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Timber Utilization in Sri Lanka

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Introduction

Timber is one of the oldest building material used by man. According to history of Sri Lanka "Lovamahapaya" which was built by the King Dutugemunu in the second Century B.C., had a complete timber structure originally comprising nine stories having a height of over 20 meters,. Timber, which is used as a building material among other uses, consists of several hundred different wood species, some of which are least known but each species possesses different wood properties according to its kind. People in Sri Lanka, in the past, used popular timber species such as Satin, Palu when it is was a commodity very widely and freely available. This situation was in existence even before colonization, at a time Sri Lanka was well known as a forested island. It is no doubt, the natural forest comprising valuable timber species was one of the attractions led this Island to be colonized.

The historical pattern of forest utilization in Sri Lanka could be classified into four stages as (a) Early exploitation stage upto the 1880, (b) forest management based on timber harvesting from 1880 to mid-1950s, (c) peak and decline of timber harvesting from mid-1950s to early 1980s, and finally consolidation from mid-1980s. The new order of managing the Sri Lankan forest resources for sustainable development would be jeopardized unless a judicious attempt is made to utilize timber resources in sustainable manner. The need becomes even more important in the present scenario where there is a continuous increasing demand for timber resources caused by increasing population, industrialization and underutilization.

This report on timber utilization of Sri Lanka is a review of available historic and current information related with timber industry will address on following topics.

1. Timber resources in Sri Lanka
    - 1.1 The forest timber resources
    - 1.2 Man-made forest plantation
        - 1.2.1 State sector
        - 1.2.2 Private sector
    - 1.3. Non-forest timber resources
        - 1.3.1. Contribution of home garden for timber supply
        - 1.3.2 Contribution of Rubber and Coconut plantations to timber supply.
2. Timber imports and exports
3. Supply, consumption, and demand for timber and timber based products,
4. Timber industries in Sri Lanka.
5. Past and present Sri Lankan timber based Enterprises.
6. Choices of timber used for various purposes
7. Timber seasoning and preservation
8. Legal background of timber and timber related operations in Sri Lanka
9. Sri Lankan standards for timber and timber related products and operations
10. Sri Lankan standards for timber and timber related products and operations
11. Some suggestions for development of timber industries in Sri Lanka

1. Timber resources in Sri Lanka

The timber resources in Sri Lanka consists of the forest timber resources and the non-forest timber resources. The forest timber resources consist of the timber harvested from natural forest and the man-made plantations. The non-forest timber resources consist of timber harvested from rubber and coconut plantations, private and village gardens.

1.1 The forest timber resources

Total natural forest cover in 2008/2009 is 29.7% from the total land area of the Sri Lanka including 21.9% dense forests; 6.5% of open and sparse forests; 0.2% mangrove forests and 1% Savannah. Except this extent, 0.1% of Marshes and 5.3% of shrubs and grasslands can be identified. The total extent of natural forests is 1,951,473 ha. At the district level, Mullativu, Mannar and Vavuniya are the top three of the forest cover; Gampaha consists of the least forest cover. Extent of the forests by forest types is shown in Table 1.

Table 1. Extent of the forests by forest types (Edirisinghe et al., 2012)

Forest type	Extent (ha)	Percentage
Lowland rain forests	123,302	1.9
Moist monsoon forests	117,885	1.8
Dry Monsoon forests	1,121,392	17.1
Montane forests	44,758	0.7
Sub Montane forests	28,513	0.4
Riverine dry forests	2,425	0.0
Mangrove forests	15,670	0.2
Savannah forests	68,044	1.0
Open and spare forests	429,484	6.5
Total	**1,951,473**	**29.7**

The low land rain forest has, an average of 205 stems/ha of at least 10 cm dbh containing an average about 126 m^3/ha in trees of more than 30 cm dbh. The dry monsoon forest and The moist monsoon forest have, an average of 123 stems/ha and 152 stems/ha at least 10cm dbh trees containing an average about 21 m^3/ha and 39 m3/ha of more than 10 cm dbh respectively. Some of these forests may be managed to obtain timber using suitable harvesting methods after comprehensive study. However in 1989 due to moratorium for logging of natural forest was imposed considering need of conservation. Thereafter the contribution from natural forest towards the country's timber demand was legally stopped though illicit harvesting is still been carried out. With the imposition of bans on timber harvesting from natural forest, various parties made projections to the effect that there would be a serious timber scarcity in the coming years. There was programmes during the past 20 years to implement rapid reforestation programs and to change the timber utilization pattern from popular timber species to lesser known timber species or to use exotic timber /imported timber

1.2 Man-made forest plantations

1.2.1 State Sector: Forest Department

Forest plantation in Sri Lanka consist of mainly forest plantations belong to forest department and regional plantation companies (RPCs) under ministry of plantation industries. Forest Department owns approximately 93,000 ha of Man-made forest plantations, however the productive extent has shrink up to 75,000 ha due to naturalize and some were declared as National Parks. The total forest plantation under forest department is given in Table 2. Yield of forest plantation vary with site condition, seed stock and management. The expected yield from teak plantation has not been achieved at end of the rotation according to yield tables. Table 3 shows the volume harvested by State Timber Corporation (STC) from forest plantation of Forest Department (FD) recent years.

Table 2: Total forest plantations under Forest Department

Name of tree species	Hectares
1. Teak	23,266
2. Eucalyptus	20,716
3. Pine	16,365
4. Mahogany	4,997
5. Acacia	3856
6. Khaya	291
7. Miscellaneous	5417
Total	**74,912**

Table 3. Harvested timber in major plantation species by STC from plantation of FD as clear fellings

	2017		2018		2019		
Name of the species	**Harvested area (ha)**	**Harvested volume (m^3)**	**Harvested area (ha)**	**Harvested volume (m^3)**	**Harvested area (ha)**	**Harvested volume (m^3)**	**Average volume m^3/ha**
Teak	569.80	30,318	836.40	32,359	625.5	31,708	46
Pinus spp	160.20	34,968	124.30	36,286	138.3	44,615	274
Eucalyptus spp	62.50	9,258	26.60	6,393	31.6	4372	166

According to Forestry Sector Master Plan (FSMP-1995) it has been projected average annual yield to supply total 392,070 m^3 (149,160 m^3 as softwoods and 242,910 m^3 as hardwoods) of industrial logs from existed forest plantation in 2020. However, present timber supply from forest plantation is much lower than the FSMP projected figures; total log supply of forest plantations in 2018 was approximately 97,000 m^3 (see Table 13), it is only 24% of the projected supply. These figures can be much lower when both existing plantations and replanted plantations are considered. Reducing of annual cutting area can be identified as one of the main reasons to drop the production, thus FSMP had projected the annual cutting area of existing plantations between 2011-2020 would be 2920 ha as clear felling and 500 ha as commercial thinning outs. However, only 951.6 ha has been released clear felling in 2018, it is approximately 32% from the projection.

