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Seminar on the Use of Wood in Construction
in the Latin American and Caribbean Region
Quito, Ecuador, 4-8 November 1991

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REPORT*

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TABLE OF CONTENT

	Page
I - INTRODUCTION	1
II - SUMMARY OF COUNTRY PAPERS: SITUATION REGARDING TIMBER CONSTRUCTION IN LATIN AMERICA AND CARIBBEAN	2
A. Diagnosis	2
B. Production and marketing aspects	4
C. Research and standardization aspects	5
D. Educational and training aspects	5
E. Financing and insurance aspects	6
F. Recommendations	6
III - HIGHLIGHTS OF PRESENTATIONS	7
IV - SUMMARY OF DISCUSSIONS	20
A. Group A - Standardization and structural design	20
B. Group B - Commercialization and industrialization	22
V - RECOMMENDATIONS OF THE WORKING GROUPS	23
A. Group A - Standardization and structural design	23
B. Group B - Commercialization, industrialization and promotion	24
VI - CONCLUSIONS AND RECOMMENDATIONS	28
ANNEX 1 - Aide-mémoire	30
ANNEX 2 - General programme	34
ANNEX 3 - List of participants, observers and consultants	36
ANNEX 4 - Working groups A and B	41
ANNEX 5 - Documentation	43
ANNEX 6a - Evaluation form	46
ANNEX 6b - Consultants' evaluation of Seminar	48

I. INTRODUCTION

1. This Seminar was first conceived some four years earlier as a joint project between FAO, JUNAC and UNIDO as the foundation for integrating and harmonizing developments and the technical assistance required in this field in the region. It is universally appreciated that the construction industries section is one of the most important in virtually all countries and that, for it to be successful, not only the building materials supplying industries but also professionals involved (civil engineers and architects particularly) must be productive and efficient as well. In the case of the use of wood for construction it has been recognized that the lack of harmonized and integrated standards and design codes have hindered development and that there is an urgent need to make building officials and professionals more aware of the contribution that timber could make. This is considered fundamental to developing the timber conversion and fabrication industry and consequently the provision of reliable, durable and cost-effective structures to satisfy growing national needs as well as value-added products for export.

2. It was with this background that, owing to policy changes within the other two organizations, UNIDO was left to carry on with the project as described in the Aide-Mémoire (Annex 1). Despite the scarcity of funds remaining, UNIDO was able to sponsor 20 participants from 11 countries in the region, plus 4 from Ecuador. A further 24 observers from Ecuador attended the Seminar and participated in the working group sessions as well.

3. Local arrangements, logistics and organizational matters were effectively carried out by the Association of Wood Industries of Ecuador (AIMA) whose staff provided strong support throughout the seminar.

4. The programme as actually happened is attached as Annex 2 and Annex 3 shows the names, addresses and contact telephone, telex and fax numbers of participants and consultants. However, only the working associations of observers who subscribed are listed. Owing to the mixed nature of the seminar, being both a training event and an expert group meeting, it was decided to appoint Mr. Christian Arbaiza (Peru) and Mr. Amantino R. de Freitas, (Brazil), both UNIDO consultants, as chairman and vice-chairman, respectively.

5. An important part of the Seminar was devoted to discussions leading to conclusions and recommendations on two main themes:

- a) Standardization and structural design; and,
- b) Commercialization and industrialization.

Two working groups were formed comprising 23 members each according to individual preference. The 8 international consultants similarly split up to work with their preferred groups. The terms of reference of these two working groups and the participating members are shown in Annex 4.

6. Provision had been made for the distribution of a number of documents during the Seminar including, for the 20 international and 4

Ecuadorian participants, 6 texts/manuals produced by JUNAC. The list of documents and working papers distributed during the Seminar is shown as Annex 5.

7. Annex 6a consists of a summary of the evaluation of the Seminar by participants including a paraphrased list of comments. The consultants similarly evaluated this Seminar as both a training course and an expert group meeting. A synthesis of their comments appear as Annex 6b.

8. Parallel to this seminar, a series of lectures was organized at the College of Architects of Pinchincha on the evenings of 5, 6 and 7 November. These were given by the UNIDO consultants Arq. C. Arbaiza M., Ing. Lucia S. Vedovello and Ing. J.J. Salinas.

9. Finally, the UNIDO representative reviewed the Seminar with the President and the sub-Director of AIMA on the following Monday and, at a session the same evening, presented a brief summary and the recommendations to a meeting of the executive board of AIMA. Most comments were positive and it was apparent that there is a great need for this and similar such familiarization seminars to be held in the region and that rationalization of the industry and harmonization of efforts will be well supported.

II. SUMMARY OF COUNTRY PAPERS: SITUATION REGARDING TIMBER CONSTRUCTION IN LATIN AMERICA AND THE CARIBBEAN¹

A. Diagnosis

1. Historical Background

10. Wood was used as a construction material in Latin America since the earliest cultures. It was during the colonial area that the tradition of the use of wood for building houses and public buildings was made popular. Wood was used principally for suspended floors and roofs combined with walls of bricks or adobe or, through the use of wood combined with coverings of cane and white washed or covered with mud or plaster.

11. Nevertheless although in rural areas of the region, wood continued to be used predominantly for floors and roofs, this was done in many cases without mechanical transformation (as poles), without treatment and without the benefits of engineering and construction technology. Quite the contrary happened in urban zones, where a substantial decrease in the use of wood in construction starting from the republican era (end of the last century and beginning of this century), during which, materials considered as exotic such as cement, glass and building iron and others appeared.

¹ Document based on the report prepared by participants from Brazil, Costa Rica, Ecuador, El Salvador, Mexico, Panama, Peru and Uruguay as well as the document "The Use of Wood as Construction Material in Latin America" by Mr. Christian Arbaiza, M

12. This situation developed, in the case of the Pacific coast of Latin America, beginning with the opening of the Panama canal in 1914. From then, the use of wood declined and the use of so-called conventional materials increased over the following 70 or 80 years. It was only since the 1960s that certain initiatives could be observed to incorporate once again the use of wood as a construction material.

13. In terms of the evolution of timber construction in Latin America in recent years, there is no doubt that the work carried out by the Andean Pact between 1975 and 1989 represented a landmark without precedent in the development of countries with tropical forests. The proposition was to stimulate the technological development of the use of wood in construction as a way of incorporating the available forest resources into the economies of Andean countries. The results of studies and experience developed over 15 years of activities has gone beyond the Andean Pact countries themselves through the rest of Latin America and the Caribbean as well as to other regions of the world with similar needs.

2. Housing deficit, wood resources and forest based industries

14. There is general awareness of the enormous housing deficit which the Latin American countries must solve in the next decades and of the important contribution that wood as a construction material can make in the solution of this acute social problem. On other hand, there exists in general, sufficient available forest resources and above all sufficient installed processing capacity. In those countries which are deficit in wood resources, development of timber construction is planned beginning with reforestation programmes and the utilization of secondary species as well as the importation of sawwood from neighbouring countries.

15. There exists a certain consensus that the future of the wood in construction depends on the sustained management of the remaining forests and those which should be established in humid-tropical zones and in temperate regions through the plantation of coniferous species as has been demonstrated in some Latin American countries. On the other hand it is known that the rate of forest destruction is alarming and above all is caused by the desire to extend agricultural and farming areas. In this sense, the use of wood in construction represents one of the best alternatives to restore the economic value to forests and to guarantee their conservation, sustained management and replacement.

16. Finally, it is worrying that the legal situation in relation to the land-holding and forest resources rights, represents a negative aspect which does not permit a sustained, long-term development much less a stimulation for either public or private sector intervention in large scale reforestation programmes. In this context, there is a coincidental need to harmonize rural development policies and promote a better sustained management of available forest resources or those which will be created in the future.

3. Limitation and obstacles to timber construction

17. In general, these vary from country to country, but depend on the level of development of the timber construction industry, on the strength of private enterprise and occasionally on the flexibility of the public sector in the execution of national housing plans. The following aspects could be singled out as limiting the use of wood in construction in most countries:

- doubts about durability
- user acceptance (image and status)
- low resistance to attack by insects, fungi and fire
- non competitive prices
- inexistence or lack of knowledge of design standards and specification
- difficulty in procuring raw material in the right qualities and quantities especially for large scale programmes
- poor dissemination of existing technologies regarding species, preservation and construction methods
- lack of aggressive public sector policies which results in low availability of financing and the lack of fair insurance premiums
- limited efforts to develop permanent training programmes at the upper and management levels
- lack of competition and availability of distribution centres for elements and structural components
- absence of standardization and/or application of standards
- limitations in primary conversion (of logs to sawwood) in terms of dimensions and grading
- inexistence of organized groups aimed at promoting the use of wood in construction.

B. Production and Marketing Aspects

18. Only in Mexico, Brazil and Chile could it be considered that a fabricating industry exists that is reasonably well organized to produce elements and components of wood destined for construction. Even there, it can be observed that the installed capacity is considerably greater than the actual demand for wooden houses. On the other hand, even in conditions where the demand increases, the existing production would not participate significantly in the solution of the housing problem in these countries. In other words, the problem lies not in the technical field but in lack of demand on the part of users.

19. In countries like Mexico in 1991, only 2% of available installed capacity was used to build timber houses. This situation obliges the forest based industry or the timber housing fabrication and construction industry itself to seek continually new export markets in which it can compete owing to the lower cost of labour regardless of the higher raw material costs. On the other hand, some countries of Central and South America with little raw material need to import wood to implement house building programmes. This is due to the degree of existing deforestation and consequently the better cost and supply opportunities in terms of quality and quantity of imported wood.

