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‘TROPICAL TIMBER USAGE AND ITS SUSTAINABILITY’

CONTENTS

SUMMARY

This paper intends to discuss the use of timber in Malaysia buildings, both traditional and current. It explains where one person's interest in timber as a major building material led to after twenty years; and that the experimentation is not yet over. It describes how after spending a considerable time living in Australia the author found himself back in Malaysia and having to relearn almost everything to contextualise his work in order to re-assimilate into the Malaysian Cultural environment.

The paper elaborates on the author's view on the preservation and sustainability of the tropical rain forests in Malaysia. Explaining some aspects of what is happening in the timber industry in his country.
The bulk of the paper highlights the many aspects of timber and its properties, which many people tends to take for granted. In finality he laments the numerous misconceptions and apprehensions towards the use of timber in Malaysia.

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PAPER ON 'TROPICAL TIMBER USAGE AND ITS SUSTAINABILITY' BY JIMMY CS LIM AT THE PACIFIC TIMBER ENGINEERING CONFERENCE, GOLD COAST, AUSTRALIA, 11TH –15TH JULY 1994.

1.0 INTRODUCTION – Use of Timber in Construction

1.1 Whilst many Asian Architects may be emulating Western values and ethics, whereby losing the 'Asian-ness' of their work, there are some of us who are trying very hard to preserve what precious little that is left of our traditional handicraft and art form. In a world of changing values and shifting emphasis we cannot even discuss about timber in architecture and engineering, without first discussing the issue of the tropical rainforests. Much has being made about their destruction and its consequential effect on the environment and the atmosphere. Are these questions, opposition and objections relevant or even unbiased, and not latched on to some self motivated interest?

1.2 Since the Industrial Revolution, global technology has gone through the Electronics Era and now going into the Green Environment Revolution. Concern about the aftermath, impact, residue and consequences of Industrialization is now being felt, causing alarm, and concern; the 'Global warming', the depletion of the ozone layer, the increase in carbon dioxide in the earth's atmosphere etc. are issues now being raised by the proponents of the industrial revolution. The sudden demand for quality of environmental control and a need for an awareness of renewable and sustainable development questions existing values. The realization, compulsion, necessity and refocusing on a global basis towards conservation and preservation of earth's natural resources, by the all-consuming developed nations may be too late to counter-balance the waste, non-sustainable or reusable resources. Old habits die hard in witnessing a shift in values and re-evaluation of existing norms, the global body of architects and engineers need to formulate a new role for their respective professions to craft a new direction for the 21st century – an environmentally friendly Architecture, a sustainable Architecture based on renewable resources, and an Architecture for global survival.

1.3 Steel and concrete hailed as new technology were major breakthroughs for construction, in late 19th century were celebrated all over Europe and later the United States with great elation. Today, that 'celebration' which propelled the West is fast exhausting and depleting the earth's energy, natural minerals and raw material reserves. Debris of that great 'celebration' can

be seen in almost every developed Industrialised society all over the world. The fuel and energy consumed in order to sustain the production of these materials must now evoke careful evaluation with respect to the deteriorating of the natural environment and the quality of the atmosphere. In production of one tonne of:

	Energy consumption (Kw. Hour)	**Coal** (Ton)
Aluminum	20,000	6.00
Steel	3,800	1.00

Energy consumed and wasted by the developed nations of the north in order to maintain and continue with their lifestyle and living standard far exceeds acceptable moral levels when compared to the rest of the world.

Degradation of the atmosphere is caused by carbon dioxide emission and 80% is attributed to the developed North whilst the South is responsible for only 20%. The need to re-discover, re-orientate and re-focus on building materials, construction techniques and traditional values which will not degrade the quality of our atmosphere and environment becomes primary concern for Architects. The present route without foresight will lead the profession into a cul-de-sac; whereby we may be accused of being 'uncaring', or even irresponsible.

1.4 Can the global body of Architects and Engineers say that we are contributing in a meaningful way towards looking after our natural resources? Is the environment being taken for granted? Are we generally getting too greedy and less concerned about earth's heritage and environment? What will we be leaving behind for our future generations? These are questions which I would like to bring to this conference and to be addressed in a meaningful way. Both our architecture and the natural environment are at the crossroads and solutions may be difficult, but we must and can:

a) plot and chart the path towards a renewable and sustainable management of earth's natural resources;

b) layout some basic ground rules for a sustainable development for the future;

and

c) restrict and define terms and references in the context of the change in global values towards maintaining sustainable and renewable developments.