However, annual thinning area has achieved that commercial thinning was conducted in 695.78 ha in 2018. Inconsistent policies on plantation forestry, poor management, low budgeting on replanting are some possible causes of underutilization of forest plantations.

1.2.2 Private sector: Regional Plantation Companies (RPC) and other private investors

According to five-year forestry management plan prepared by RPCs have reported that they have 16,463 ha of total forest plantations. Statistical information on plantation crops says that totally 8000 ha are available for timber production while nearly 9000 ha are available for fuel wood production. Nonetheless, it will have significant contribution cater to national timber demand by providing fuel wood, Eucalyptus electrical transmission poles and Railway sleepers, sawn timber etc. Table 4 shows the forestry extent of estate sector.

Table 4. The forestry extent of estate sector – 2018 (Hectares)

RPCC & State Agencies	Timber Extent	Fuel Wood Extent	Immature Extent	New Planting	Re Planting
RPCC	7,491	8,001	2,607	119	178
1 Hapugastenna	191	1,172	43	14	8
2 Watawala	383	696	582	10	-
3 Balangoda	-	-	-	10	-
4 Kahawatte	743	690	464	-	-
5 Bogawantalawa	314	554	142	26	6
6 Maskeliya	515	571	-	-	-
7 Agalawatte	389	-	-	-	-
8 Talawakelle	-	392	141	-	7.5
9 Kelani Valley	941	320	-	-	-
10 Horana	-	554	20	-	20
11 Malwatte Valley	-	738	-	-	-
12 Maturata	869	77	281	35	28
13 Elpitiya	866	28	38	-	38
14 Madulsima	-	1,618	74	-	-
15 Kegalle	91	165	4	-	-
16 Pussellawa	1,160	274	635	-	-
17 Kotagala	890	-	93	23	70
18 Namunukula	-	-	74	-	-
19 Udapussellawa	140	152	16	1	2
STATE AGENCY	552	976	74	-	4
Chilaw Pl Ltd	10	-	10	-	-
Elkaduwa Pl Ltd	119	147	47	-	4
JEDB	423	829	17	-	-
SLSPC	-	-	-	-	-
Total	**8,043**	**8,977**	**2,681**	**119**	**182**

From recent past, several private companies have started Teak and Mahogany reforestation programs attracting public to invest in their business from initial stage. The profit from the investments of such projects is calculated based on prediction of high growth rate of tree and future timber price. It is known that short rotation plantation produce low quality, less durable timber, which cannot be marketed for a profitable price. Hence, as far as timber utilization aspect is concerned it is very important to produce not only a large volume but also quality timber.

However, private sector participation for reforestation may have positive impact on Sri Lankan's forestry sector development.

Apart from this, the timber produced from forest plantations is inadequate compared with country's timber demand to supply for various sizes and uses. Eg: there is a scarcity of long length construction timber in Sri Lanka. At present construction timber produced by up country *Eucalyptus grandis* and *Eucalyptus microcorys* are not adequate because logging ban was applied to higher elevation forest plantations (over 5000 feet) which are dominated by *Eucalyptus spp*. Thus, major planted wood source is unavailable at the present, which is significantly effected to local industrial timber production. Teak and Mahogany are preferably used for furniture, joinery, decorative and parquet industries as super luxury and luxury timber respectively. During the last three years, a large quantity of pine timber have been extracted from forest department plantation, which is more susceptible for mould and stain attack. Hence appropriate antisap stain treatment should be included. Use of pine-sawn timber is not popular due to this timber drying and preservation process. Boron and CCB treatments are ideal for Pine-sawn timber, which are becoming popular in local market. Pine poles were being used after creosote treatment for electrical transmission poles, however it has suspended since 2013 due to constraint related to the strength of the poles.

1.3. Non-forest timber resources

Even though natural forests and forest plantations have the potential to supply country's total timber demand, either most of this is in inaccessible, protected area or felling is banned. Therefore, around 70% of the industrial timber have to be supplied from home gardens, rubber and coconut plantations, and trees planted along farm boundaries, on roadsides, and in urban areas.

1.3.1. Contribution of home garden for timber supply

The extent of home gardens in Sri Lanka in 1983 was 781,000 ha compared to 858,100 ha in 1995. FSMP (1995) projected the extent of home gardens can be increased up to approximately 1,266,000 ha in 2020. There are more than 400 woody species planted and naturally regenerated in home gardens. Average tree density of home garden in dry zone and wet zone have been recorded 125 trees per hectare and 260 trees per hectares respectively. Three main multipurpose tree species namely coconut, Jak and Mango would produce 38 percent of the total timber volume produced in home gardens. Five exotic timber species namely Mahogany, Alastonia, Albizia, Eucalyptus and Teak contribute 30 percent of the total timber volume produced in home gardens. Home gardens contribute 40 percent of Sri Lankan timber demand nonetheless the major portions of timber produced from home gardens are less durable and low quality timber, which cannot be used for structural purpose of construction industries. Home gardens will produce an average of about 0.95 m^3 of saw logs and 0.5 m^3 of poles per hectares per year. FSMP (1995) predicted 265,800 m^3 saw log and 57,000 pole productions from home gardens in 2020, however no literature is found out to identify the actual current production.

Most common and valuable timber species grown in home gardens according to study made by Mr: K.P. Ariyadasa (2002) are listed in Table 5. The log price varies with mid girth classes of log and log grading. Averaged log price of STC for most common timber species are given in Table 4.

This price is a graded price for quality logs with minimum defects and 1 m girth. The price may highly drop with amount of defects. Price for lower girths is comparatively low.