C. Research and Standardization Aspects

20. From the point of view of technological development and standardization of products and design methods, a considerable disparity can be observed between Latin American countries. Once again the harmonization of criteria realized by the five Andean Pact countries to incorporate and promote the use of wood in construction could be presented as an example. Even in this case, much remains to be done and there are currently steps being taken to initiate some regional projects directed at complementing the previous efforts in the area of standardization.

21. The concept of structural grouping of species has given good results in the Andean Pact not only to permit a greater availability of species in the same structural group but also above all, for the methodology proposed to incorporate progressively many lesser known but abundant species in the tropical forest. This aspect should be considered in future efforts to harmonize building codes of the region.

22. In terms of available installed capacity for research, this could be considered as sufficient to promote a greater familiarity with the use of wood as a structural material. The principle problem however, is the in-operational state of these installations which, as official property, are in many cases inactive either for lack of local or international funds or due to the limited services offered to the private forest-based or construction industry sectors.

D. Educational and Training Aspects

23. One of the common features among the Latin American countries is the lack of regular and permanent training courses at all levels - professional, technical and carpentry. The existing opportunities are limited to offering short-duration seminars on specialized subjects which are no substitute for full time training in areas of technology, structural design, fabrication and timber construction. Very few regular courses exist in universities and instruction on the use of wood in construction is normally shared with instruction on the use of steel and other non-conventional materials. At the level of technicians, workers and carpenters, the situation is even worse since they are trained in furniture making and joinery and in the majority of cases in the use of wooden formwork for traditional construction with cement and bricks.

24. Another common feature is the feeling that it is necessary to invest in training of professionals that represents the real bond between the user and the raw material. In this way the situation would be avoided that finds those few professionals who do practice timber based construction many times encountering the problem of not being able to execute adequately a project due to the absence or limited capability of qualified manpower.

25. Currently various efforts are being made to resolve this problem in full consciousness that it represents one of the best mechanism to promote and develop timber construction. There exists, on the other hand, sufficient

teaching material, publications and audio-visual aids to undertake this type of activity. In this context the work developed by the Andean Pact merits pointing out or emphasizing since it permits making available technical documents based on serious research on the properties and possibilities of using tropical wood in construction.

E. Financing and insurance aspects

26. With respect to the subject of financing, there exists agreement that in no country there exists a specific programme to assist timber construction. In fact on the contrary, there still exists serious credit limitations for timber based housing although a change of attitude on the part of the authorities responsible for organizing housing credit has recently been observed, making credit available on conditions similar to those of other construction materials.

27. For the point of view of premiums and insurance rates, timber construction is at a disadvantage owing to the greater perceived risk of fire without taking into consideration the advantages of better seismic resistance. As in the case of availability of financing, a progressing change in favour of timber construction has been observed reducing significantly the premiums for fire insurance and its damages considering that the fire and seismic cancel each other out so that in this way timber is able to compete under conditions of equality with traditional construction.

F. Recommendations

28. The following recommendations reflect the views of the contributors:

- Sensitize the producers and consumers on the necessity to establish sustained and responsible management of the forest resource.
- Improve the conditions of timber supply in terms of opportunities, quality, quantity and costs.
- Establish technical service and sawnwood distribution centres including structural components.
- Incorporate secondary or lesser known species within structural grouping schemes.
- Promote development of new products, accessories and building systems based on wood.
- Initiate promotion programmes to eliminate prejudices and to overcome problems of acceptability of timber construction on the part of users.
- Coordinate programmes of dissemination of technologies, standards, technical specifications and sources of available financing.

- Orient programmes dealing with construction using timber towards different strata of the population.
- Encourage the use of timber in mixed construction, combining the comparative advantages of the different construction materials.
- Elaborate instructional brochures for the conservation and maintenance of timber based construction.
- Elaborate permanent and regular courses on the use of wood in construction at the technical and higher levels.

III. HIGHLIGHTS OF PRESENTATIONS

Agenda Item 1 a

"The use of wood as construction material in Latin America"

Christian Arbaiza M., (CAMBIUM, Peru)

29. The timber construction industry in Latin America is now at the initial development stage and above all great differences exist between countries of the region. Efforts such as those made by the Andean Pact countries in Bolivia, Colombia, Ecuador, Peru and Venezuela have given some advantages in relation to technological development of the use of wood in construction compared to the rest of the countries in the region. Similarly, Brazil, Chile and Mexico have made significant efforts directed at promoting the timber based housing construction industry.

30. At the same time and in general, notwithstanding the existing problems, the forestry resources are such as to enable their more intense use in construction as a means of developing the rightful economic importance of the forest and at the same time their possibilities of being managed in a sustainable way.

31. The obvious result is that wood construction centres should at first be organized at the country level before trying to develop programmes at the Latin American, regional level. The proposal is to transfer the already developed technical information in some countries with the ultimate aim of harmonizing criteria and supporting a simultaneous development in the whole region.

Agenda Item 1 b

"The situation in Ecuador"

Fernando Guerrón (CORMADERA, Ecuador)

32. Mr. Guerrón described the main problems as lack of R&D information and laws and standards which prevented Ecuador from taking full advantage of its large potential to use wood in construction. He summarized the population

dynamics and needs as well as the main wood industries and the general structure and objectives of CORMADERA.

33. He pointed up the need for technical assistance to firms in the private sector and for education to the post-graduate level and for middle management.

Agenda Item 2

"Activities of UNIDO"

Secretariat of UNIDO

34. The Industrial Development Officer, Agro-based Industries Branch, who organized the Seminar, welcomed the participants and consultants to the Seminar and described UNIDO's activities by introducing the document "Statement on the Activities of UNIDO in the Wood Processing and Wood Products Sector" (dated March 1989). This document describes the role of wood in development and the division of responsibilities between UNIDO and FAO and draws attention to some of the main requirements of the industry; appropriate design, appropriate technology, regular and planned maintenance of tools and equipment, and the introduction of industrial production planning and control practices.

35. This was followed by a short list of typical technical assistance projects that UNIDO had carried out in the wood sector and a brief summary of the types of training and human resources development activities and other means of transferring technology, namely the provision of experts and consultants, the subcontracting of consulting firms or technical institutions for more complex jobs and purchase of equipment for demonstration or prototype production purposes.

36. An important point was that the wood sector differed from many other industrial sectors since communications and relations had to be established with a variety of Ministries and organizations in each country owing to the great range of wood products and uses ranging from manufactured products such as furniture and joinery items, matches, toys, as well as institutional buildings for education and health care and industrial and agricultural buildings and civil works projects.

37. The important role of timber as a serious structural material was pointed out as was the UNIDO philosophy regarding good management, efficient utilization and conservation of the forest resources.

38. Finally, attention was drawn to the list of documents attached to the statement produced by UNIDO which deal with this subject.

Agenda Item 3

"Wood, housing and the economies in Latin America"

Christian Arbaiza M. (CAMBIUM, Peru)

39. Traditionally, national housing programmes in Latin American countries are executed taking into consideration the availability of funds and the sectors with the greatest need for houses and urban services. Nevertheless, the impact on the economy of each country is not known with regards to the greater or lesser use of the various construction materials. Especially not considered or known are the multiplier effects obtained from the point of view of employment generation, energy consumption and the need to import machinery or capital investment to fabricate the necessary construction materials to deal with the housing deficit.

40. The investigation presented the results which would have been obtained as a pilot case study for Peru. It was observed that comparative advantages existed in terms of direct and financing costs in favour of wood based constructions and also in mixed constructions, combined walls of masonry with suspended floors and roofs of wood. Similarly, from the point of view of employment generation and above all the consumption of energy, there existed enormous advantages in promoting programmes based on wood construction considering the levels of unemployment and scarcity of energy resources in most of the Latin American countries. From the point of view of investment it was equally demonstrated that the importation of machinery and the egress of foreign currencies is less for the production of wood for construction than for the rest of construction materials considered "conventional".

Agenda Item 4

"Environmental aspects"

Luis Castello (IUCN, Quito)

41. Mr. Castello introduced the "Global Strategy for Conservation" as one of seeking better understanding of the problems and not of preventing the use of forests. The aim was to work with producers and users to ensure sustained supplies since natural resources were, after all, the basis for economic development. He noted that destruction of the environment was worse than previously believed - only partly due to improved methods of detection (e.g. satellite surveys).

42. He explained that there was an information exchange network, based in London (Centre for Resource Conservation) which maintained a roster of specialized experts and produced technical bulletins and promotional literature such as "Cuidar la Tierra" (Care for the Earth) and "Estrategia Mundial para la Conservación" - (Global Strategy for Conservation). Mr. Castello emphasized that deforestation in the region was very serious and included loss of forests for industrial use as well as other local effects.

43. Other points mentioned were the large role that forests play in people's lives, the number of diverse species harboured, the need to protect against soil deterioration, the sovereign rights of nations to determine forest policy and the issuance of "seals of sustainability", which were unique features of forestry. He stressed the need to understand technical aspects to avoid adverse consequences which may only show up in the longer term and warned particularly against monocultural forest plantations and genetic deterioration by selective harvesting.

