty of Forestry, 46050 Kahramanmaras, Turkey
alma@ksu.edu.tr

Hareesh T S
Assistant Professor
Department of Forest Products and Utilization
College of Forestry, Ponnampet 571216, Kodagu
Karnataka, India
tshareesh@gmail.com

Himanshu
Artisan, Fashion Wood Works
No. 85, 1 Main Road, Nehru Nagar Industrial Estate
Old Mahabalipuram, Kottivakkam, Chennai-600096, India.

Howard Rosen
Staff Specialist Forest Products
USDA Forest Service, 4th Floor, RP-C, 1601 North Kent
Street Arlington, VA 22209, USA
hrosen@fs.fed.us

Hsien-Hsin Lin
Program Designer
International Wood Culture Society- Taiwan Division
3F-3, No.75, Ruiyuan Rd, Qianjin Dist.
Kaohsiung City 801, Taiwan
tkvjackson@yahoo.com.tw

Illias Animon
Forestry Officer (Economics)
FAO, Viale delle Terme di Caracalla, 00153 Roma, Italy
illias.animon@fao.org

Indu Parthasarathy
Art Historian
Crafts council of Karnataka, 72, Miller Road
Bangalore 560 052, India
parthasarathy.indu@gmail.com

Ismita Nautiyal
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Jadhav Anvesh Ashok
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Jagadish Vengala
Scientist
Indian Plywood Industries Research
and Training Institute
Post Bag No. 2273, Tumkur Road, Yeswanthpur
Bangalore - 560 022, India
jdvangala@yahoo.com

Jain S H
Scientist
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
shjain@icfre.org

Jay Vidhani
Managing Director
Vidhani Veneers Pvt Ltd, 121, Mani Complex
Opp. Madhuban Multiplex
Gandhidham, Gujarat, India
jay.vidhani@gmail.com

Jegatheswaran Ratnasingam
Associate Professor
Universiti Putra Malaysia, Faculty of Forestry
43400 Upm Serdang, Selangor Darul Ehsan, Malaysia
jegaratnasingam@yahoo.com

Jez Ralph
Technical Advisor
Silvanus, 9 Mudges Terrace, Gunnislake
Cornwall PL18 9LW, UK
jez.ralph@silvanus.org.uk

Jikesh Thakkar
Vice President
Rushil Décor Ltd., 1 Krinkal Appt.
Mahalaxmi Society, Opp. Mahalaxmi Temple, Paldi
Ahmedabad-380007 India
jikesh@rushil.com

Jim Birkemeier
Timbergreen Forestry
Timbergreen Farm, S11478 Soeldner Rd
Spring Green WI 53588, USA
Jim@TimbergreenForestry.com

Jinling Su
Manager
International Wood Culture Society
38 Shuntong Road
Renhe Shunyi District, Beijing, China
Sujinling@iwcs.com

Jirawat Tangkijngamwong
Secretary General
Thai Furniture Industries Association, Thailand
jirothailand@gmail.com, deesawat@ksc.th.com

Joey Anchondo
5989 N Parkwood Circle, Coeur d' Alene, ID, USA
Janchondo2@gmail.com

Joseph George
J.J.Industries Private Ltd, Peenya, Bangalore, India

Joshi S C
Director
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
dir_iwst@icfre.org

Junwen Pu
Professor
Beijing Forestry University, Tsinghua Donglu 35
Hai Dian District, Beijing, China
pujunwen@126.com

Kadiroo Jayaraman
TEAKNET Coordinator
Kerala Forest Research Institute
Peechi, Thrissur, Kerala 680653, India
coordinator@teaknet.org

Kanuri S Rao
Director (Retd), Institute of Wood Science
and Technology
C/o Gp Capt K V K Anand, P-124, TETRA House
Gangamma Circle, Jalahalli East
Bangalore 560013, India
kanuri_rao@yahoo.com

Kapil Sihag
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Kapilraj M
Hindustan University, Dept of Civil Engineering
Chennai, India
goon.27dj@gmail.com

Kenan Akyuz
Head of Department
General Directorate of Forestry, Orman Genel
Müdürlüğü Gazi Tesisleri 06560, Beştepe / Ankara
Turkey
kenanakyuz@ogm.gov.tr

Kenan Kilic
Department Manager
General Directorate of Forestry, Orman Genel
Müdürlüğü Gazi Tesisleri 06560
Beştepe / Ankara, Turkey
kenankilic@ogm.gov.tr