Table 5. Most common and valuable timber species found in home gardens

Species name		Total no. of trees	Density of timber at 12% m.c. (kg/m^3)	Timber class of STC	Uses of timber (see the notes)	STC Log price: Rs./m^3 in 2019 (mid girth 1m)
Local	Botanical					
Coconut	*Cocos nucifera*	38,616,649	480-560	Class II	2, 13,	6,307.00
Rubber	*Hevea brasiliensis*	17,101,488	640-720	Class III	9,10,13	3,290.00
Jak	*Artocarpus heterophyllus*	10,437,142	640	Luxury	1,2,3,5,6,7,8,9,12,13,	52,702.00
Mahogany	*Swietenia macrophylla*	6,410,248	560	Luxury	7,8,9,10,11,13,14	21,856.00
Alastonia	*Alstonia macrophylla*	5,968,286	640	Class II	15, 5,	13,005.00
Mango	*Mangifera indica*	5,607,688	480-560	Class III	10,	5,593.00
Albizzia	*Albizia molucana*	5,607,581	480-560	Class III Other	16	5,593.00
Eucalyptus	*Eucalyptus spp*	4,061,191	*Eu. microcorys*	Special class	1,2,3,4,5,7,9,11,,14	46,828.00
			Eu. grandis	Class II	2,3,4,5,13	20,416.00
Teak	*Tectona grandis*	3,293,609	720	Super luxury	2,3,4,5,7,8,9,10,11,13,15	79,534.00
Margosa	*Azadirachta indica*	3,044,932	720	Special upper	2,3,4,5,7,8,9,13,14,15	35,020.00
Lunumidella	*Melia dubia*	2,349,245	400	Class II	10,14(a)	12,331.00
Satin	*Chloroxylon swietenia*	1,489,903	960-1040	Luxury	1,7,8,9,13,14	63,866.00
Sabukku	*Grevillea robusta*	1,460,721	560	Class III	4,5,7,9,13,14	8,568.00
Halmilla	*Berrya cordifolia*	1,185,466	800-880	Luxury	1,2,3,4,5,6,7,9,10, 11,13,14	39,816.00
Toona	*Toona sinensis*	1,023,771	560	Class II	13,14a,16	13,005.00
Hora	*Dipterocarpus zeylanicus*	865,437	800-960	Class I	1,2,3,4,5,7,9,	22,660.00
Milla	*Vitex altissima*	774,419	880-960	Luxury	1,2,3,4,5,6,7,9,11, 12,14	36,486.00
Kumbuk	*Terminalia arjuna*	686,953	720-800	Special	1,2,4,5,6,7,9,11,12 13,14	49,632.00
Welang	*Pterospermum canescens*	564,431	640	Special upper	4,5,7,8,9,10,12,14	28,840.00
Kolon	*Ardina cordifolia*	548,464	720	Special upper	2,4,5,7,8,9,13,14	30,900.00
Suriyamara	*Albizia odoratissima*	509,591	800-880	Special upper	1,2,3,5,7,8,9,11,13,14	35,020.00
Nadun	*Pericopsis mooniana*	473,408	800	Super luxury	13,14,	53,992.00

Notes: (1)Beams, (2)Rafters, purling, Ridges, Hips , (3)Ceiling joints, wall plates , (4) Reapers, (5) Ceiling spacers, (6) Fascia Boards , (7) Door and window frames , (8) Door and window sashes, (9)Partition frames , (10) Ceiling Board (11) Floor Board , (12) Weather Board, (13) Furniture , (14) Paneling(14a) and Decorative work, (15) Transmission pole.(16) Packing cases

1.3.2 Contribution of Rubber and Coconut plantations to timber supply

There are two sectors in Sri Lankan rubber wood plantation; estate sector represents 37,442 ha of more than 20 hectares of plantation and small holding sector represents 89,243 ha, which are less than 20 hectares; the total extent is 126.685 ha. As per the records of Rubber Development Department, the extent under smallholder sector ownership of rubber reported as 69,676 ha in 2007, which is 70% of the total extent. Since 2007 to 2018, smallholder land ownership indicated a significant improvement with 28 % increase in extent cultivated while estate sector had lost 12,425 ha. However, FSMP has projected 175,000 ha of Rubber plantations, even though the actual figure is less. Rubber plantation will produce an average of about 0.24 m^3 of peeler logs and 65 m^3 of saw logs for every hectare felled at the end of a 25 years economic lifespan. It can be

projected that from Rubber plantations can supply 268,800-m^3 saw log production and 8,200 m^3 of peeler logs in 2020. Rubber wood is moderately hard and heavy with a density of 640 to 720 kg/ m^3 at 12% moisture content. Rubber timber has higher shear value. Timber is suitable for furniture being reasonably hardwearing, and attractive apart from the occasional unsightly black stain.

According to the Economic Census - 2013/14, Department of Census and Statistics, there are 443,529 ha of coconut plantation in Sri Lanka while 371,237 ha is belongs to small holders, which is 84% of the total extent. These figures are greater than projected figures of FSMP. The coconut plantations will produce an average of about 49.4 m^3 of saw logs for every hectare felled at the age of at least 50 years. FSMP (1995) predicted 75,900 m^3 saw log production from rubber plantations in 2020. It is possible to obtain 0.5 to 0.6 m^3/tree out of which estimated average sawn timber yield per tree would be 0.2-0.23 m^3. The density of coconut stem vary from 900 kg/ m^3 (outer wood near base) to 150 kg/ m^3 (center wood near top). Drying times required are one month for 25 mm thick timber. Treatment with boron by diffusion are possible for coconut wood. High-density wood is extremely strong and can be used as a structural material like roof rafter, paneling. High-density wood will give a good finish but furniture tend to be very heavy.

2. Timber imports and exports

Imported timber

When we discuss about timber utilization in Sri Lanka it is very important to study the import of timber and timber based products, because it is an indicator on scarcity of quality local wood sources and cost on island's economy. According to international Harmonized Serial (H.S) code under section ix, chapter 44, wood and articles of wood; Sri Lanka has imported timber or timber based products as mentioned in Table 6.

The figures shows Sri Lanka has spent approximately Rs. 10,738 million foreign exchange to import nearly 137,218 thousand kg of quantity of wood products in 2017. (1) Sawn wood, (2) Fibreboard of wood or other ligneous materials and (3) Plywood, veneered panels and similar laminated wood are the top of the list based of CIF value; worth of these three articles solely is Rs. 8167 million, which is approximately 76% of total CIF value. Among the imported items, country had spent nearly 49% (approx. Rs. 5000 million) of its total CIF value for sawn timber importation. In 1993, 29,000 m^3 of timber were imported to Sri Lanka, which represented 5% of total sawn timber demand at that time. However, it had increased by 356% in 2017. The amount of imported sawn timber (HS 4407) is 103,369 m^3 in 2017 and it has raised up to 133,022 m^3 in 2019. The total worth of imported sawn timber in 2019 is Rs. 7242 million; the increment is 37% (approx. Rs. 2000 million) comparatively to 2017. Nearly 100,000 m^3 of tropical hardwoods were imported from Malaysia and nearly 12,000 m^3 of conifers were imported several countries in Europe, Asia and New Zealand.