44. In conclusion, as was pointed out by one participant, it was most important to stress management, use and conservation. It was also suggested that these three terms be used together in future publications of the IUCN and related bodies when dealing with forestry.

Agenda Item 5 a

"Commercial aspects - CORMADERA buildings and housing"

Felipe Prado (AIMA, Ecuador)

45. Mr. Prado gave an explanation of the design of the CORMADERA buildings and general information on housing in Ecuador.

Agenda Item 5 b

"Commercial aspects - the situation in Argentina"

Alicia Martin (National Forestry Institute, Argentina)

46. Ms. Martin presented a long document covering forest resources and industry including information on plantations and break-downs by species and locations. She described the work being undertaken by the National Institute for Housing Studies and Standardization which had produced a manual on timber and mixed constructions and several promotional publications. They were also building model houses (not prototypes) to demonstrate the flexibility of wood construction.

Agenda Item 5 c

"Commercial Aspects - the situation in Mexico"

Manuel Elorza W. (COMACO, Mexico)

47. Mr. Elorza presented a detailed account of house construction activities including prices and building cost comparisons with USA, Malaysia and others. Some 15 firms produced prefabricated houses or components but the limiting factors for wood construction were:

1. Insurance costs
2. Low level of structural knowledge
3. Poor knowledge of standards
4. Little knowledge of fire-resisting designs

5. Doubts about durability
6. Poor technical dissemination
7. Prices and building costs
8. Disinformation on prices
9. Lack of awareness about sources of wood.

48. He showed different building systems used and stressed the need for their acceptance to solve financing problems. He also reviewed training facilities and the need for human resource development at all levels.

49. Finally, he announced that a Seminar on Wood Construction would be held beginning 2 December in Mexico City and invited all participants to attend.

Agenda Item 6

Presentations by Participants

50. The participants, observers and consultants briefly introduced themselves and stated their main interests and expected value of the Seminar. One participant from Ecuador also mentioned that the housing deficit (and thus need for efficient wood production) would be much greater if substandard units and renovation needs were considered.

Agenda Item 7

Global use of timber in construction

Secretariat of UNIDO

51. The UNIDO organizer began by pointing out that the supply of raw materials for the wood processing industries was a difficult and complex task, especially with current pressures to ensure responsible and well-managed extraction consistent with conservation criteria. The presentation followed the pattern of presenting traditional methods of transporting, converting and using wood followed by examples of improved and rationalized methods which illustrated UNIDO's policies towards development of the sector. He stressed that it was important to restructure the commercial supply and processing channels so that the raw material was treated as an industrial product as early as possible in the conversion chain. In effect this meant that decisions as to species utilization and to selecting and preparing logs for conversion into industrial material had to be taken even before the sawmilling stage and under well-controlled conditions. It was only in this way that new species and efficient production methods could be introduced and the industrial sector supplied with the necessary raw material on a sustained basis.

52. Traditional housing designs were shown which used more wood than structurally required and needed more skilled craftsmen to produce. Answers proposed were to improve design details, introduce prefabrication and quality control in the factory as well as industrial production planning methods.

Several different types of prefabricated systems were also shown. It was also pointed out that this ultimate downstream activity relied upon a large number of "invisible factors" and up-stream technology to be successful.

53. Other technical aspects that were illustrated included the necessity of introducing good cutting tool and machine maintenance procedures, appropriately designed wood processing equipment, proper drying and wood preservation for enhanced durability of structures, stress grading (either by visual or machine methods) as well as training in all the above as well as quality control in factories. Preservation was singled out as a subject worth a separate seminar owing to its importance to conserve wood resources as well as to the environmental issues associated with the chemicals used.

54. Such design details considered appropriate for developing countries included post or pile foundations and the necessary design details for footings and hold-down hardware for roofs in areas with strong wind forces. A range of appropriate structural systems were also shown such as vertically nail-laminated portal frames and pole structures with glulam beams. Glulam manufacture, which can be on either the large or very small scale, was described as relying on most of the foregoing upstream technical developments, including stress grading, finger jointing and close quality control during manufacture.

55. Finally, a range of miscellaneous structural uses were illustrated including drainage culverts, water towers and bridges. The UNIDO prefabricated modular wooden bridge system was briefly introduced as a means of introducing the concept of industrial or serial production (interchangeability of components) and most of the upstream technologies previously referred to.

Agenda Item 8 a

Construction Examples in the Latin American Region

José Carlos Cano (Lima, Peru)

56. Mr. Cano gave a summary of the most important characteristics of the prefabricated modular wooden bridge system that UNIDO had developed in 9 Latin American countries.

57. Mr. Nelson Jimenez, official of the Ministry of Public Works of Ecuador subsequently explained in detail the reasons for selecting sites for building such bridges in Ecuador and described the processes of fabrication and launching, with the help of illustrations.

58. Mr. Cano then explained four timber building systems for non-housing uses; referring first to light constructions with soft wood (group C) joined by nails and intended for agricultural uses. He then referred to the HB system, diagonal web with nailed flanges of solid wood of spans and dimensions suitable for various industrial uses.

59. Finally, and combining the presentation of glued laminated and domed structures, he provided abundant details on the type of wood, adhesives and constructive processes utilized for all the construction presented and showed transparencies with actual examples of using tropical timber in Latin America.

Agenda Item 8 b

"Structural timber forms for buildings of medium and large span"

Christopher Mettem (TRADA, UK)

60. Mr. Mettem described the various forms of structural timber: solid sawn timber, glued laminated timber, and modern composites such as laminated veneer lumber and parallel strand lumber which offer a structural medium of enormous versatility to the designer. After reviewing the advantages of such structural timber materials, and outlining timber jigs commercially available in Europe, he described the principal timber forms which can be recognised in non-domestic structures, i.e. medium-to-large span buildings. The forms were described and illustrated systematically, firstly two-dimensional or planar forms and then three-dimensional and space structures. The aim was not to advocate that all of these are necessarily appropriate in all cases for countries in development, but to illustrate that for the ingenious designer there was always the chance to come up with something new and exciting.

Agenda Item 8 c

"Examples of timber construction in North America"

Juan J. Salinas (Carleton University, Canada)

61. In accordance with the general aims of the seminar, the advantages of timber construction were briefly presented and specific details of building practices used in Canada were shown. Mr. Salinas used a variety of colour slides to illustrate the post and beam and wood frame (platform) construction systems which were the most utilized in Canada. He also discussed the importance of integrating wood with other construction materials.

62. The presentation continued by showing techniques and construction details of five construction projects embracing examples from various regions of the country including architectural programmes and unit costs. Since these examples from Canada did not correspond to the high-priority to apply timber construction for social housing according to the prevailing need in Latin America, the presentation instead showed in global terms the potential of the material and the importance of using and depending on construction systems based on highly uniform and standardized technologies.

Agenda Item 9

"Timber standards and quality"

Secretariat of UNIDO

63. The UNIDO organizer presented some general concepts and described the differences between quality and performance, the ideas of acceptance/rejection of products or services, complaint thresholds and mechanisms for process and product control. Referring to the wood sector, he suggested a hierarchy of standards including civil law, building regulations, design codes and materials standards which served as an introduction to the following two presentations.

64. He concluded by stressing the fundamental importance of an integrated set of standards for designing and building timber structures that would meet the requirements of structural integrity, serviceability and cost efficiency and so attract financing and public acceptance. This was seen as a basic need to promote the use of wood in construction in the region and could be the subject of regional collaboration supported by international technical assistance.

Agenda Item 10 a

"Design codes"

Amantino R. de Freitas (IPT, Brasil)

65. Mr. de Freitas presented a summary of the technical timber design standards for the United States, Australia, Malaysia, Philippines, Brazil, the Andean Pact and France. He emphasized the role that these standards should play in construction and in the building of economical and safe structures. He pointed to the natural versatility of wood as a construction material and especially to the advantages in using the probabilistic design format such as was used by the CIB² when dealing with tropical forest. Another form of taking into account the variability of species was to group them by strength as had been practised for this standards of Australia, Malaysia, Philippines, JUNAC and CIB.

66. The participants' comments were directed principally at establishing technical standards for timber construction for the countries of Latin America and the Caribbean which were at the same time simple and technically compatible with the latest advances in the harmonization of structural standards for all materials as exemplified in the EUROCODES.

² International Council for Building Research Studies and Documentation, Rotterdam whose working group CIBW 18A has been responsible for the EUROCODE 5 dealing with the design of timber structure.

Agenda Item 10 b**"Models for structural timber design codes"**

Christopher Mettem (TRADA, UK)

67. The development of a harmonized structural timber design code for the countries of Latin America and the Caribbean is an important theme of the Seminar. In order to illustrate the type of approach that could be taken, a description was given of the system for EUROCODE 5, Design of Timber Structures. The legal background, the EUCORODES series, and the drafting and publication of these codes was also described. International codes institutes tend to be more complicated than national ones, because they have to cover a wider field of structures and materials. Different traditions for details and workmanship exist, and this will be quite pronounced in Latin America. The drafters of the limit state code EC5, have attempted whenever possible to keep the design rules simple. In principle, the aim has been to produce a code directly applicable by designers, rather than a "code for code writers". However, the style is different from most of today's timber codes. It contains only the "legal" rules, or principles which must be observed, plus application rules which give a way of satisfying the principles. The EC5 draft does not contain materials design data, nor does it give text book material and design aids. The former is assigned to CEN standards, which support the code, whilst the latter is presumed to be necessary, but to be provided through channels exterior to the code itself.