1.5 Historically and traditionally Malaysia had been very lucky both environmentally and economically. The rich and natural heritage of Malaysia with its vast tropical jungles, river networks, flora, fauna and natural formations make it one of the more interesting and dynamic of the developing tropical Nations of the South. Management of Malaysia's natural forests was started in 1901 with the appointment of the first Forest Ranger, and Malaysia had since then practised renewable and sustainable forestry management, and will achieve full sustainability well before the year 2020, the deadline set by the International Tropical Timber Organisation (ITTO).

1.6 Traditionally, indigenous architecture of the South East Asian tropical basin are predominantly timber based therefore a return to rediscover and to relearn the skills of the craftsman and artisans should be encouraged. Fundamental ideas about traditional lifestyle and construction methods need to be re-established. The misguided notion that 'reinforced concrete with brick infill' buildings are preferable and better than timber needs redressing.

1.7 Conservation and preservation of built heritage, already accepted and practised in the developed countries of the North must be taken seriously by the less developed South. With the shift of economic activity and center to the Asian/West Pacific region, many cities and their heritage buildings are under threat. An overall reappraisal of the concept of planning the modern city is required. New cities in this basin should consider using more building materials that do not contribute towards depleting world resources and deteriorating atmosphere. We are convinced that clues for a sustainable that can contribute towards global survival can be found among architects and engineers from within the Pacific Rim basin.

1.8 National governments can also play an important and constructive role towards the proper use of timber in the environment. For without a political commitment, there can be no political will to follow through. Architects of Asia still enjoy an exalted position within their respective societies and their opinions are respected by their governments. A recent ruling by Malaysia's Ministry of Housing and Local Government, 'No trees, no Certificate of Fitness', was probably one of the greatest landmark decisions for the environment. It was seen as a victory for NGO's striving for quality environment and lifestyle for a sustainable future. Every building industry needs the support of their respective governments; and for a directive concerning quality of environment and life. To achieve an environmentally balanced year 2000 co-ordinated and committed support from the government is required.

Interference from across boundary organizations although well-meaning may sometimes be misconstrued and undo much of what has been achieved by local NGO's towards achieving sustainable Architecture and developments. Unqualified and uninformed restrictions and boycotts on the use of tropical timber are universally acknowledged by experts as counter-productive. What should the populous of most of the countries in the Pacific Rim basin use for their basic building material? To import more steel and other raw materials from the developed north? Could this be the new hidden agenda for 'Imperialism', the creation of economic bondage and dependency?

Timber deprived of its trade value would discourage investment, research, and development in the tropical rain forests' renewal and protection, resulting in the forests being converted to other economic land use.

1.9 We ought to view the global 'family of forests' as an overall concern and not only just at tropical rain forests. Citizens from countries around the Pacific Rim basin depend on their tropical timber for part of their national income. If they are discouraged from using their own natural resources for their Architecture what alternatives do they have? Provided some form of forestry management is being practised and a genuine concern for the sustainability, their continued usage as a major component in building should be encouraged.
We, in Malaysia, had since 1901 practised renewable and sustainable forestry management, and we will be fully sustainable by the year 2000.

At a recent International Conference in June 1993 organized jointly by the **Commonwealth Association of Architects** and the **Malaysian Institute of Architects** on **'Design and Development for a Sustainable Future"** among the numerous resolutions adopted for a sustainable future was one pertaining to "Construction and Building Materials", which reads;

> "3.1 Architects must take pro-active measures to intensify the use of **indigenous and appropriate materials** in their designs. Bias and ill-considered pronouncements in public forum by otherwise responsible professionals with regards to building materials such as the indiscriminate **boycott of tropical hardwood are inappropriate.**
>
> 3.2 Every effort must be made to support local industries in the manufacture and processing of indigenous materials, particularly those that support sustainability."

1.10 This is the crossroads, if architecture and the environment as we know it today is to survive, prevailing attitudes must change. The responsibility to create structures must be to complement the natural environment totally and which, co-jointly inspire and conjure a sense of well being of, and belonging to its occupiers. In this context Architects and Engineers must be supportive towards each other, in order to discharge their responsibilities; to capture and enhance their respective cultural spirit and the texture of their ethnic surroundings in their works.