Khalid Pasha
Traffic India
172 B, Lodhi Estate, New Delhi 110003, India
khalid@wwfindia.net

Kitazawa Hideta
Mask Carver
Shinto Temple Carver, 4-11-22 Mizumoto
Katsushika-ku, Tokyo 125-0032, Japan
yoshiyam@sea.plala.or.jp

Krishna Das K
Executive Director
Vayali Folklore Group, P.O Arangottukara
Thrissur, Kerala, India- 680 593

Krishna Kumar Pandey
Scientist, Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
kkpandey@icfre.org

Kunhamu T K
Associate Professor
College of Forestry, Kerala Agricultural University (PO)
Thrissur- 680 656, Kerala, India
kunhamutk@yahoo.com

Le Thi Loc
WWF Vietnam
D13, Thang Long, International Village, Cau, Giay Dist.
Ha Noi, Vietnam
Loc.letthi@wwfgreatermekong.org

Le Tran Thuy
Vinafor
32 Dai Tu, Dai Kim Ward, Hoang Mai Dist.
Ha Noi, Vietnam
buiquangdung56@yahoo.com.vn

Le Tri Thang
Director
Duc Loi 2, Binh Phuoc B Hamlet, Binh Chuan Village
Thuan An Dist., Binh Duong Province, Vietnam

Legiman Arya S P
Wood Carving and Statue Artisan
Gajah Sungging Carving Ud. and Multi Usaha Raya Pt.
Jln. Shima-Belakang gunung
Centra Industry of Wood and Statue Carving
Jepara 59432, Centra Java, Indonesia
gajahsungging@gmail.com

Liem Nguyen
Director
Lamviet JSC, 1B Hamlet - Khanh, Binh Village
Tan Uyen District - Binh, Duong Province, Vietnam
contact@lamvietfurniture.com

Lim Nai Seng
Nguyen Thanh Furniture Ltd, Vietnam

Madan Jalan
Arunachal Plywood Industries Limited
Park Street, 4th Floor, Kolkata - 700 016
mmjalan@gmail.com

Maharana P K
Ritual specialist
Sapanko (Village), Puri (District), Orissa-752046, India

Mahesh Joshi
Director
Doordarshan Kendra, Bangalore, India

Mai Xuan Quang
Thang Loi Enterprise, Phuoc Thanh commune
Tuy Phuoc district, Binh Dinh Pro., Vietnam
quangthl@vnn.vn

Mamatha B S
Scientist C
Indian Plywood Industries
Research and Training Institute
PB No. 2273, Tumkur Road, Yeswanthpur
Bangalore 560 022, India
mamatha@ipirti.gov.in

Mangala De Zoysa
Professor in Agricultural Economics
University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka
mangala@agecon.ruh.ac.lk

Mani A C
Chief Executive Officer
Aoro Monish Exports, Tamilnadu, India
mani@auromonishexports.org

Manish Ranjan
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Manisha Agarwal
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Manoharan T R
Head, Forest Programme
WWF India
172- B Lodi Estate, New Delhi 110003, India
tmanoharan@wwfindia.net

Manoj Kumar
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Maria Florence E J
Scientist F and Head, Forest Pathology Department
Kerala Forest Research Institute
Peechi, Thrissur, India
flory@kfri.org

Maria Riala
Researcher, Finnish Forest Research Institute
P.O. Box 18, (Jokiniemenkuja 1)
FI-01301 Vantaa Finland
maria.riala@metla.fi

Mary Tyrrell
Executive Director
Yale Global Institute of Sustainable Forestry
Yale University, 195 Prospect St.
New Haven CT 06517, USA
mary.tyrrell@yale.edu

Michael Grabner
University of Natural Resources and Life Sciences
Peter Jordan Strasse 82, A-1190 Vienna, Austria
michael.grabner@boku.ac.at

Michael Green
Architect
MGB Architecture, 15b Chesterfield Place
North Vancouver, BC V7M 3K3, Canada
mgreen@mgb-architecture.ca

Michael Martin R
Director
FAO, Viale delle Terme di Caracalla
00153 Roma, Italy
michael.martin@fao.org

Mike Wen Pin Hou
Executive Vice President
International Wood Culture Society
2549 Eastbluff, #307 Newport Beach, USA
mikehou@iwcs.com

Mochan Bhattarai
ECCA, Wise Use House, Jwagal, Koupoundole
Lalitpur, P.O Box-9210, Nepal
mochanbhattarai@hotmail.com