Agenda Item 11 a**"Integration of wood processing industries"**

Eduardo Fuhrken (Maderas Pinelli, Mexico)

68. The presentation began with a summary in general terms of the main aspects of the theme such as, the forest, the industry and forest activities and the use of timber in construction in Mexico. The theme was developed with a real example of a primary forest transformation enterprise (sawmill) seeking to give more value-added to its products through involvement in timber constructions.

69. Comments were given throughout on the situations which presented themselves in this country relating to timber construction, dealing with such points as cultural aspects, standardization, fabrication, construction and financing.

70. Using these examples, it was demonstrated that despite conditions under which timber construction had not been established in an industrialized form success had been achieved, integrating all the factors from the primary raw material supply to the construction and sale of social housing of intermediate costs. It emphasized also the concept of integration for industrial production of a well-defined product.

Agenda Item 11 b

"Prefabricated constructions and standard elements"

Lucia Sanchez Vedovello (CASEMA, Brazil)

71. Ms Vedovello gave a presentation on the prefabricated system used by her company CASEMA - Casas de Madera - to produce houses using Amazonian species. She described the complete production cycle beginning with forest management and extraction activities in the 69,000 ha of natural tropical forest in the State of Maranhao, following with those of the sawmill, dimensioning and transport of the industrialized elements to the construction sites.

72. The CASEMA system is based on boards of 45 mm thickness, tongue and grooved horizontally, one on another, with the ends between channels on vertical posts. One interesting aspect of the system is that it uses about 10 different species, from these in the Amazon zone, and that the high densities varied between 870 and 1100 Kg/m³. This was possible because green wood was used as soon as it came out of the processing plant and the design details took into account the dimensional changes which took place after erecting the house. CASEMA produced approximately 600 houses per year with an average area of 130 m². The prices not including erection and finishing varied between US\$ 86/m² for low cost houses up to about US\$ 230/m² for more luxurious houses.

Agenda Item 12 a

"Timber roof design and construction"

Mr. Christopher J. Mettem (TRADA, UK)

73. This paper described the evolution, current practices and trends including computerization, in timber roof design and construction. It majors on roofs of small and medium span, including domestic, commercial and social structures, in contrast to the first paper which concentrated upon larger non-domestic forms of timber structures. There are numerous ways of constructing pitched roofs over domestic buildings and other similar sized structures. This paper presents a review of the techniques which are available to timber engineers and structural designers for providing satisfactory and stable overall roof structures. Great changes and improvements in the design of roofs have taken place since the introduction, some thirty-five years ago, of trussed rafters. Recently there has been a revival in the UK of the use of glulam. Already very popular in some continental European countries, glulam and other modern composites can be expected to play a larger role in small timber structures, especially when considering ex-stock standard dimensioned components.

74. The paper consists of six illustrated chapters, as follows: introduction; the historical development of roof carpentry; traditional pitched roof construction; the development of the bolted and connected roof truss; the design of trussed rafters and trussed rafter roofs; the future including European harmonization and computer developments.

Agenda Item 12 b

"Applications of computers in design and costing of buildings"

Juan J. Salinas (Carleton University, Canada)

75. In order to satisfy the demands of building and urban infrastructure imposed by the problems of over-population, migration of people from the field to urban centres and the tremendous deficit of houses, professionals involved in construction should use and incorporate advanced technologies. The use of computers will have a beneficial impact on professional activities of analysis, design and construction of timber structures with the result of increasing productivity and quality of services. Mr. Salinas presented some of the aspects which define the training and education of students and professionals. The computer was presented as one of the most important working tools in dealing with the various stages of the process production. The presentation ended with discussion of various commercial programmes with explanations of their functioning in relation to the activities of design, analysis, construction and planning of timber construction projects. An annotated bibliography was prepared and distributed which showed various commercially available software packages including names and addresses of distributing companies.

Agenda Item 13 a

"Technological development in wood construction in the Andean Pact Countries"

Christian Arbaiza (CAMBIUM, Peru)

76. The document described the common objectives of the Andean Pact countries (Bolivia, Colombia, Ecuador, Peru and Venezuela) to develop in a collaborative form, various programmes to incorporate wood into their countries' economies through its use as a construction material.

77. The programmes, developed in the first phase between 1975 and 1989, comprised aspects of investigation, technological development and implementation of infrastructure. The second and third phases were oriented towards developing programmes to identify and put into practice opportunities for transferring the results obtained at the urban and rural levels. In the final phase the programmes emphasized industrial promotion, training and rural and social housing demonstration construction projects.

78. The project, which was concluded 2 years previously, permitted users to count on a large variety of technical material and training aids based on the study for almost the first time of tropical hardwoods. Thus it was possible to provide technical assistance to the forest based industries and trained technical personnel as well as professionals, teachers and instructors. Finally, the 2 programmes for construction in rural and urban areas permitted the building in a promotional manner of diverse community buildings such as medical centres, schools, community centres, etc. as well as 6 experimental social housing schemes. In this way not only were social housing schemes realized but also technology was transferred, personnel

trained and in the case of the cooperative housing a revolving fund was established from the initial investment for other housing programmes.

Agenda Item 13 b

"CORMADERA buildings"

C. Burbano/H. Guarderas (Quito)

79. The two architects involved with the design and construction of the facilities at Pembo, 35 km to the east of Quito, described the details and procedures followed so that the buildings could serve both a useful and a demonstration purpose. The 4200 m² area was divided into distinct parts to accommodate the administrative and research activities, the forestry/nursery work and the demonstration sawmilling programme. The buildings were designed to show different structural techniques including the use of prefabricated components. The work was carried out between 1990 when the ground was bought and late 1991. The presentations were amply illustrated.

Agenda Item 13 c

"Opportunities for distribution centres"

Ramon Echenique-Manrique (MECMA, Mexico)

80. In order to increase the use of wood in construction it is necessary that collection and distribution centres be established to make available sawnwood in sizes, qualities and quantities needed. For these to be viable it is necessary that structural wood elements be included in the inventories as well as complementary materials such as connectors, finishing and covering materials. It is also necessary to offer technical assistance services to builders and users and to provide construction services directly to users.

81. It is of utmost importance to maintain a programme of promotional activities in such a way as to remain in constant contact with publicity media and directly with professionals involved in construction. Emphasis must be placed on the final consumer.

82. It is feasible and viable to establish small or medium units of collection/distribution/technical assistance/construction advice as effective means of building with wood without large investment nor complications.

Agenda Item 14 a

"Investments needed - capital"

Ing. J. Aloniá (Junta Nacional de Vivienda, Ecuador)

83. Mr. Aloniá presented detailed statistics on housing construction, needs and conditions in Ecuador, including the need to repair and renovate substandard units. He showed the various sources of funding available by a number of categories and explained that the Government was increasingly trying to involve the private sector. He also noted that the Ecuador Chamber of Construction (Camera Ecuatoriana de Construcción) was a logical target for this type of Seminar on a national basis, and referred to an earlier point that without a tradition of "stick-building" it was very hard to introduce "systems" whose origins elsewhere have been to improve on the economics and efficiency of stick building.

Agenda Item 14 b

"Investments needed - R&D"

Lourdes Orejuela (CORMADERA, Ecuador)

84. Ms. Orejuela presented an overview of the entire wood industry sector and its main problems. She referred to the current promotion of products and marketing, through AIMA, the existing, rather ineffective, research efforts and facilities for training. Due to the above situation, technical support to the sector was considered almost non-existent, which was the reason why CORMADERA was formed. Its programme would cover the entire range of problems and provide the necessary technical support for industry. This represented a considerable investment from the private and public sectors, collaboration with a wide range of national and international institutes, universities and agencies as well as financial support at these early stages from the international aid agencies.

Agenda Item 15

"Promotion and demonstration"

Ramiro Guarderas, (President, AIMA)

85. Mr. Guarderas spoke of the need to work together in describing the role of AIMA and its 26 members which represent the large (and some medium-sized) forest products firms. He referred to their control, coordination and execution of projects such as the biennial exhibition held in Quito and their capacity to participate in international events and to act as counterpart for technical assistance.

86. He also announced the recent signing of the Andean Chamber of Forestry (Camera Andino Forestal) in Lima and the opportunities this gave for collaboration in promotion and training for industrialization, housing, construction and export. He noted that all firms must contribute and coordinate with similar associations (to AIMA) in other countries to develop the sector since Governments are not in a position to do so.

87. However, he urged that a dialogue with Governments be maintained and that collection/distribution centres offered a way to help control illegal felling and extraction as well as to rationalize the sector leading to improved domestic distribution and processing for local use and export as well.

88. Other points related to the transfer of technology, service and extension centres and training, with the German - supported (GTZ) SECAP project for training operators as an example, and to the work of CORMADERA (supported by USAID and Belgium primarily) in investigations on wood properties and training engineers, architects and technicians. In short, services to members was the key to AIMA's success, including personal contributions by its directors.

Agenda Item 16

"Plenary session - plans of action"

89. This session, moderated by Ing. Roberto Peña Durini, started with the conclusions and recommendations of the two Working Groups (see Chapter V and Annex 4) being presented to the participants. Comments were received by representatives of each country with some discussions and clarifications. Then the general recommendations, based on these and prepared by the 8 Consultants and the UNIDO representative, were presented one by one for clarification, if needed, and approval.