Most of the timber imported comes to Sri Lanka under the category of "other" of 44.071 HS code viz but not under their Botanical or commercial name. This has resulted where some importers import low grade timber which are below the accepted standards and is being marketed. As the buyers are not aware of the standard quality of timber or not able to identify the timber species, they tend to get mislead easily. STC has recognized a number of cases that importers and local timber dealers mislead our consumers to sell out low quality imported timber at prices for high-quality species and standards. STC has conducted numerous timber authentication tests upon requests made by distracted parties. According to STC statistics, during the period from 2012 to 2017, 72% of test results proved that local merchants (Siriwardana and Muthumala, 2018) had already misled relevant consumers. Some studies have shown that species like "Balau" reported a very low authenticity (Muthumala and Amarasekara, 2013). Moreover, STC has found that there are approximately 14 tropical hardwood species (Table 7) being imported mainly from Malaysia. This prevailing situation can be minimized if standard and regulation for timber market is introduced

Table 6. Quantity and value of imported wood based product in 2017

HS Code and description	Quantity (kg '000)	CIF (LKR million)
4401- Eg: Fuel wood, saw dust, pellets or similar form	20.83	1.58
4402- Eg. Wood Charcoal	6,392.11	468.67
4403- Eg. Wood in rough whether or not stripped of bark or sapwood, or roughly squared	696.10	26.51
4404- Eg. Hoopwood; split poles; piles, pickets, stakes of wood	24.52	2.30
4405- Eg. Wood Wool / Flour	881.72	58.47
4406- Eg. Railway Sleepers	0.66	0.05
4407- Eg. Wood sawn or chipped lengthwise, sliced, peeled, whether or not planed, sanded or finger jointed, of a thickness exceeding 6mm	72,358.11	5,289.51
4408- Eg. Veneer sheets and sheets for plywood (spliced or not)	1,328.46	300.05
4409- Eg. Wood (including strips, friezes for parquet flooring, not assembled)	1,262.64	274.58
4410- Eg. Particle board and similar board	4,257.39	285.73
4411- Eg. Fibreboard of wood or other ligneous materials	31,273.36	1,844.83
4412- Eg. Plywood, veneered panels and similar laminated wood	11,881.10	1,032.68
4413- Eg. Densified wood, in blocks, plates, strips or profile shapes	12.69	1.42
4414- Eg. Wooden frames; for paintings, photographs, mirrors	82.23	8.81
4415- Eg. Packing cases, boxes, crates, drums and similar packings	653.30	233.03
4416- Eg. Casks, barrels, vats, tubs and other coopers' products	0.16	0.02
4417- Eg. Tools, tool bodies, tool handles, broom or brush bodies	1,507.96	62.95
4418- Eg. Builders' joinery and carp entry of wood	1,500.57	403.67
4419- Eg Tableware and kitchenware of wood	72.00	27.75
4420- Eg. Wood marquetry and inlaid wood; caskets and cases for jewellery or cutlery	126.97	97.87
4421- Eg. Other articles of wood	868.61	318.49
Total	**137,218.47**	**10,738.96**

Table 7. Description of main importing Malaysian timber species

No	Species	Botanical name	Other names	Timber Category	Density (kg/m^3)
1	Balau	*Shorea spp.*	Selangan Batu	Heavy hardwood	850-1155
2	Kekatong	*Cynometra spp.*	katong-katong	Heavy hardwood	880-1155
3	Keranji	*Dialium spp.*	Kralanh lomie	Heavy hardwood	755-1250
4	Red Balau	*Shorea spp.*	Selangan Batu	Heavy hardwood	800-880
5	Resak	*Vatica spp.*	Vatica spp. & Cotylelobium spp.	Heavy hardwood	655-1155
6	Alan Batu	*Shorea albida*	Singawan batu	Medium hardwood	800-925
7	Kandis	*Garcinia spp.*	Lulai	Medium hardwood	690-1120
8	Kapur	*Dryobalanops spp.*	Dryobalanops spp.	Medium hardwood	575-815
9	Kasai	*Pometia spp.*	Sarawak	Medium hardwood	735-915
10	Kulim	*Scorodocarpus borneensis*	Ungsunah	Medium hardwood	640-975
11	Kempus	*Koompassia malaccensis*	-	Medium hardwood	770-1120
12	Keruing	*Dipterocarpus spp.*	-	Medium hardwood	690-945
13	Tualang	*Koompassia excelsa*	-	Medium hardwood	800-865
14	Meranthi	*Shorea uliginosa*	Obar Sulak	Light hardwood	560-865

Exported timber

Table 8 shows data of export of wood-based products in 2017.

Table 8. Quantity and value of exported wood based product in 2017

HS Code and description	Quantity (kg '000)	CIF (LKR million)
4401- Eg: Fuel wood, saw dust, pellets or similar form	3,741.01	101.86
4402- Eg. Wood Charcoal	10,182.76	742.13
4403- Eg. Wood in rough whether or not stripped of bark or sapwood, or roughly squared	0.97	0.39
4404- Eg. Hoopwood; split poles; piles, pickets, stakes of wood	4.90	0.54
4405- Eg. Wood Wool / Flour	-	-
4406- Eg. Railway Sleepers	35.26	9.44
4407- Eg. Wood sawn or chipped lengthwise, sliced, peeled, whether or not planed, sanded or finger jointed, of a thickness exceeding 6mm	9,289.83	365.76
4408- Eg. Veneer sheets and sheets for plywood (spliced or not)	41.15	5.18
4409- Eg. Wood (including strips, friezes for parquet flooring, not assembled)	0.78	1.47
4410- Eg. Particle board and similar board	4.39	0.54
4411- Eg. Fibreboard of wood or other ligneous materials	52,043.95	2,483.09
4412- Eg. Plywood, veneered panels and similar laminated wood	261.81	37.52
4413- Eg. Densified wood, in blocks, plates, strips or profile shapes	226.80	89.14
4414- Eg. Wooden frames; for paintings, photographs, mirrors	1.71	1.37
4415- Eg. Packing cases, boxes, crates, drums and similar packings	92.70	11.53
4416- Eg. Casks, barrels, vats, tubs and other coopers' products	0.83	0.33

4417- Eg. Tools, tool bodies, tool handles, broom or brush bodies	2,906.77	630.22
4418- Eg. Builders' joinery and carp entry of wood	109.20	33.24
4419- Eg Tableware and kitchenware of wood	7.62	9.11
4420- Eg. Wood marquetry and inlaid wood; caskets and cases for jewelry or cutlery	134.35	352.59
4421- Eg. Other articles of wood	1,835.00	1,331.88
Total	**80,921.78**	**6,207.32**

The data shows that total quantity is nearly 81 million kilograms while the total CIF value of exports is approximately 6200 million LKR. Fibreboard of wood or other ligneous materials (HS 4412) is the top exported product in terms of CIF value. The shortage between total exports and imports is approximately 4500 million LKR.