1.11 A consistency of thoughts and words need to be encouraged, only then are we able to craft a new architectural environment based on sustainable engineering practice for a caring Architecture; a sustainable Architecture based on renewable resources; and an Architecture for Global survival.

2.0 PREFERENCE

Timber is readily available, plentiful, comparably inexpensive, homegrown and is contextual to the Malaysian environment. Students of architecture were always taught to design and build within the context of their environment; responding to, and respecting both the natural and that which is man-made. Regrettably many architects from the less developed countries upon returning to their homeland simply regurgitated what they had seen and continued to copy from trendy, glossy architectural magazines.

Having spent more than 13 years in Australia, the return to my own culture and environment was startling and overwhelming one. To be equated to the proverbial “fish out of water” may not be far from the truth. One could either be succumbed by the cultural shock and simply accept everything as mainstream without questioning it, or to be propelled to respond and to react in a positive manner. The initial period was spent on a relentless search for the answer to what constituted Malaysian architecture. In searching among the traditional built forms the single recurring element was timber. How it was used in simple and humble constructions and many of these timber buildings were outstanding in the manner they were detailed and their structure formed. They were enjoyable and delightful to look at. There were many imaginative ways of using timber. Methods of achieving structural stability and bracing were different from those employed in the west. The different ways junctions were resolved and treated were unfamiliar, not seen before, was refreshing and educational. The use of timber brackets at the capitals of columns was not only decorative but also for bracing to create a rigid joint and reducing the spans between columns. It broadened my own understanding of timber and introduced

another dimension into the use of timber as an important building material in my work.

Prior to this reorientation into Asian timber tradition timber was looked upon as a fairly straightforward building material as described in most of the construction books and building codes in Australia. During the period when Singapore was at its height of modernisation almost the whole of the original commercial city centre of Singapore was devastated by whole scale demolition of buildings from the colonial period. I was fortunate to be able to get a glimpse of how some of those monumental timber framed roofs and trusses were constructed, type of connectors used and type of timber used. Much of the old timber ended up at Tempinis where most of the second-hand yards were in Singapore, only to be recycled as smaller sized members. It was never a pleasant experience to witness some beautifully constructed buildings being demolished simply due to an economic shift of a different era. We call it progress but surely progress and history can develop side by side. This enlightening experience sustained and rekindled my interest and affinity to timber as a potential building material. And what I am about to show you is where that interest after more than twenty years has led me. I, therefore, hope to share with you some of the joys and delights that I found in my pursuit in using timber as a major building material in my architecture.

Until recently I was able to come up with essentially only thirteen (13) reasons why I continually use timber. I have since been able to add a fourteenth reason, the renewability and sustainability of timber.
The reasons for my continued use of timber are; -

1.	Beauty	2.	Availability
3.	Workability	4.	Speed
5.	Economical	6.	Single-trade
7.	Easy Maintenance	8.	Durability & Strength
9.	Inherent Warmth	10.	Contextual
11.	Thermal Comfort	12.	Flexible & Versatile
13.	Mass-production	14.	Renewable & Sustainable

2.1 BEAUTY

The earliest architectural civilization in Europe, the pre-Hellenic Greek trabulated architecture was essentially a generic development from timber architecture. Although only traces of their structure reveal their derivative from timber other earlier civilizations of Asia confirmed that timber was the predominant building material both for structural as well as for in-filling. There are still existing fine examples of intricate wooden carvings, panellings, and furniture in both China and the Indian sub-continent. Other buildings built in timber have withstood the test

of time can still be seen in the arid parts of China and central Asia.

Timber can be easily worked to manifest and enhance its natural beauty, due mainly to its texture and woodgrain. Different timber has different colour hues; an added advantage as a natural material. This variation is virtually non-existant in other building material.

Unlike other materials, timber can have many methods of finish treatment. It can be oiled and polished, rubbed with colour pigmentation, simply painted over, veneered over with paper or cloth and painted, wrapped with horsehair, plastered and lacquered, etc. The choice is unlimited and as varied as the imagination permits. Malaysia has more than one hundred different type of commercial grade timber. The variety in grain structure, pattern of the grain formation and texture of the wood grain can only lead to more creative architectural resolution.