90. All were approved as appear in Chapter VI.

91. Finally, it was strongly urged that the contacts made (see Annex 3) and the momentum built up be followed up by personal actions in the part of participants and that the recommendations be seriously considered by Governments, industry and international agencies.

IV. SUMMARY OF DISCUSSIONS

A. Group A - Standardization and Structural Design

92. Themes proposed

1. Construction rules
2. Design factors
3. Permissible stresses
4. Harmonization of design criteria
5. Grouping of species
6. Use of secondary species
7. Stress grading
8. Research

93. Distinct interventions were made by the participants with the intention of modifying the proposed order, taking into account:

- The complexity of the themes assigned and their developments;
- Their diversity considering the length and breadth of the region in which can be found strongly contrasting geo-climatic conditions even within the same country.

94. After discussing the different interpretations and viewpoints based on actual local conditions it was decided to regroup the sub-themes as follows:

- a) Construction rules;
- b) Design factors, permissible stresses, harmonization of design criteria, and
- c) Grouping of species, use of secondary species, stress grading.

Research was considered to be a part of each group.

95. At the suggestion of a representative of Argentina, each participant was requested to make an analysis of the specific situation in his or her country based on the planned themes.

- a) Since the majority of the countries do not have timber construction codes it was suggested that a special committee be formed with the purpose of helping those countries to formulate their codes, suggesting the following:
 1. Collate all existing information;
 2. Analyze the situation in each country or group of countries with similar conditions and
 3. Integrate the production of construction standards into the national committee.
 4. Seek funding for this activity.
- b) The different advantages and disadvantages of the various philosophies were discussed, noting that in the case where information on physical - chemical properties was lacking it was possible to adopt more modern design criteria.
- c) The urgent need to investigate the fire performance of wood, wood-based products and constructional elements was noted. This was seen as a very strong impediment to the acceptance of wood in building regulations in some countries.
- d) Representatives of some countries indicated that in certain cities it was expressly prohibited to build with wood.
- e) After hearing the presentation on the development of timber standardization in the countries of the

European Community and the current situation in the Latin American countries, a consensus was reached on the urgent need to make official the use of wood in construction other than through rules, technical standards and building codes.

- f) The advantages of working in sub-regional groups comprising the countries of the Central America Common Market, the Andean Pact and Mercosur were discussed with a view to proposing coordinated plans of action to attract effective international assistance and to facilitate the development of national programmes.
- g) Also discussed was the necessity to produce on a massive and continuous scale technical information aimed at different levels of society which use wood with the objective of backing up the technical - legal development actions on the use of wood in construction. Furthermore, the importance of formulating educational programmes at all levels in a permanent form, aimed at raising the level of familiarity with wood was agreed.

B. Group B - Commercialization and Industrialization

96. The group began by discussing how each participant understood the terms of reference and finally agreed to group the 12 themes into 5. It was emphasized that wood construction was extremely variable and did not concern only house building.

97. The theme of mixed construction was dealt with in considerable detail including the pros and cons of construction with other materials such as stone, masonry, adobe, etc.

98. In discussing the theme in general, there was concern over how to increase the possibility that the recommendations and conclusions emerging from this Seminar would be implemented with clear results. Participants spoke of the difficulties of working in isolation and that in the past, there had been many recommendations and conclusions made which for the most part had remained mere expressions of good intentions.

99. This theme was concluded by the presentation of the experience in Mexico and the formation and functioning there of an association which incorporate all the interested sectors and which had over the last 11 years obtained good results.

100. Considering all the foregoing it was concluded that the creation of associations, commissions or the reinforcement of existing groupings would at this time be the most viable means of assuring that recommendations of this Seminar would be carried out.

101. There were discussions on how to integrate and function as associations. This led to a proposal to make a list of plans of actions which could serve as indications so that the associations could in each country determine which points were necessary to act upon.

102. This brought the conclusion that associations should be formed in the shortest possible time and should examine in detail the recommendations so listed.

103. Nevertheless there was still concern to ensure that the plan of action would be implemented and ideas were discussed on how to maintain communications and interaction between countries, individuals and institutions and/or associations either formed or in the process of being formed.

104. The conclusion emerged that an international information network should be formed which would make use also of the existing mechanisms such as IUFRO and the working group CIB W18B since in this way action could be taken immediately even while groups were being formed in each country. This brought the conclusion that it was not at this point in time viable to create a separate Latin American and Caribbean organization for timber construction but that a base could be created for a possible future development of this kind. In order to make use of and to inter-change experiences it was agreed that this or a similar group should convene a meeting within two years - provisionally in Mexico.

105. The general consensus with respect to the forest resources was that it should always be borne in mind that sustainability was brought about by good management and optimal utilization.

106. The group counted on the active participation of each one of the 9 countries represented in the group: Argentina, Brazil, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Panama and Peru.

V. RECOMMENDATIONS OF THE WORKING GROUPS

A. Group A - Standardization and Structural Design

1. General Comments

107. The participants were aware of the necessity to raise the standard of living of the population and aware of the multiplier effect that construction industry and above all construction with wood could exercise on the economy.

108. The participants agreed on noting the lack of a technical legal base to help stimulate the use of wood in construction in most of the countries represented.

109. The urgent task of making timber construction official through standards and rules required the execution of a series of scientific/technical activities. It was also necessary for some countries to analyze the criteria for rules which existed in diverse and disparate forms and the participants noted the need to have a national strategy linked with regional efforts in

order to finance these activities aimed at drafting design codes and putting the rules into effect.

2. Agreements

110. The participants agreed to request the national representatives and regional directors of UNIDO to bring to the attention of those authorities responsible for construction rules and materials standards the results of the seminar and to request officially the approval in principle of the need to change the technical legislation referring to the use of wood in construction.

111. It was also agreed to request UNIDO to organize a regional meeting to put together a general base for a regional plan of action to establish timber construction standards. This meeting should be composed of two official representatives of each interested country, one from the national standards agency and the other a technical adviser from the timber construction sector.

112. The participants agreed to assist UNIDO in identifying the agencies and individuals most suitable to participate in such a reunion.

113. In order to bring about a regional plan of action to establish timber construction standards, the representatives promised, in consultation with their authorities, to make an official request for UNIDO assistance in obtaining financing and for the execution of the plan.

114. With the objective of designing and implementing actions aimed at teaching, informing and disseminating technical knowledge on wood and its uses in construction, the representatives agreed to coordinate forces in this field and especially:

- a) Request support from UNIDO to formulate a national strategy for a permanent flow of information, training and dissemination of knowledge in the field of the use of timber in construction;
- b) The horizontal inter-change of experiences between experts at the university, industrial and management levels.

B. Group B - Commercialization, industrialization and promotion

1. Conclusions at country level

115. The single main conclusion identified was that highest priority should be given in the short term to the rationalization or consolidation of national associations to promote and develop the use of wood as a construction material in each Latin American country, regardless of whether they were naturally forested or reforested with conifers or broadleaved species.

2. Justification

116. The current tendency at the global level to promote sustained development of forest resources, reconciling the criteria of conservation and development, suggests the necessity of assigning the real economic value to forest as forested land and not as land for farming or agriculture as has often been the case.

117. Considering the experience in other countries, and taking into account the great existing housing problem it is obvious that the use of wood as a construction material represents one of the most viable alternatives, if not the only alternative, for realizing the value of forest resource. It is in this economic perspective that forests not only can be exploited rationally but also reforested to guarantee their conservation and renewal.

3. Background

118. Many countries around the world have made a significant contribution to economic development through industrial forestry and sustained management of their forest resources.

119. Without delving into the causes and effects which brought about the creation in these countries of specialized associations covering the use of wood in construction, it remains clear that there had been private interest involved in the sector which had started up, promoted and developed in a competitive context, this new form of economic activity which justifiably should be implemented in Latin American countries.

120. Still, at the Latin American level, the region can point to magnificent examples by which the feasibility of organizing diverse sectors all interested in timber construction had been demonstrated, with good economic results and tangible promotion activities have served to consolidate the initial efforts.

4. Description

121. It will be necessary to incorporate all or the major part of public and private institutions devoted to the use of wood as a construction material, emphasizing the incorporation of the private sector as an efficient and motivating component in order to guarantee the independence and above all continuity in the phase of political changes.

122. It will be necessary to include in such groupings those who own and transform the forestry resource, those who do research and develop standards as well as training and technical development centres, financial and insurance bodies, and above all, the professional bodies which represent the real link between the raw material and the users.

5. Issues

123. It was recommended that the national associations should be established and developed, promoting different action plans and activities, that would permit in the medium term the harmonization of criteria and interchange of experiences between Latin American countries.