3. Supply, consumption, and demand for timber and timber based products

Wood consumption per capita

The estimates of forest product demand are based on certain explicit and implicit assumptions on driving forces of demand; GDP and population have been adopted as basic economic/demographic shifters. It was assumed that population and GDP in 2005 is 20.06 million and 14,615 USD millions respectively and it would increase to 21.86 million and 22,266 USD millions in 2015 respectively (FSMP-1995). Central Bank report (2019) stated that population of Sri Lanka is 21.80 million and GDP is USD 84,000 million in 2019. Table 9 shows that Sri Lankan timber consumption under any category of industrial wood, sawn wood, pulp, and paper are lower when compared with most of other countries. In Sri Lanka, sawn wood consumption per capita in 2018 is 33 m^3/1000 persons, which is higher than India but lower than international comparison.

Table 9. Comparison of wood consumption per 1000 capita in different continents with Sri Lanka in 2018

Country	**Consumption per 1000 capita/year**			
	Industrial round wood (m^3)	**Sawn wood (m^3)**	**Wood fuel (m^3)**	**Pulp and paper (Tonnes)**
Sri Lanka	33	05	217	20
Africa	56	13	549	06
Asia	113	43	158	44
Europe	855	155	231	124
North & central America	1388	329	197	206
Oceania	1074	198	240	99
South America	399	42	418	46
World	**266**	**64**	**254**	**53**

Biofuel consumption

In Sri Lanka, 70% of national bioenergy being consumed for domestic cooking and industrial purposes. The share of biomass as a primary energy source has gradually reduced from 65% in 1990 to 47.4% in 2007 due to higher petroleum consumption. However, this figure has changed to

81% in 2003. Although electricity being available to 85% of households, firewood is still popular due to high cost of electricity, in comparison with the relative abundance of wood. Biofuel is responsible for 37% of Sri Lanka's energy consumption in 2017, which is mainly used for cooking, and it is used for thermal energy requirements in the industrial sector. Biofuel largely consists of agricultural residues (rice husk, waste from rubber and coconut plantations, yield from woodlots and home gardens) and yields from rubber replantation activities. Household, commercial, and others, accounted for 39.6% of total energy use. The estimated total consumption of bioenergy by household sector in 2020 is 8.82 million tons. The percentage of total population using fuel wood is 86 %; consumption per capita is 1.24 kg/day. Total fuwlwood requirement of industries is 0.82 million tones; The tea industry is the main consumer of fuel wood of about 44%, followed by hotels and eating-house (16%), the brick and tile industry (18%) and Hotels and restaurants (14%). Inefficient utilization of fuel wood can be found elsewhere these resources are undervalued. The FSMP projectsion shows a surplus of fuel wood supply as a whole nevertheless some districts; Nuwara eliya, Gampaha, Colombo, Kalutara, Badulla, Matara, Galle and Jaffna are facing fuel wood shortage in 2020. The gap between surplus and deficit is difficult to narrow down due to high cost of fuel wood transportation.

Table 10. Projection of bio-fuel supply and demand, '000 tonnes based on 1993 data.

	1995	**2005**	**2008**	**2015**	**2020**
Natural forest	664.3	582.8	560.7	557.1	505.5
Forest plantation	372.0	192.4	254.1	498.5	404.4
Processing residues	341.5	425.9	454.2	557.5	606.5
Non forest wood and other biomass resources	8493.1	8733	8812.4	8980.6	7278.5
National supply	**9870.9**	**9934.1**	**10081.4**	**10593.8**	**10109**
National demand	**9260**	**9560**	**9619.9**	**9710**	**9709**
National surplus	**610.9**	**374.1**	**461.6**	**883.8**	**401**

Roundwood consumption by supply source

Total requirement of round wood in 2020 was approximately 1.962 ('000 m^3), out of which almost 100% industrial logs (1.531 million m3) was used to convert into the sawn timber. This conversion of logs into sawn timber should be taken to consideration when country's total timber requirement is calculated. The estimated share of wood supply in 2007 can be given as follows:

Table 11. Projection made by FSMP (1995) of demand, production, and trade in wood products,'000 m^3 or ton per year for the year of 2020

Timber product	**Demand**	**Production/ sustainable supply**	**Import/ unsustainable supply**
Industrial wood	2450	2700	-
Poles and post	486		
Sawn wood	885	876	9
Plywood and Other wood panels	82	5	77
Paper	407	147	260
Fiber and recycled paper	153	100	53

Table 12: Projection made by FSMP (1994) for supply of sawlogs '000 m^3 for the year of 2020

Timber source	Volume (m^3)	Timber source	Volume (m^3)
Natural forest		Home gardens	769.2
Dry zone	299	Rubber	265.8
Wet Zone	51	Coconut and Palmyra	154.3
Forest plantations		Trees on tea lands	75.9
Existing	392	Other perennials	81.9
Replanted	905	Roadsides and settlements	5.2
		Total	**2999.3**

The wood from natural forest is unavailable for consumption; however, the projection said that forest plantations could be supply 1,297,000 m^3 of sawlogs. Moreover, projected total sawlog production is 2,999,300 m^3.

However, the yield of plantations has decreased up to 97,150 m^3 in 2018 (See the production of Forest plantations in Table 13).

Table 13. Yield recorded from Forest plantations in 2018

Species or timber category*	Thinning yield (m^3)	Regeneration cutting (RCT) yield (m^3)	Total yield (m^3)
Teak Logs	2427	32359	34786
Nadun logs	-	3	3
Mahogany logs	-	8	8
Milla logs	-	7	7
Luxury Others excluding Teak, Nadun, Mahogany and Milla	-	39	39
Special Class Upper and Special Class logs	509	824	1333
Class I Class Logs	730	5823	6553
Class II Class Logs	3939	14037.5	17976.5
Class III Class Logs	3	152	155
Pinus Logs	5	36286	36291
Total	**7,613.00**	**89,538.50**	**97,151.50**

**Timber category is based on STC timber classification*

.4. Timber industries in Sri Lanka

Sri Lankan Forest Industry involves of the following:

1. Sawmilling
2. Sawn wood processing Industries;

(a) Furniture (b) Packaging (c) Other wood products (d) Timber Seasoning and Impregnation

3. Wood-based Panels Industries

(a)Plywood (b) Fibre Board (c) Particle Board

4. Pulp and Paper Industries
5. Wood and Wood based Industries: (a) Safety Match (b) Boat Building

This paper will discuss only sawmilling and sawn wood processing industries.