Mohan S
Scientist, Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
smohan@icfre.org

Mohanty B N
Group Co-ordinator (Research)
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
bnmohanty@icfre.org, groupco_iwst@icfre.org

Mr Raghuvanshi S Rao
Elixir Technologies
29 Ground Floor Ist Cross, Micolayout
Mahalakshimpura, Bangalore 560 086, India
sales@elixirtechnologies.in

Nagaveni H C
Scientist, Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
hacnagaveni@iwst.org

Nalin Rai
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Narayanan Asari D V
Artisan, Vattaparambil House
Desamangalam Thrissur Dt, Kerala, India

Nath S K
Joint Director
Indian Plywood Industries Research
and Training Institute
PB No. 2273, Tumkur Road, Yeswanthpur
Bangalore 560 022, India

Neelam Manjunath
Managing Trustee
Centre for Green Building Materials & Technology
No.7, Aditigreescapes, No.20, Venkateshpura,
Sampigehalli Rd Bangalore - 560064, India
cgbmtblr@gmail.com

Neelkant Pandhare
Senior Programme Manager
43, Prakruthi, 2nd Cross, Ramaya Layout
St. Thomas Town, Post, Kammanahalli
Bangalore-560084, India
neelkant.p@prakruthi.org

Neera sarmah
Tripura Bamboo Mission
Dasgupta Villa, North side of Governor House
Agartala Tripura, India
neecol@rediffmail.com

Negi S S
Director
Forest Research Institute
New Forest P.O, Dehradun 248 007, India
negiss@icfre.org, dir_fri@icfre.org

Nguyen Chien Thang
General Director
Scansia Pacific, Lot 24-30 Street 1
Tan Tao Industrial, Zone Binh Chanh
District, HCMC, Vietnam
scansiapacific@scansiapacific.com

Nguyen Duc minh
WWF

Nguyen Sy Hoe
Thang Loi Enterpirse, Phuoc Thanh commune
Tuy Phuoc district, Binh Dinh Pro., Vietnam
quangthl@vnn.vn

Nguyen Van Quy
Staff, Due Loi, Binh Phuoc B Hamlet
Binh Chuan Village, Thuan An Dist.
Binh Duong Province, Vietnam

Nobuaki Hattori
Professor
Tokyo University of Agriculture and Technology
Faculty of Agriculture, 3-5-8 Saiwai-cho
Fuchu-shi, Tokyo 183-850, Japan
hattori@cc.tuat.ac.jp

Olga Georgievna Sevan
Head of Department
Russian Institute for Cultural Research
Department for the "Cultural Environment
of Settlements"
Bersenevskaja nab. D.20
119073 Moscow, Russia
osevan47@gmail.com, ecovast@rambler.ru

Pandey C N
Director
Indian Plywood Industries Research
and Training Institute
Post Bag No. 2273, Tumkur Road
Yeswanthpur, Bangalore - 560 022, India
cnpandey@ipirti.gov.in

Pankaj Aggarwal
Scientist
Institute of Wood Science and Technology
18th Cross, Malleswaram
Bangalore-560003, India
pankaj@icfre.org

Pascal Kamdem
Professor, Michigan State University
Department of Forestry
126 Natural Resources Building
East Lansing, MI 48824, USA
kamdem@msu.edu

Ping Yang
Professor, Kumamoto University
Faculty of Education, 2-40-1
Kurokami Kumamoto 860-8555, Japan
yangping@educ.kumamoto-u.ac.jp

Pradeep Singh
Deputy Conservator of Forests
Dangs South Forest Division, Gujarat, India
dcfdangssouth@gmail.com

Pramod John
Executive Director
Prakruthi, 43, 2nd Cross
Ramaiah Layout, Kammanahalli
St. thomas Town post, Bangalore-560084, India
pramod.john@prakruthi.org

Prasad P S R K
Artisan
Vagdevi, Maharajpeta Street, Bobbili town and Mandal
Vijaynagaram Dist, A.P. 535558, India

Prem Dhiman
Artisan
Tikkar (Village), Kangra (District), Himachal Pradesh
India

Prem Hindwal
Artisan, Joshimatt, Uttranchal, India

Priya Saloni
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Raghavan Srinivasan
Strategic and Technical Advisor
TechnoXL Green Technologies Pvt Ltd
59/11, Guru Ravidas marg, Kalkaji
New Delhi-110019, India
raghavan_29@hotmail.com