124. The following lines of action were recommended:

1. Research and technological development
 - 1.1 Technical characteristics
 - 1.2 Drying and preservation
 - 1.3 Standardization of dimensions
 - 1.4 Stress grading
 - 1.5 Wood sub-products (panels, etc.)
 - 1.6 Structural components
 - 1.7 Non-structural components
 - 1.8 Accessories and complementary materials
 - 1.9 Design forces
 - 1.10 Software
 - 1.11 Structural systems.
2. Information
 - 2.1 Creation of data banks
 - 2.2 Establishment of information networks
3. Standardization
 - 3.1 Material and product standards
 - 3.2 Design standards
 - 3.3 Technical specification for construction
 - 3.4 Standardization of materials
 - 3.5 Mechanisms for product certification
4. Market development
 - 4.1 Market studies
 - 4.2 User education (for acceptability)
 - 4.3 Identification and development of new products and components
 - 4.4 Orientation of quality control aimed at consumers
 - 4.5 Elimination of legal barriers (insurance, rules, etc.)
 - 4.6 Creation of maintenance manuals for wooden houses
 - 4.7 Promotion of specific products
 - 4.8 Elimination of prejudices through publicity, the press, exhibitions and fairs, competitions, etc.
 - 4.9 Protection against biases against wood.
5. Production development
 - 5.1 Identification of investment opportunities
 - 5.2 Identification of bids and financing of equipment and machinery
 - 5.3 Implementation of specialized technical assistance
 - 5.4 Identification of sources of financing for new enterprises and

construction activities

- 5.5 Fabrication methods
- 5.6 Demonstration construction programmes
- 5.7 Distribution/supply and service centres
- 5.8 Mechanisms for product certification

6. Training

- 6.1 Training of professionals, teachers, instructors, workers and carpenters
- 6.2 Establishment of regular pre- and post-graduate courses
- 6.3 Assistance with university thesis development
- 6.4 Elaboration of technical publications and teaching material.

6. Recommendations

125. It was recommended that the implementation of the lines of action and activities earlier proposed would constitute only a framework of references which should be evaluated and complemented according to the priorities and needs of each Latin American country. Nevertheless, at the same time, it was recommended that there was no need to wait for agreement on rationalizing the national associations before starting to take action to develop the use of wood in construction. There existed a series of activities whose implementation did not depend on greater organization of the sector. In other words, it was necessary to rely on the existing management capacity of the national associations without waiting for optimal conditions before taking action.

126. It was also recommended that before the creation of this type of national association, the principle objective consisted of the work of identification and collecting together of interested parties beginning formation, according to the case, with only those which strongly identify with the objectives or which had the greatest influence in the sector. Later, the small results and promotion activities could be built upon and a larger number of interested parties could gradually be incorporated into the association.

127. From the point of view of financing, the private sector as well as international technical cooperation bodies constituted the most important sources of economic support.

7. Conclusions at the regional level

128. The participants of the seminar concluded that it was still premature and the conditions did not yet exist to promote with any degree of success the formation of a Latin American and Caribbean union or association on timber construction. It was considered to be the early stage of development of the sector and the short term priorities in establishing national associations meant that the desire to establish a regional integration of the sector had to be postponed.

129. Nevertheless, it was agreed that in order for this medium term objective to be implemented, it was necessary to undertake programmes which favoured the integration and the specialized technical knowledge of the sector

at the regional level. In this context it was recommended that a regional information network be created that would motivate and permit the sharing of activities among countries and promote the transfer of experiences in the use of wood as a construction material.

130. Finally, it was recommended that the second Latin American and Caribbean seminar on the use of wood in construction be organized in 1993, provisionally in Mexico, subject to agreement of the plenary meeting.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Wood construction standards

131. It was recommended that UNIDO should invite each country to participate in a regional programme to harmonize criteria for the elaboration of timber building codes and standards for the region.

2. Timber construction codes

132. The Technical Research Institute (IPT) of Sao Paulo, Brazil, should be invited to establish and coordinate preparatory activities including the collection of existing codes and standards.

3. Timber construction codes

133. UNIDO was requested to draft a project document to organize a meeting of representatives from those countries potentially interested in harmonized development of timber construction codes in the region.

4. Timber construction codes

134. It was recommended that participants at the seminar disseminate the recommendations of the seminar amongst those sectors interested in timber construction and that they promote the formation of groups of specialized professionals at the national level as well as collaborate in setting up the information exchange network on the use of wood in constructions.

5. Associations

135. Existing organizations, in coordination with other groups and both public and private bodies, should combine forces to rationalize and/or consolidate their activities, seeking to promote the integration of the wood industry sector, its general development and timber based construction in particular.

6. Information networks

136. It was recommended to establish an information network in the area of the use of wood in construction making use to the extent possible of existing networks at the regional level such as that of IUFRO and CIB W18B, with the purpose of disseminating technical information, promoting its development and securing contacts between interested sectors of the region. It was also agreed to request Latin American and Caribbean wood promotion and development centres (for example CAMBIUM, Lima, Peru) to, in coordination with UNIDO, take steps for the establishment of such an information network.

7. Training

137. It was recommended to draw the attention of the authorities in each country to the importance of developing and implementing permanent training programmes at the technical and professional levels relating to the use of wood in construction.

8. Regional meeting

138. It was agreed to request the assistance of UNIDO for the support necessary to organize a working group meeting of experts, provisionally in Mexico in 1993, for the purpose of evaluating progress of activities and planning future plans of action. The participants from Mexico appreciated the decision of the group but pointed out that organizing the event would be conditional on agreement by the authorities and availability of funds.

9. Management utilization and conservation of forests

139. It was agreed to draw the attention of authorities, industrialists and the population as a whole in countries of the region to the primordial importance of implementing integrated and sustained development programmes based on the strategies of "care for the earth" (IUCN).

ANNEX 1

SEMINAR ON WOOD PRODUCTS IN CONSTRUCTION
IN LATIN AMERICA AND THE CARIBBEAN

Organized by the United Nations Industrial Development Organization
(U N I D O)

in collaboration with the Wood Industry Association of Ecuador
(A I M A)

to be held in Quito 4 - 8 November 1991

AIDE MEMOIREBackground and Purpose of the Seminar

Timber has been used as a structural material for a very long time, but its potential in most developing countries has not been realized.

Construction/structural engineers are usually trained to use concrete and steel, assigning to wood a much less important role, and, in spite of the long traditions of timber use in many developing countries, inappropriate and sometimes overly expensive structures are often built of steel or concrete due to lack of trained personnel involved in planning, designing, specification and fabrication in timber. This has meant that scarce foreign currency has been used to import other building materials, when a renewable natural resource could have been used instead and jobs created in the local industry.

The need for housing, institutional, industrial and special purpose agricultural buildings is enormous and timber could play a far greater role in meeting the demand. Timber frame construction is also particularly suited to designing for earthquake resistance, and timber's use for bridges, marine and other special structures is also well developed.

This seminar will be aimed at furthering the use of timber in national building and construction programmes by showing architects, engineers and responsible officials how wood can be utilized as a material, and familiarizing these with the particular design procedures used for economic, safe, rigid and efficient structures. This in turn is expected to stimulate the use of timber in construction leading to the development of both primary and secondary wood processing industries and improved trade channels. It will provide employment, aid rural development and, in many cases, save on foreign currency.

The format will allow national, regional and international experts to present material as per the programme with a maximum of discussion and interchange of ideas and experiences between participants and "resource persons". Recommendations are expected to be generated on practical steps to take to promote progress in this field. It will be in Spanish. Working groups will be formed to address the two main fields - 1) construction and commercial, and 2) timber engineering and design. Technology aspects will be included in each. The working language at these sessions will be Spanish, although English may be used by common consent.

Dates and Places

Hotel Quito
 Av. Gonzalez Suarez 250
 Quito, Ecuador

4 - 8 November 1991

Tel. (593-2) 230330 Telex 2223 Fax (593-2) 567284

Participants

It is expected that about 50 architects, civil engineers and Government Officials involved in the building sector will participate in the seminar. UNIDO will sponsor the attendance of at least 20 key professionals and it is expected that a further 30 will be sponsored by other sources. Every effort will be made to assist interested and qualified candidates to secure financial support from other sources that would enable them to participate.

Governments are invited to nominate up to 4 candidates who should be fully qualified engineers or architects or representatives of the building sector industry. They should be actively involved in design, specification and/or construction of public or private housing, schools, hospitals/clinics and other institutional buildings, and be interested in promoting rational use of timber. They should be closely involved in these fields and, if possible, also be in a position to influence large-scale programmes and the development of design codes and standards.

Nominations forms will be available from each UNDP Office for candidates to provide information on their education and technical training, their past and present jobs and a note on how the Seminar is expected to help in the performance of their current duties or in their businesses. Full nominations endorsed by the Government should be received by UNIDO through UNDP by end August 1991. UNIDO reserves the right of final decision on the selection of participants and sponsors.

Participants selected will be notified by mid-September 1991, and will receive complete sets of the documentation. Participants will attend the Seminar in their individual professional capacities although they will have been officially nominated by their respective Ministry or institution. They must attend the entire Seminar according to the schedule proposed. It is essential that they contribute to the proceedings whenever possible and take an active part in discussions.

Observers

A limited number of qualified observers may attend the Seminar if at no cost to UNIDO or the organizers, and may take an active part in the proceedings. However, they must first make suitable application to AIMA, Quito, which will then ascertain, together with UNIDO, the availability of space and if the application can be accommodated. AIMA is authorized to charge a registration fee of US\$ 100.00 for each accepted observer. This sum will cover the costs of lectures, didactic material, social activities plus text books and other publications of JUNAC valued at US\$ 60.00.

Note: With the objective of promoting wood construction and dealing with related issues, CORMADERA will organize evening lectures to be presented by some of the consultants. The audience will differ from that of the seminar participants.

Background documents (ie. previously published reports) will be provided to each participant at no cost by both AIMA and UNIDO. Conference documents and the Seminar report will be reproduced by UNIDO.

Working groups will be formed to consider presentations and discussions. These will be:

- I. Construction and commercial: including wood supply, specifications, trade, fabrication, financing.
- II. Timber engineering and design: including standards, design codes, seismic problems, durability/service life.