Sri Lankan economy and population have increased during the last decade. This has resulted in increase of demand for sawn wood, panels, paper and other industrial products. The biggest challenge faced by the timber industry is that there is no guaranteed continuous supply of wood resources, which need to feed existing industries and to encourage new investment in this industry. In addition to this, the other weakness reflected are, lack of stable policy direction, excessive regulation of transport of wood and finished product, bad image of the industry, lack of industry information, inadequate management technology and skill. Even under this situation, at present timber industries consume around 1.56 m^3 of log for different usage annually.

5. Past and present Sri Lankan timber based Enterprises

The increased construction activities in Sri Lanka have created an increased demand for timber. With the conservation of natural forest for environmental reasons resulted in reduction of local supply of timber. The increased demand for timber has to be met through other means of imported timber or man-made forest. Statistics published by authorities does not reveal the real picture of supply source because part of timber supply still comes from illegal and unreported manner. This scenario is well explained by following study and its findings.

According to census report, Colombo and Gampaha lead the timber stock among the other districts by 23% and 19% respectively. Census timber stock comprise with Albizia (17%), Jak (9%), Coconut (8%), Rubber (7%), Ginisapu (6%), Lunumidella (6%), Mango (6%) and Teak, Eucalyptus and Alstonia each by 3%. The greatest majority of available log timber stock are of class 11(12%) and class 111(63%). The study reveals that out of available 89000 m3 of timber stock, 55% and 45% are forms of logs and sawn timber respectively. 32 dimensions of sawn wood are used widely for three most important purposes, namely manufacture of furniture (19%), door/window (38%) and roofing materials (42%). Larger portions of total supply of timber come from wet zone, which is needed to be treated with preservatives to improve its durability. For that, It is necessary to develop cost effective treating methods. Otherwise, added cost of preservation exceed the cost of good timber species available.

According to performance report of FD in 2018, reported forest offences are 3577 (court cases), which contains 1210.15 m^3, valued of Rs: 87,257,159.48. According to this report, FD has filed court cases comprising 801 illegal felling, 292 of illegal transport of timber, and 399 of unauthorized timber deport. These figures also carry emphasis on the magnitude of unseen side of timber Enterprise. Anuradhapura recorded the highest number of forest offinces, followed by Moneragala. According to Forest Department the registered number of timber-based enterprises have increased from 4208 in 1994 to 12, 734 in 2006 and it has continuously raised up to 25,909 in 2017. However, number of timber-based enterprises has increased 28,754 in 2018 by 10% comparatively to 2017 (see Table 14). The largest number of timber-based enterprise are remained in the Rathnapura, Kurunegala, Gampaha, Kandy and Kegalle districts. Carpentry shops are the most established enterprise.

It is time now to conduct another study of this nature to review available timber resources and pattern of timber utilization, which might have been changed during the recent decades. Because popularizing exotic timber species (Teak, Mahogany, Eucalyptus and Alastonia species), imported Malaysian timber species, existing demand for Rubber wood and other timber raw materials created by Medium Density Fiber board manufacturing are the key factors in Sri Lankan Wood industry.

Table 14: Total Number of Registered functioning Timber Based Enterprises as at 31.12.2018

Division/ District	Saw mills	Timber depots	Carpentry workshop	Mobile timber saw mill	Wooden furniture shop	Firewood shed	Timber seasoning & processing factory
Ampara	162	363	520	0	127	1	0
Anuradhapura	126	231	215	0	781	55	0
Badulla	53	109	332	56	336	78	0
Batticaloa	72	250	0	0	253	70	0
Galle	229	264	292	47	184	28	0
Gampaha	359	673	625	0	281	33	0
Hambantota	256	224	454	90	348	75	0
Kalutara	201	292	265	0	126	24	12
Kilinochchi	100	198	186	1	160	145	0
Kandy	364	481	607	10	387	72	0
Kegalle	377	354	448	108	285	52	0
Kurunegala	662	566	933	323	810	165	0
Matale	135	79	150	34	179	21	0
Matara	302	283	394	100	295	53	0
Mullaitivu	18	31	55	2	50	34	0
Moneragala	140	171	390	0	380	92	0
Mannar	5	35	15	0	10	4	0
Nuwara Eliya	14	74	104	0	77	9	0
Polonnaruwa	40	78	27	0	238	6	0
Puttlam	218	336	521	0	445	74	0
Ratnapura	136	165	3600	0	226	49	0
Trincomalee	9	0	65	0	17	1	0
Vavuniya	50	91	122	0	102	68	0
Jaffna	0	0	0	0	0	0	0
RDCF office Colombo	132	343	294	0	182	7	11
Total	**4160**	**5691**	**10614**	**771**	**6279**	**1216**	**23**

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6. Choices of timber used for various purposes

Timber resources in Sri Lanka will have to be used as efficiently as possible and every species, grade and quality should be used in such a manner their characteristics and properties are employed in the best way. The competent and efficient use of timber to manufacture wood-based products or sawn timber for construction depends on the selection of the best timber depending on

the task; there are two aspect to the choice of timber. One aspect is selection of the most appropriate species for the given set of environment and stress conditions; second aspect is to obtain the correct grade or selecting the appropriate specification for the wood of any one species. When selection of timber for a particular purpose, not only its technical performance but also its cost, size and availability should be concerned. The technical performance of a timber lie on its durability, movement, strength, stiffness and toughness, permeability, ease of processing and appearance. The importance of these properties varies with the task the timber has to perform.

Maximum utilization of Timber

As far as timber utilization is concerned, it is necessary to identify how and where valuable wood is wasted from the time a tree is felled in the forest until it is brought to a processing factory. The wasting of timber due to harvesting operation has to be minimized to get maximum expected yield from a tree. The logging waste vary with harvesting method, harvesting condition and nature of defect in the timber and so many other reasons. In Sri Lanka upcountry eucalyptus has higher logging waste (around 15%) than low land teak plantation (10%). Residues produced by various harvesting activities like cutting branch wood, tops, and trimmed ends at stump site needs to be absorbed for a suitable industries rather than using for fuel wood. Wastage of timber can be minimized by using proper machines and adopting new technology at each value addition process eg: saw milling and wood processing industry.