Rajesh Bhowmik
Department of Fine Art, Tripura University
Agartala, Tripura, India
rajindia_73@yahoo.co.in

Ramakantha V
Government of manipur
v_ramakantha@hotmail.com

Ramakrishna Hegde
Associate Professor
College of Forestry
University of Agricultural Sciences
Ponnampet-571216, Kodagu, Karnataka, India
vanasiri03@yahoo.com

Ramakrishnan V
Chairman
Leitz Tooling Systems India Pvt. Ltd.
Leitz Tooling Systems
India Pvt. Ltd., No.486C, 14th Cross, 4th Phase
Peenya Industrial Area, Bangalore, 560 058, India
ramu@leitzindia.com

Raman Kutty
Artisan
Kothavil House, Vellinzi Post
Palakkad-679504 Kerala, India

Ramazan BALI
Department Manager
General Directorate of Forestry, Orman Genel
Müdürlüğü Gazi Tesisleri 06560
Beştepe / Ankara, Turkey
ramazanbali@ogm.gov.tr

Ramesh Chandra Mishra
Chairman, Friends of Santalum Society of India
H II /97 L.D.A. Colony, Sector D, Barabirwa
Kanpur Road Lucknow-226012
Uttar Pradesh, India
rcmishralko@gmail.com

Ranjan M P
Designer
National Institute of Design (retired)
Ahmadabad, India
ranjanmp@gmail.com

Rao M V
Scientist
Institute of Wood Science and Technology
Wood Biodegradation Centre (Marine)
Yoga Village, Andhra University Post
Visakhapatnam-530 003, India
mvrao@icfre.org

Rathish Kumar R S
Artisan, Shilpa Trust
C/o Bhupathy,M/s Shilpa Trust,Bangalore, India

Rathore T S
Scientist F, Arid Forest Reserach institute, Jodhpur
New Pali Poad, Jodhpur, 342005, India
tsrathore@icfre.org

Ravikumar G
Research Assistant
Institute of Wood Science and Technology
18th Cross,Malleswaram, Bangalore-560003, India
gravikumar@icfre.org

Ravindra Singh Negi
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Remadevi O K
Scientist-F
Institute of Wood Science and Technology
18th Cross Malleswaram, Bangalore-560003, India
okremadevi@icfre.org,okremadevi@gmail.com

Roger Ndifonmbi
Wood Carver, Cameroon
rogerndifonmbi@yahoo.com

Romy Varkey Mathew
Managing Director
Indian Window Products Industries, 338, Babusa Palya
Kalyan Nagar, Bangalore - 560043, India
romymathew@indianwindow.com

Roshan Shetty
Assistant Professor
Manipal School of Architecture & Planning
Manipal University Manipal – 576 104, India
rooshan22@yahoo.com

Ru-An Hsu
Journalist
International Wood Culture Society- Taiwan Division
3F.-3 No.75, Ruiyuan Rd., Qianjin Dist.
Kaohsiung City 801, Taiwan
ruanhsu@iwcs.com

Rushil Thakkar
Managing Director
Rushil Décor, Bangalore, India

Saara Taalas
IKEA Professor
Linnaeus University, School of Business and Design
Linnaeus University, 351 95 Växjö, Sweden
Saara.Taalas@tse.fi, saara.taalas@lnu.se

Sandeep Theng
The Forest Trust, TFT, 608, Kirti Mahal, 19
Rajendra Place, New Delhi-110008, India
s.theng@tft-forests.org

Sangeeta Gupta
Scientist in-charge
Wood Anatomy Discipline
Forest Research Institute
P.O. New Forest, Dehradun
Uttarakhand-248006, India
guptas@icfre.org

Sanjay Bala
Traffic India, 172 B, Lodhi Estate
New Delhi 110003, India

Sanjay Magaji
Proprietor
Watermatt Coating Solutions
29/3 CKC Garden, 2nd Main Mission Road Cross
Bangalore- 560 027, India
sanjaymagaji@watermatt.net

Sankar Rao P
Assistant Keeper
National Human Museum, Shamlu Hills
Post Bag No. 2
Bhopal 462 013, India
drpsrao2010@gmail.com

Sanket Sadanand Bondre
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Sarika Parimao
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Satish Kumar Sinha
Assistant Professor
ASPEE College of Horticulture and Forestry
Forest Products and Utilization-Division
Navsari Agricultural University
Navsari, Gujarat 396450, India
sinhafri@gmail.com