2.2 AVAILABILITY IN MALAYSIA

Because of the vast rainforests, timber is easily available. Traditionally one only has to go into the jungle to take whatever is required. Tropical hardwood has been native to our forests for centuries. They grow naturally and are in many ways self generating and is therefore self sustaining.

Even the furthest urban area of any Malaysian town or city is within easy reach of the natural forests. A drive of less than one hour out of Kuala Lumpur, the national capital will see you in the midst of secondary jungles. In the heart of Kuala Lumpur is a natural primary forest reserve where some of the oldest trees in Malaysia may be found.

The harvesting and processing are all done by Malaysians and carried out locally. This is a boost to the national economy where foreign exchange is minimised. Since timber is harvested locally its supply is virtually uninterrupted. If is not exported. With foreign demands being high it could create a seasonal shortage.

2.3 EASY TO WORK WITH

Timber is an easy to work with material. Requiring relatively simple tools and fairly inexpensive machinery to cut and size it down to the required working dimensions. Timber craftsmanship is easy to work and put together. Fasteners and well thought out details used to hold the components together may also be constructed of timber, e.g. dowels, wedges, birdsmouth, dovetails, mortise and tenon, etc. These are always very simple to make.

The dry nature of timber has an added advantage in that all joints or connections once fixed have its own inherent strength to the job immediately.

2.4 SPEEDY ERECTION

Timber is dry and it has its inherent strength. In building it allows the construction of instant platforms and floors for scaffolding if required or it could be for a permanent floor of part of a storey. Noggings and timber post could be used for partitions and intermediary walls to form instant work spaces.

Beams thrown across a span can be used instantaneous to be used by workers on the site. Columns upon erection can support vertical transferred loads.

2.5 RELATIVELY ECONOMICAL

Besides being readily available and proximity of the raw material that makes it relatively inexpensive compared to steel and other imported products; a primary economic consideration is the possibility of using timber structural and finishing qualities. As well as being the structural member the surface can also be treated and finished for its aesthetic value.

As a structural component the load it carries in relation to its weight and size is more economical and efficient than most other materials. When constructing timber structures one cannot help but notice the lack of wastage. It does not have to depend on other products to sustain its erection, e.g. concrete relies on strutting and framework to hold it in place prior to its hardening and strength development.

2.6 ONE-TRADE-IN-ALL CONSTRUCTION

Walls constructed or structural floors to be constructed out of timber may be done quite simply by a single trade, i.e. carpentry. It would be fast, easy and relatively economical. A similar structure to be made using concrete would involve approximately six trades and may take more time to complete. Where a timber structure may only take three to four days to complete, a comparable concrete one would take between 28-35 days.

A concrete framed structural wall would involve the following trades:

1) **carpenter** - to construct the formwork;
2) **barbender** - to bend and lay the reinforcement steel;
3) **concretor** - to batch, mix and pour the concrete;
4) **carpenter** - to return to the job after the setting of the concrete to strip the formwork;
5) **bricklayer** - to construct the brick in-filling to the RC frames to complete the wall;
6) **plasterer** - to finish off the brickwall with plastering ready to take other finishes;

2.7 EASY MAINTENANCE

Timber requires minimal maintenance. Knowing how to maintain it is however, important. A decision on how to use or treat timber needs to be recognised. Question whether to use it in an exposed or a sheltered location is to be addressed. Different climatic conditions produce differing effect and weathering. Correct choice of species of timber to be used helps in easy maintenance.

Proper detailing to shed off water is beneficial to prolonging the lifespan of timber and keep maintenance cost down. Joints if exposed to the weather ought to be kept as dry as possible by sensible connectors to allow rapid drying and draining off.

To enhance timber there are available in the market commercial protective coating and treatment for exposed timber. Some are known to provide protection of up to more than 10 years in the tropical sun.

2.8 DURABILITY

Contrary to popular belief, timber has qualities which very few of the modern and popular structural materials have. It is an established fact that steel loses its inherent rigidity and strength the moment temprerature reaches 1000oC. Timber does not. Its outer surfaces maybe burnt and charred but the inside which is deprived of oxygen is not touched by the fire. Burnt timber is often salvaged and recycled.