Green building concept

A ‘green’ building is a building that, in its design, construction or operation, reduces or eliminates adverse impacts, and can create positive impacts, on our climate and natural environment. Use of materials that are sustainable, is one of the qualities of green building. Thus, it can be suggested timber is the best material for green buildings. Why?

Timber requires the least energy, cost and effort for its processing. The process is environmental friendly. It may be surprised, how it would be? More details are discussed here.

Timber transportation is a less energy consuming operation; the weight of a cubic meter of timber is around 1000 kg, this can be more reduced by air seasoning. However, other material such as concrete shows approximately 2400 kg weight per cubic meter, thus higher weighted material needs more energy for transportation. Timber processing: initially sawmilling is environmental friendly comparatively. Because steel, plastic such material consume higher energy and their wastes are highly toxic. On the other hand, wastes of sawmilling such as saw dust and saw chips are degradable and they can be used for other products. Timber seasoning is less energy consuming operation, air seasoning does not cost for any energy while Klin seasoning can be operated by saw wastes. Dressing and moulding is environmental friendly, the waste (i.e. shavings) can be used for other industries such as mulch, land filling etc. nail planting, finger joints are the technical advancements to reduce wastage of small wood pieces while reconstituted products (i.e. particle board) are produced using flakes and other small wooden waste. Timber is reusable.

Timber is a carbon deposit rather than a carbon emitter, because unlike other construction materials, timber acts as a long-term carbon retention material. Carefully preserved wood retains its carbon; paper – 3 years, pallets – 10 years, furniture - 30 years and building material – 50 years.

Table 15. Embodied energy and carbon retention and emission of different construction materials

	Construction materials			
	Sawn timber	**Steel**	**Concrete**	**Aluminum**
Fossil fuel energy consumption (kg/MJ)	1.5	35	2	435
Carbon emission (kg/m^3)	15	5320	120	22000
Carbon retention (kg/m^3)	250	0	0	0

7. Timber seasoning and preservation

As discussed earlier, at present majority of timber supply in Sri Lanka consist of less durable timber which need to be properly handled to get maximum benefit out of them. The service life of timber can be prolonged by using proper seasoning techniques and adequate preservative treatment. This longer serviceable life would result in lesser quantity of timber needed to fill the deficit.

Timber seasoning

Timber is a hygroscopic material. It shrinks or swells with changes in the moisture content of the environment. The process of timber evenly drying under controlled conditions is referred to as seasoning. It could be mentioned that majority of timber marketed in this country is either unseasoned or partially seasoned. For this reason, it is advisable for the user to plan, say 3-4 months to ensure that the timber is seasoned for use and in a well dried state. Under local conditions depending on species and atmospheric conditions, the equilibrium moisture content will be anything from 12-18%. This equilibrium may be attained by easily drying timber in about 2 months for 1" plank. However, the period may be very much longer for dense timber such as Satin, Palu.

State Timber Corporation operates 6 Kiln seasoning plants of 110 m^3 capacity which are used to season the timber used for furniture manufacturing. A few furniture manufactures and timber dealers also own kilns but these operate mainly for their private use. It is somewhat difficult to prepare seasoning schedules to guide the user due to variation between species. It is quite evident that if the moisture content of the timber is kept below 20%, the timber become dimensionally stable, stronger and less prone to insect and fungi attack.

Wood preservation

The principal causes of deterioration of wood in service are fungal infection, termite and other insect or marine-borer attack, mechanical failure, and fire. The resistance of timber to these agents may be increased by applying suitable chemical preservatives. The selection of the most suitable chemicals and method of treatment is of the utmost importance. When selecting wood preservatives following properties are useful as a basis for comparison: Highly poisonous to fungi and insect, readily penetrating into wood, chemically stable, Easy to apply, cheap and readily available, Non- corrosive to iron, fire retardant. It is a common question asked by people "how is

durability of timber ". Durability of the particular species cannot be expressed meaningfully without knowledge of the situation in which the timber is going to be used. Many species of wood, which are not durable when exposed to weather, become perfectly durable when kept under shelter.

The popular preservative treatment in current use in Sri Lanka are pressure treatment with creosote, pressure treatment with copper chrome arsenate preservatives (CCA), diffusion treatment with boron or mixtures containing boron and low pressure treatment with light organic solvent preservatives (exposed building timber and joinery). CCA preservative was used to treat Transmission poles and sawn timber by STC until Import and use of CCA was prohibited recently. However, Copper Chrome Boron preservatives (CCB) has become popular in recent past. Creosote preservatives is a mixture of many organic compound obtained during the distillation of coal tar. Creosote has good penetrating quality, toxic or repellent to most wood destroying organism and protect wood from physical weathering. STC operates 3 creosote impregnation plants, capacity of each diameter 1.8 m x length 15m to treat Railway sleepers and Electric transmission poles for Railway Department and Electricity Board respectively. The most common diffusion treatment is boron because this needs minimum equipment and cost. In addition to mixture of boric acid and borax, fungicide to be added to control mould growth during diffusion especially when pine and rubber sawn timber are treated. Freshly sawn timber will have to be dipped in a bath of the correct chemical concentration.

The performance of treated timber vary with methods of treatment, type of preservatives, retention of preservatives, the species of wood, the climate and the condition of use. Therefore knowledge of timber preservation will have to develop in Sri Lankan situation and it is a long time felt need for a standard or regulatory body to control or monitor the use of preservatives.

8. Legal background of timber and timber related operations in Sri Lanka

According to the ownership, timber resources of Sri Lanka can be categorized as State and private. All state sector timber (except lands of few authorities) is harvested by State Timber Corporation. Timber of private lands has full authority to the owners, however, special permission are essential for felling and transportation for some species. As well as, special legal procedure has to be followed to obtain permission for timber related industries. Forest conservation ordinance is major act of Sri Lankan government to control the timber resources of Sri Lanka. Under this ordinance, special gazettes/ circular are issued to cover some circumstances related to timber.