Saurabh Nigam
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Sejal Worah
WWF India, 172 B, Lodhi Estate
New Delhi 110003, India
sejal@wwfindia.net

Shakti Chauhan
Scientist
Institute of Wood Science and Technology
18th Cross Malleswaram, Bangalore-560003, India
shakti@icfre.org

Shanmugan
Artisan
Fashion Wood Works
No. 85, 1 Main Road, Nehru Nagar, Industrial Estate
Old Mahabalipuram, Kottivakkam, Chennai-600096
India

Shantharam Patil
Associate Professor
Manipal School of Architecture and Planning
Manipal University, Manipal-576104, India
spatilss@yahoo.com

Sharma S K
Scientist
Institute of Wood Science and Technology
18th Cross Malleswaram, Bangalore-560003, India
sksharma@icfre.org

Shashidhar K S
Department of Forests, Ecology
Environment and Wildlife
Kohima, Nagaland, India
kss70@hotmail.com

Shengfu Wu
Director of Market Dept.
China National Forest Products Industry Association
18 Hepingli Dongjie, Beijing, China
shengfu@woodbasedpanel.com

Shengquan Liu
Director, Anhui Agricultural University
International Office, 130 Changjiang Road
Hefei City, Anhui Province, 230036, China
Liusq@ahau.edu.cn

Shilpa Naryal
WWF India
172 B, Lodhi Estate, New Delhi 110003, India
snarayal@wwfindia.net

Shruti Mukherjee
WWF India
172 B, Lodhi Estate
New Delhi 110003, India
shruti@wwfindia.net

Shukla S R
Scientist
Institute of Wood Science and Technology
18th Cross, Malleswaram
Bangalore-560003, India
srshuklaj@icfre.org

Siddappa B
Professor of Economics
SP and JMB College, 651 Sri Vinayaka Layout
9th Main Nagarbhavi, Bangalore 560 072, India
siddappa.bagali@gmail.com

Singanpalli Balaram
Dean
DJ Academy of Design, Coimbatore, India
s.balaram43@gmail.com

Singh A M
Deputy Inspector General of Forests (SU)
Ministry of Environment and Forests
Government of India
Paryavaran Bhawan, CGO Complex
Lodhi Road, New Delhi 110 003, India

Sivaraman T K
Marketing co-ordinator
Uravu, Thrikaipoth, Waynad, Kerala, India

Smitha Kamath
Green and sustainability solutions practise lead
Mahindra Satyam Electronic City, Bangalore, India
smitha.dr.kamath@gmail.com

Sreelakshmy M P
TEAKNET Secretary
Kerala Forest Research Institute
Peechi, Thrissur, Kerala 680653, India
secretariat@teaknet.org

Srinivasan V V
Director (Retd)
Institute of Wood Science and Technology
Bangalore, India

Stephen Tekpetey
Researcher
Forestry Research Institute of Ghana
PO Box UP 63, KNUST, Kumasi, Ghana
stekpetey@csir-forig.org.gh

Subramony T P
President
International Network for Bamboo and Rattans

Sudipta Dasmohapatra
Assistant Professor
Dept. of Forest Biomaterials, North Carolina State
University Box 8005, 1022H Biltmore Hall
Raleigh NC 27695, USA
sdasmoh@ncsu.edu

Sujatha Dhanapal
Scientist (R&D)
Indian Plywood Industries Research
and Training Institute
Post Bag No. 2273, Yeswanthpur
Bangalore - 560 022, India
dsujatha@ipirti.gov.in

Sundararaj R
Scientist F
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
rsundararaj@icfre.org

Sunil K Mehra
Chief Executive
TechnoXL Green Technologies Pvt Ltd, 59/11
Guru Ravidas Marg, Kalkaji, New Delhi-110019, India
technoxl@bol.net.in, technoxlgreens@gmail.com

Sunil Sanodiya
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Suraj
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Surendra Singh
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Surendranath S P
Partner
Garnier Seatings, 25, 1st main, Bhyraveswara Nagar
Nagarbhavi Main Road, Bangalore 560 072, India

Suresh Pant
Artisan
Vill. Aambaag, Near Shri Ganesh Agro Mill
PO Tanakpur Distt. Champawat, Uttarakhand, India

Susy Tafuro
FAO, Viale delle Terme di Caracalla, 00153 Roma, Italy
susy.tafuro@fao.org

Swagatika Nayak
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Syam Viswanath
Scientist E and Head (TIP Division)
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
sviswanath@icfre.org