These groups will meet periodically throughout the Seminar and make key contributions to the conclusions and recommended "action plans".

Documents and presentations will be in Spanish. Working groups sessions will be in Spanish (unless mutually agreed that English may be used occasionally). Summaries of conference documents will be available in both languages.

Financial and administrative arrangements

A. UNIDO will provide, from funds of project XP/RLA/90/002:

- 1) Regional and international consultants and a substantive staff member to help conduct the Seminar,
- 2) Participation expenses for at least 20 selected candidates from the region comprising:
 - Round trip economy class air transportation between the airport of departure and Quito in accordance with existing arrangements between the UN and the country receiving technical assistance.
 - Daily subsistence allowance to cover board, lodging and incidentals at the prevailing UN rate for Quito at the time of the Seminar. (N.B. Special rates may be arranged which reduce hotel costs and therefore the balance paid to participants).
- 3) Reports and audio-visual aids for presentations.
- 4) A final report summarizing the proceedings and setting out the main recommendations and conclusions including "action plans".

B. AIMA will provide:

- 1) Conference facilities including Secretariat office rooms, rooms for working group meetings, plus necessary supplies and copying facilities during the Seminar.
- 2) Logistic and organizational support and collaboration in selecting participants and observers.
- 3) Technical inputs as per the programme including responsibility for ensuring background 'country papers' describing the current situation in each in this field and a summary document covering them.

D. Participants' Government or his/her employer will be required to bear the following costs:

- 1) All expenses in the home country incidental to travel abroad, including expenditures for passport, medical examinations, inoculations and other such miscellaneous items as well as internal travel to and from the airport of departure in the home country;
- 2) Salary and other benefits for the participant during the period of the workshop.

E. UNIDO and AIMA will not assume responsibility for the following expenditures in connexion with the participant's attendance at the workshop:

- 1) Costs incurred by participants with respect to any insurance, medical bills and hospitalization costs;
- 2) Compensation in the event of death, disability or illness;
- 3) Loss of, or damage to personal property;
- 4) Purchase of personal belongings and compensation for damage caused to them by climatic or other conditions.

NOTE: Participants are not allowed to have family members accompany them. Before submitting an application each candidate should be fully aware of the content of this aide-mémoire.

ANNEX 2

GENERAL PROGRAMME

Seminar on Wood Products in Construction in Latin America and the Caribbean
 Quito, Ecuador
 4 - 8 November 1991

Monday, 4 November 1992

Registration and document pick up

Opening Ceremony

- a. Arch. Ramiro Guarderas
President of AIMA
- b. Peter Kruck, UNIDO
Country Director
- c. Ministry of Public Works
- d. Renan Valdivieso, General
Coordinator, MOP

- 1. Summary of Construction needs Mr. C. Arbaiza
- 2. Activities of UNIDO Mr. Fernando Guerron
UNIDO Secretariat
- 3. Wood, housing and the economy
of Latin America Mr. C. Arbaiza
- 4. Environmental aspects Mr. Luis Castello, IUCN
- 5. Commercial aspects - trade channels,
specifications, technical information Arch. F. Prado, AIMA
- 6. Presentations of participants and
formation of working groups

Tuesday, 5 November 1992

- 7. Global attitudes towards timber
construction. Examples and trends UNIDO Secretariat
- 8. Construction examples:
 - a. In Latin America Mr. J.C. Cano/Mr. N. Jimenez
 - b. In Europe Mr. C. Mettem
 - c. In North America Mr. J. Salinas
- 9. Standards, quality control and quality assurance UNIDO Secretariat
- 10. Design
 - a. Building codes Mr. A. de Freitas
 - b. Model design code and discussion Mr. C.J. Mettem

Working groups

- a. Design
- b. Commercial

Wednesday, 6 November 1992

- | | |
|---|---------------------|
| 11. Industrial aspects | |
| a. Integration. economic factors cost | Mr. E. Fuhrken |
| b. Prefabrication and standard elements | Ms. Lucia Vedovello |
| 12. Applications of computers | |
| a. Design of roof systems | Mr. C. Mettem |
| b. Design of buildings and costs | Mr. J. Salinas |
| Afternoon free | |
| Evening - Working groups | |

Thursday, 7 November 1992

- | | |
|--|-------------------------------|
| 13. Opportunities: Case studies | |
| a. The experiment of JUNAC | Mr. C. Arbaiza |
| b. CORMADERA buildings | Mr. C. Burbano |
| c. Distribution | Mr. R. Echenique
Manrique |
| 14. Investment needs | |
| a. Capital | Mr. J. Alomia, J.N.V. |
| b. Technical assistance | Ms. L. Orejuela,
CORMADERA |
| 15. Promotion and demonstration - Associations:
the need to work together
Working groups | Mr. Ramiro Guarderas |

Friday, 8 November 1992

- | | |
|--|-------------------------------------|
| 16. Action Plans (Discussions) | |
| a. At national level | AIMA |
| b. At regional level | Mr. A. de Freitas |
| c. With international organizations | UNIDO |
| 17. Various | |
| a. Visit to CORMADERA (Puembo)
(Lunch included) | a. Participants |
| b. Preparation of working groups and
plenary | b. Organizers and
consultants |
| 18. Closing ceremony | UNIDO, AIMA and
the participants |

ANNEX 3

LIST OF PARTICIPANTS, OBSERVERS AND CONSULTANTS

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Ing. Hugo Ayala P.	CUERPO ING. EJER.
Ing. Jorge Carra R.	CUERPO ING. EJER.
Ing. Luis Clavijo Ro.	CUERPO ING. EJER.
Ing. José Salvador	MUTUAL. BENALCAZ.
Ing. Ramiro Terneus	MUTUAL. BENALCAZ.
Sr. Diego González	I R O K O
Ing. Germán Valdivie	FUNDACION FIAT
Arq. Fco. de la Torre	MUTUAL. PICHINCHA
Sr. Pablo Negrete	MAPRESA
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Arq. Galo Arellano	I.E.S.S. (S.S.C)
Ing. Nelson Crespo F.	M.O.P.
Arq. Fernando Puma G.	M.O.P.
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Working Group AStandardization and Structure Design

- Discussion Themes:
- Construction rules
 - Design factors
 - Permissible stresses
 - Harmonization of design criteria
 - Grouping of species
 - Use of secondary species
 - Stress grading
 - Research

1. Arq. Lorena A. Montoya A.
2. Arq. Guido Garcia H.
3. Arq. Gustavo A. Rodriguez
4. Arq. Roberto E. Tarchini
5. Ing. Wladimir Vaca
6. Arq. Mariela Argoti
7. D.I. Pablo Negrete
8. Ing. Juana Gusukuma Shiroma
9. Srta. Silvia Sotomayor
10. Ing. Jorge Carrera
11. Arq. Hugo Ayala P.
12. Arq. Enrique G. Morey
13. Ing. Mayobanex Irvin Escoto A.
14. Ing. Gonzalo Dalence E.
15. Arq. Nelson Colet
16. Arq. Noemi Lydia Alonso Firpi
17. Ing. Nelson Crespo F.
18. Arq. Edgardo Torres C.
19. Arq. Rudy Eduardo Cabrera Reyes
20. Arq. Gonzalo Alvarez
21. Ing. Julio Romero Z.
22. Ing. Luis Clavijo Rodriguez
23. Ing. Marina Garcia

Working Group BCommercialization and Industrialization

- Discussion Themes:
- Collection/distribution and service centres
 - Standardization of dimensions
 - Quality Control
 - Preservation and drying
 - Investment opportunities
 - Fabrication methods
 - Construction systems
 - Accessories for construction

1. Ing. Andres Barrantes R.
2. Arq. Iris Ivette Mazorra de Romero
3. Sr. Victor H. Fernandez R.
4. Ing. Ricardo Molina Peñaloza
5. Arq. Alicia C. Martin
6. Ing. Ramiro Terneus
7. Ing. José Angel Rojas G.
8. Ing. Marcio Cabezas C.
9. Arq. Fernando Puma G.
10. Ing. Carlos Burbano B.
11. Ing. Manuel Edgardo Elorza W.
12. Sr. Guillermo Olivas Rodriguez
13. Sr. Ramon Echenique Manrique
14. Arq. Holguer Asqui A.
15. Ing. Betty Castañeda Sanchez
16. Sr. Luis Barona
17. Arq. Fco. de la Torre
18. Ing. René F. Benitez Ramos
19. Arq. Byron Suasnavas
20. Arq. Galo Arellano
21. Arq. Manuel Mariño
22. Arq. Fco. Zumarraga
23. Sr. Paco Velasco
24. Ing. Isabel Moromi Nalcata