Timber from demolished buildings are always recycled and resold as seconds without any reduction in its strength and properties. This is wonderful testimony to its durability and recyclebility. Many buildings built predominantly with timber are still standing good despite their users' abuses and often misuses.

The structure is sound, the carvings looking delightful and intricate, wall panels still standing tall and solid, doors and windows despite their constant opening and closing are bearing up to the wear and tear. All this only serves to confirm the durability of timber.

2.9 INHERENT WARMNESS

The mention of a log cabin stirs visions of fireplace, a cabin set in the pine forest, or even scenes of snowbound landscapes. The lone timber cabin exudes a feeling of warmth, comfort and security which even the threatening snow cannot detract from. In the tropical weather, timber structures project a sense of coolness that is comfortable as well as a warm and hospitable abode. Timber because of its organic nature is not only pleasant to touch but also friendly and welcoming.

There is universal appeal in timber application. Many of the more expensive homes in the West are constructed with a predominant emphasis on timber. Most of the timber being

softwood is not comparable to the varieties found in the tropics. Malaysia is blessed with an abundance of nature's gift to mankind. This asset needs to be protected and regenerated in a sustainable manner for our future usage.

2.9 CULTURAL ROOTS AND TRADITIONS IN MALAYSIA

To construct in timber is very much part of the Malaysian tradition. Crafting in timber has been going on for many centuries. It was the only known and easily available building material for the tropics. Though the population of Malaysia is cosmopolitan, most of the immigrants had arrived from cultures that understood and had used timber traditionally, the Chinese and the Indians had long history of timber architecture.

It would be foolish and culturally wrong to totally abandon a traditional building material of such versatility. In a society where existing values are being eroded there must be preserved some linkages to ones' tradition and heritage. To continue with timber as a regular building material would be most appropriate. Traditional skilled craftsmen are still available to produce complex designs. To allow these traditional skills to be lost with the passing of these craftsmen will be regretted in time.

2.10 THERMAL COMFORT

Timber unlike concrete or brickwork does not release heat that has been absorbed and retained during the daytime. The rapid loss of heat upon nightfall makes it cooler and more comfortable to live in without having to rely on electrical energy for cooling. Even under full sunlight timber surfaces are not hot to touch. Inhabitants of the tropical belt region had traditionally slept on timber floors.

2.11 FLEXIBLE AND VERSATILE

As previously mentioned, timber is a material which could be used for both its structural strength as well as its finishing quality. This flexibility and versatility makes it a most sought after material. In the initial stage of many projects due to cost constraint insufficient funds may be set aside for decorative treatment resulting in a simply finished interiors. Timber structures and wall panellings allow for later addition of carvings and special details to embellish an otherwise simple interior. Craftsmen with simple tools are able to produce very intricately carved, refine and complex motifs in wood. No other materials can match this ease and simplicity to modify.

Timber components salvaged from demolished buildings could be very simply recycled, adapted and reused in almost any creative and innovative situations. Recent trends have pushed the price of some of these items sky high. It is considered vogue to have in one's remodeled home some elements from a historic or heritage building already demolished. This growing trend of wanting to retain things from one's heritage is encouraging for

the conservation and presentation of one's historic past. The single element that stands up to this recycling exercise is timber.

2.13 MASS-PRODUCTION

There are many existing systems of mass-producing timber houses and other structures. They, however, lack creativeness and had too often been considered as less than desirable for the serious house purchaser. The traditional log cabin epitomized and romanticized in the Yuletide marketing strategy lacks credibility therefore unable to promote the appropriateness of timber as built material.

Designers of mass-produced timber houses will require support and an unconditional mandate from manufacturers to re-conceptualise and systemize a new approach towards mass-produced timber buildings. Timber components can be designed sufficiently small to be manageable for easy handling and fabrication. House components appropriately designed for transportation and speedy erection will further contribute towards cost effectiveness. This may provide the competitive edge over other competitors. The current lack of market acceptability of timber mass-produced houses may be attributed to the lack of resourcefulness of the manufacturer.

In the mass-produced timber industry, there is room for further research and product development.

2.14 SUSTAINABILITY

The natural forest, which is abundant in Malaysia, has been sustained and under proper management since 1901, and with continued proper management the forest will continue to be renewable and sustainable. The continued preservation of the natural rainforest will also ensure preserve its bio-diversity.