Tapkir Deepak Gorakh
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Thanigai K
Scientist C
Indian Plywood Industries Research and Training Institute
Post Bag No. 2273, Yeswanthpur
Bangalore - 560 022, India

Thulasidas P K
Scientist
Division of Wood Science and Technology, Kerala
Forest Research Institute, Peechi - 680653, Kerala, India
thulasidas@kfri.org

Tran Chinh
Thanh Hoa Co. Ltd
466 Cao Thang, Dist., 10, Ho Chi Minh City, Vietnam
Chinh@Thanhhoaco.com

Tran Minh Hoi
Director, AQ Company Limited, Lot A9
Tra Da industrial zone
Pleiku city, Gia Lai province, Vietnam
kimnhi@aqvigor.com

Tran Thien
Thanh Hoa Co. Ltd, 466 Cao Thang, Dist., 10
Ho Chi Minh City, Vietnam
Thien@Thanhhoaco.com

Tran Van Ngan
Happy Wood Co.
Road No.9, Tam Phuoc, Industry Zone, Tam Phuoc
Commune Bien Hoa Dist.
Dong Nai Province, Vietnam
info@happyfurniturevn.com

Triveni P R
Research Officer
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
prtriveni@icfre.org

Ugyen Tenzin
Head (Forest Resources Utilization Section)
Department of Forests and Park Services, Bhutan
utenzin_2000@yahoo.com

Ujjwal Dheeman
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Uniyal K K
Student, Forest Research Institute
P.O. New Forest, Dehradun, India

Venkata Raman P
Artisan
Vagdevi, Maharajpeta Street, Bobbili town and Mandal
Vijaynagaram Dist, Andhra Pradesh. 535558, India

Venkatesha Gowda V S
Deputy General Manager (R & D)
Karnataka Soaps and Detergents Limited
Sandal City, P. B. No. 5531, Bangalore 560 055, India
vsagowda@yahoo.co.in

Victor Adekunle
Senior Lecturer
Department of Forestry and Wood Technology
Federal University of Technology, Akure, Nigeria
vajadekunle@yahoo.com

Vikram Singh Meena
Student
Forest Research Institute, P.O. New Forest
Dehradun, India

Vindhya Prasad Tewari
Scientist-F
Institute of Wood Science and Technology
18th Cross, Malleswaram, Bangalore-560003, India
vptewari@icfre.org

Vipin K Chawla
Scientist
Indian Plywood Industries Research
and Training Institute
Post Bag No. 2273, Yeswanthpur
Bangalore - 560 022, India
vipinfri@gmail.com

Wong Sai Kin
Managing Director
Maeve Furn Co., Ltd, An Phu Village, Thuan An District
Binh Duong Province, Vietnam
kin@maevefurn.com.vn

Xiaomei Jiang
Researcher
Chinese Academy of Forestry
xiaomei@caf.ac.cn

Ximing Wang
Dean
Inner Mongolia Agricultural University
306, Zhaowuda Road, Hohhot, Inner Mongolia, China
w_ximing@263.net

Yao Chen
Editor
International Wood Culture Society
38 Shuntong Road, Renhe, Shunyi District, Beijing, China
chenyao@iwcs.com

Ying-Lin Hung
Researcher
International Wood Culture Society- Taiwan Division
3F-3, NO.75, Ruiyuan Rd., Qianjin Dist.
Kaohsiung City 801, Taiwan
marthahung@iwcs.com

Yi-Ning Wang
Communication Coordinator
International Wood Culture Society- Taiwan Division
3F-, No.75, Ruiyuan Rd.
Qianjin Dist., Kaohsiung City 801, Taiwan
yiningwang@iwcs.com

Yuan-Cheng Chen
Carpenter, Department of Wood Science and Design
National Pingtung University of Science
and Technology
1, Shuefu Road, Neipu, Pingtung 912, Taiwan
abc80208@hotmail.com

Zhengjun Li
Videographer
International Wood Culture Society
38 Shuntong Road, Renhe, Shunyi District
Beijing, China
lizhengjun@iwcs.com

Zhifu Xu
Videographer
International Wood Culture Society, 38 Shuntong Road
Renhe Shunyi District, Beijing, China
xuzhifu@163.com

ZhiYu You
Chairman
Fujian Southeast Xianyou Fine Craft Co., Ltd, Laidian
Zhen Tushankou, Xianyou, Fujian, China
ads@winmail.cn