ANNEX 5

Documentation

a) As distributed at the Seminar

1. CONFERENCIA: ALTERNATIVA DE SOLUCION AL PROBLEMA HABITACIONAL EN MEXICO, REPRESENTADA POR EL ARQ. MANUEL ELORZA, MEXICO
2. ACTIVIDADES DE LA ONUDI EN LAS INDUSTRIAS DE ELABORACION DE LA MADERA, ONUDI
3. MANUAL POPULAR PARA LA CONSTRUCCION DE CASAS DE MADERA, ABSTRACT, REF. ID/330
4. CONFERENCIA: OPORTUNIDADES ESTUDIOS DE CASO "CENTROS DE DISTRIBUCION DE MADERA", DR. RAMON ECHENIQUE MANRUIQUE, MEXICO
5. CONFERENCIA: DESARROLLO TECNOLOGICO DE LA CONSTRUCCION CON MADERA EN EL PACTO ANDINO, ARQ. CHRISTIAN ARBAIZA, PERU
6. CONFERENCIA: INTEGRACION EN LA INDUSTRIA PROCESADORA DE LA MADERA, CONSULTOR EDUARDO FUHRKEN DE LA PEÑA
7. TECHOS, GALPONES TINGLADOS, ESTRUCTURA METALICA, SR. RENE BENITEZ, HONDURAS
8. CONFERENCIA: DECLARACION SOBRE LAS ACTIVIDADES DE LA ONUDI EN EL SECTOR DE LA ELABORACION DE LA MADERA Y SUS PRODUCTOS, SR. ROBERT HALLETT, ONUDI
9. REUNION DEL GRUPO DE EXPERTOS EN CONSTRUCCION CON MADERA, VIENA (AUSTRIA), ID/WG.447/17(SPEC.), ONUDI
10. MADERA, VIVIENDA Y ECONOMIA EN LATINOAMERICA, CONFERENCIA, ARQ. CHRISTIAN ARBAIZA, PERU
11. CONFERENCIA: EL USO DE LA MADERA COMO MATERIAL DE CONSTRUCCION EN LATINOAMERICA, ARQ. CHRISTIAN ARBAIZA, PERU
12. CONFERENCIA: APLICACIONES DE LA INFORMATICA EN EL DISEÑO DE EDIFICIOS Y COSTOS, PROF. JUAN SALINAS, CANADA
13. CONFERENCIA: EJEMPLOS DE CONSTRUCCION CON MADERA EN AMERICA DEL NORTE, PROF. JUAN SALINAS, CANADA
14. CONFERENCIA: TECHOS DE MADERA PARA PAISES EN DESARROLLO, SR. JOSE CARLOS CANO, ONUDI

15. CONFERENCIA: LA MADERA COMO MATERIAL DE CONSTRUCCION EN CENTRO AMERICA, SR. JOSE CARLOS CANO, ONUDI
16. CONFERENCIA: EJEMPLOS DE CONSTRUCCION CON MADERA EN AMERICA LATINA, SR. JOSE CARLOS CANO, ONUDI
17. CONFERENCIA: TIMBER ROOF DESIGN AND CONSTRUCTION, EVOLUTION CURRENT PRACTICE AND TRENDS, SIX CHAPTERS , MR. CHRISTOPHER METTEM

b) As reproduced by UNIDO following the Seminar

- | | |
|--------------|---|
| ID/WG.525/1 | El uso de la madera como material de construcción en Latinoamérica (Item 1a) Christian E. Arbaiza |
| ID/WG.525/2 | Madera, vivienda y economía en Latinoamérica (Item 3) Christian E. Arbaiza |
| ID/WG.525/3 | La construcción con madera: alternativa de solución al problema habitacional en Mexico (Item 5c) Manuel Elorza W. |
| ID/WG.525/4 | Ejemplos de construcción con madera en America Latina (Item 8a) José Carlos Cano d. |
| ID/WG.525/5 | Ejemplos de construcción con madera en America del Norte (Item 8c) Juan J. Salinas |
| ID/WG.525/6 | Standards and Quality (Item 9) R.M. Hallett |
| ID/WG.525/7 | Codejos de la Construcción (Item 10a) Amantino R. de Freitas |
| ID/WG.525/8 | Integración en la industria procesadora de la madera (Item 11a) Eduardo Fuhrken de la Peña |
| ID/WG.525/9 | La prefabricación en el proceso industrial de la madera (Item 11b) Lucia Helena S. Vedovello |
| ID/WG.525/10 | Timber roof design and construction - evaluation, current practice and trends (Item 12a) Christopher J. Mettem |

- ID/WG.525/11 Aplicaciones de la informatica en el
diseño de edificios y costos (Item
12b) Juan J. Salinas
- ID/WG.525/12 Desarrollo tecnologico de la
construccion con madera en el Pacto
Andino (Item 13a) Christian E. Arbaiza
- ID/WG.525/13 Oportunidades: Estudios de caso.
"Centros de distribución de m a d e r a
(Item 13c) Ramón Echenique-Manrique
- ID/WG.525/14 S Informe
- ID/WG.525/14 E Report

ANNEX 6a

**Evaluation Form
Quito, 8 November 1991**

Summary of 17 participants	4	3	2	1
1. SEMINAR PROMOTION				
1.1 General information	3.3			
1.2 Level of information	3.0			
1.3 Travel arrangements	3.4			
2. ORGANIZATION AND INFRASTRUCTURE				
2.1 Programme	2.9			
2.2 Secretariat	3.3			
2.3 Hotel	3.4			
2.4 Conference room	3.3			
3. LECTURES				
3.1 Content and technical interest	3.5			
3.2 Presentations	3.1			
3.3 Puctuality	2.1			
3.4 Documents	3.4			
4. GENERAL COMMENTS				
See attached sheet.				
NAME:	_____			
INSTITUTION:	_____		COUNTRY:	_____

ANNEX 6 a

General comments (Paraphrased)

Good info on importance of wood in building and the need to get more info.

Needed more global technical info but very useful in general. Considered highly positive.

Generally satisfied expectations but we need more international cooperation in (my) country. Lack of preliminary info; programme not followed and some presentations wasted time.

Should have arranged programme for better use of time. The next Seminar should not repeat the same topics but give more examples of progress in this field.

Interesting information and good attempt to bring together differing viewpoints.

Could have coordinated presentations better - by a committee possibly.

I will try to help the seed of information to grow in my country.

This type of event should be organized more frequently and at the sub-regional level.

Presenters should keep to their times better. The international experts were the best in Latin America and the host country looked after us in the best way.

Country papers should have been prepared and available in advance.

Appreciated the opportunity to exchange experiences.

Follow-up communications between participants will be the first step to implementing the recommendations.

The evaluation forms filled in by Ecuadorean participants (4) and observers (22) followed the same pattern (with the exception of some non-applicable categories) and the following comments are typical (also paraphrased):

- The Seminar was very useful - follow-up is necessary.
- The publications and documents well supported the Seminar.
- Transfer of developed technology is very important.
- It was an important experience and many useful ideas were transmitted.
- High technical level.
- Learned many aspects of construction details.
- More such seminars should be organized.
- Should have had site and factory visits.
- Better relations between countries in the region in this field and more instruction in universities is called for.
- National seminars would be better now.

ANNEX 6b

Consultants' evaluation of Seminar

During the final afternoon, the 8 international consultants and the UNIDO staff member made a detailed review of the Seminar. The first observation by the UNIDO staff member was that, owing to the long development period (almost 4 years) and the withdrawal in early 1990 of both FAO and JUNAC, the event had developed into a cross between a training seminar and an expert group meeting on the subject. It was thus proposed to look at the Seminar from both aspects. In fact, it was suggested that the event could have been divided into three days for an expert group meeting and three days for training.

From the Training point of view, it was considered very useful for the observers from Ecuador and most participants were thought to have learned a lot. It was felt that one week was enough and people tended to get bored and absorb less with longer times.

In fact, it was felt that the programme was too tight and should have had presentations of one half hour maximum with more opportunity for participants and consultants to mingle and discuss the subject matter informally between presentations.

It was agreed that one free afternoon (for tourism) should be arranged at such events (with a site or factory visit as an option) but that, in order to make up the time, it was acceptable to have one or two evening sessions, round table discussions, or working group meetings.

In general, the control of time should have been more strict with clearer instructions to the presenters to keep the allocated times and to keep their answers to questions short and to the point rather than simply using the discussion time as an extension of the presentations.

The difficulty of seeing that participants arrive on time for sessions, particularly after breakfast and after lunch, was recognized by all. Suggestions included making a very strong statement at the beginning, not accepting breakfast vouchers after a certain time in the morning (say 8:45 for a 9:00 start), wake-up calls to the rooms, or a recognizable signal over the hotel loudspeaker system.

Finally, although participants and observers were invited to introduce themselves as an "ice-breaking exercise" on the first day, sufficient time should have been left for participants to make "country presentations" on the first day.

Regarding the event as an Expert group meeting, it was felt that there had been good brainstorming sessions but this had been squeezed in between other activities rather than planned for. The consultants felt that there had been strong leadership and orientation of the working groups although it was agreed that consultants in such events should have been instructed to arrive two days early so that a more organized orientation and briefing session could have been arranged the day before the start to coordinate views and to fully understand what conclusions and recommendations were being sought by the organizers. A second meeting of international consultants should also have

been programmed mid-way through the event to check on progress and consider the various participant's inputs.

There was a feeling that there should have been more consultants with a better knowledge of UNIDO, although considering the financial constraints which meant that regional consultants were preferred, this was not practical.

The consultants agreed that there had not been enough emphasis on general construction such as retaining walls, industrial buildings and other structures and that too much attention had been paid to housing.

Finally, it was felt that there had been too much local input which tended to put pressure on other items of the programme and so detract from both the expert group meeting and training purposes of the Seminar. The large number of observers also made the working groups somewhat unwieldy despite the keen interest shown by the large majority of both participants and observers in the working group discussions.

In general, the consultants felt that it had been a worthwhile Seminar and were pleased with the working relationships and the conclusions and recommendations which resulted.