Out of Malaysia's total land mass area of 32.86 million hectares (approximately 330,000-sq. km.) about 72% are under forests and tree plantations. Natural forests account for 19.4 million hec. and 4.2 million hec. are under tree plantations. A total of 14.1 million hec. of forests is set aside as permanent forest reserves meaning that no logging is permitted. Within the permanent forest reserve 11.2 million hec. are earmarked for commercial logging on a rotational cycle, under a sustained-yield management system. These are objectives set out by the Malaysian Government for guide of the timber industry. With such a rigorous policy Malaysia can continue to enjoy a long and sustainable timber industry for many years to come.

3.0 OBJECTIONS

Present population in Malaysia have some misconceived misconception towards timber for building. The prejudice is not restricted only to the public at large but it also includes professional architects, engineers and contractors. There is a

need to win over the skeptical by demonstrating the effective properties and versatility of timber.

3.1 FROM THE LAY PUBLIC

Laymen's view is that timber looks cheap. It conjures up a vision of squatter housing which are always built in timber or scrapped wood galvanized iron sheets, unpainted walls etc. hence the revulsion towards the natural look. Anything natural looking has the connotation of lack of wealth; resulting in everything having to be brightly painted.

An inherent fear of the local population is fire. Fire had known to wipe out whole village leaving the inhabitants with nothing but the clothes they were in. Therefore anything to do with timber is not favoured. Until a sense of security can be instilled into these people and their confidence assured the use of timber will not be universally accepted.

The attitude towards timber in the west is quite different from the Asian. A shift in education and appreciating timber is needed. The younger generation being more exposed are more ready to accept timber. Other prejudices like difficulty to maintain, attacks by pests etc; difficulty to obtain financing, and having to pay higher premium for insurance coverage are some other barriers to be overcome.

3.2 FROM THE PROFESSIONALS

Among the professionals both the architects and engineers, there is also a reluctance to use timber as it involves a lot more work than other form of construction. Structural connections are more difficult to resolve more work. It is time consuming. Once on site there is extensive supervision required to ensure that work is done correctly.

The lack of working knowledge about timber among Malaysian consultants may be another reason for their reluctance to use timber as a major construction material. The lack of information about timber properties being disseminated for professional use is a contributory factor. Engineers requiring data for calculating loadings has this difficulty. The lack of standardization in the timber industry further discourages timber being specified. A rigorous effort to systemize and categorize different species of timber for different use will simplify things for the consultants. A concerted need is required to popularize timber.

3.3 FROM THE BUILDERS

Contractors generally prefer simple methods of construction. Timber is difficult and requires more supervision and attention. Skilled carpenters are difficult to find. There are traditional craftsmen but their numbers are dwindling and the number of apprentices coming into the industry is very few.

The lack of understanding about the properties of timber and their behavioral pattern frightens modern builders and workers. Timber construction requires a lot more attention, care and protection during construction. Once the surfaces are damaged more effort is needed to rectify it. Corners and sharp arises needs constant protection. Timber also needs to be protected from staining by water and other liquids.

The inability to maintain consistency in the type of timber does not make it easy for the contractors. The whole timber industry in Malaysia must be upgraded to a level whereby its reliability in terms of quality, supply, grading, selection, pricing, control etc. can be maintained before an appreciable increase in its popularity and universal use in Malaysia.

4.0 CONCLUSION

I hope I have in the above provided an overview which is fair and balanced with respect to the use of tropical hardwood.

Whilst in my opinion the advantage of timber over concrete and steel are plentiful there are problems and issues which need to be resolved for our continuing to use what nature has provided. Although there are much legislation to protect, to sustain and to ensure renewability of our forests, greed may ultimately overtake good common sense. When there is a change in political personnel there may be a big shift in emphasis and laws may be changed. This is our greatest apprehension. There must be more concern to desist the plundering of earth's resources, environment and natural heritage.

Whilst there are signs that National Governments are supporting the cause, much more can be done. Prevailing restricted attitudes against timber in the construction industry must change. Current misconception among the lay public, on the use of timber needs to be corrected. Whilst these misconceptions may be easily corrected, the bigger problem lies with the professionals in the industry who do not appear willing to exert the extra effort when working with timber.

A concerted effort is required by all to correct the situation.