Tree felling

Trees of state lands including forest plantations and leased lands are felled by State Timber Corporation under permission of a special authorized officer. Private land owners can harvest their own; however, a few tree species should be felled under special permission. **Felling of trees (control) act** has stated that *Artocarpus heterophyllus (kos), Artocarpus nobilis (gam del, rata del), gahaunu thal* should be felled under special permission of authorized officer: "Divisional Secretariat". Moreover, special permission of "Range Forest officers" is needed to fell other 14

timber species as “Limited timber”: *Chloroxylon swietenia* (Satin), *Vitex altissima* (Milla), *Berrya cordifolia* (Halmilla), *Diospyros ebenum* (Ebony), *Diospyros quaesita* (Calamander), *Manilkara hexandra* (Palu), *Azadirachta indica* (Neem), *Madhuca longifolia* (Mee), *Pterospermum suberifolium* (Welang), *Pleurostylia opposite* (Panakka), *Chukrasia tabularis* (Hulan Hik), *Pterocarpus marsupium* (Gammalu), *Albizia odoratissima* (Sooriyamara) and *Terminalia arjuna* (Kumbuk).

Some other acts are also influence to the timber related activities.

Timber Transportation

Special gazette no. 1548/29 dated 09.05.2008 and revised gazette no. 1762/1 dated 11/06/2012 state that the conditions of the timber transportation. Thus, following 30 timber species/items **do not need** special permit to transport island wide.

Table 16. Timber species/items, which do not need permit for transportation

Common name	Botanical name	Common name	Botanical name
1.Coconut	*Cocos nucifera*	16.Lunumidella	*Melia dubia*
2.Rubber	*Hevea brasiliensis*	17.Sabukku	*Grevillea robusta*
3.Puwak	*Areca catechu*	18.Rambutan	*Nephelium lappaceum*
4.Cashew	*Anacardium occidentale*	19.Ipil Ipil	*Leucaena leucocephala*
5.Planted Cinnamon	*Cinnamomum verum*	20.Kanda	*Macaranga peltata*
6.Kotambba	*Terminalia Catappa*	21.Wanasapu	*Cannaga odorata*
7.Gadumba	*Terma orientails*	22.Erabadu	*Erythrina variegata*
8.Gansuriya	*Thespesia populnea*	23.Kithul	*Caryota urens*
9.Pulun	*Ceiba pentandra*	24.Rukattana	*Cerbera odollam*
10.Planted Mango	*Mangifera indica*	25.Aligatapera	*Peresa americana*
11.Albeezia	*Albizia molucana*	22.Gon kaduru (Wel Kaduru)	*Alstonia scholaris*
12.Ambralla	*Spondias dulcis*	27.Plywood and its products	
13.Katu Imbul	*Bombax ceiba*	28.Cane products	
14.Gliricidia	*Gliricidia sepium*	29.Sawn timber of Ginisapu (*Michelia champaca*)	
15.Hawarinuga	*Alstonia macrophylla*	30.Imported Timber	

All other timber species are needed a valid permit for transportation; however the gazette describes several exceptional cases allows free transportation of some species in specific administrative units. As examples, Satin, Mahogany, Teak and Neem can be transported in Colombo district without a permit; Ginisapu (*Michelia champaca*) does not need transport permit in Kandy district; Transport permit for Toona (*Toddalia asiatica*) is compulsory in Kandy, Nuwara-Eliya, Badulla and Rathnapura districts. The permits should be requested from Divisional secretariat via Grama niladhari (Village officer). However, the permit is issued after the recommendation of Range Forest officer in the area.

According to the Special gazette No 1548/29 dated 09.05.2008 and revised gazette, No.1762/1 dated 11/06/2012, furniture of all kind of species **except** Ebony, Calamander, Sandalwood, Satin and Nadun is allowed for island wide transportation without a permit. The permit should be requested from Divisional Secretariat. Additionally, any wooden construction item such as doorframes, window frames, doors, windows etc should have a permit for transportation if the item is made out of timber species, which also need permission for transportation.

Timber exportation

According to the Forest Ordinance No. 23 of 1995: As per Sec 24 (1) P (chapter 451), Gazette notification No.1161/6 of 5/12/2000, the exportation of timber must require permission of Conservator General of Forests.

Timber based industries

Any timber-based industry should be registered under Forest Department and a permission is also compulsory to run the industry. This permission is issued only for valid period. Several conditions are considered before issuing the registration. Recommendation of Divisional Secretariat, Environmental protection certificate, any evidence for ownership of the location. The arial distance between the location and the nearest natural forest and forest plantation is critical for issuing the permission (see Table 17). Moreover, permission is essential for mobile sawmills, which can be used only within permitted area and they cannot be operated within 200 m from natural forest or forest plantation.

Table 17. Permitted aerial distances for timber based Business premises from forests

Timber based Business	**Areal distance (km) from forests**		
	Municipal Councils	Urban Councils	Pradeshiya Sabaha
Timber Saw mills	0.3	03	05
Timber sales centers	0.5	0.5	03
Mechanical carpentry sheds	0.5	0.5	02
Ordinary carpentry sheds	0.5	0.5	02
Furniture shops	The distance will not be considered		
Fuel Wood sales centers	0.5	0.5	0.5
Traditional carpentry sheds that have been registered in the National Crafts Council	0.5	0.5	01
Mechanical & Ordinary carpentry sheds located within the Divisional secretary's Divisions mentioned by Conservator General of forests	The distance will not be considered		
Timber based enterprises that sell only the imported timber	0.5	0.5	0.5
Timber based enterprises that use only the timber which can be transported without a permit in each district according to the Gazette notification of the Conservator General of forests	0.5	0.5	01
Timber based enterprises that use only Rubber , Albizia & Coconut timber	0.5	0.5	01

Timber storing

The Forest Ordinance's chapter VI: sentences 30-36 and Gazette notification No. 1380/30 of 18/02/2005 describe the legal background of timber storing in private place or another location. Thus, any person has to prove the ownership of such stored timber, otherwise the stock is considered as a state property. Nevertheless, 25 species are released for free storing without permission: species no. 01-23 in Table 12 and Goda kaduru (*Strychnos nuxvomica*) and Divi kaduru (*Pagiantha dicnotoma*).

9. Sri Lankan standards for timber and timber related products and operations

Sri Lanka standard institute has developed several standards for timber and timber related products and operations collaborating with several institutes such as State Timber Corporation, Forest Department of Sri Lanka, Universities, Private sector organizations, Food and Agriculture Organization (UN) etc. However, more standards should be developed on various timber related operation such as timber importation, CCB, Boron and other wood preservation etc.

Table 18: Sri Lankan standards for timber and timber related products and operations

Standards	Description
SLS EN 1995 Part 1-1	Eurocode 5 : Design of timber structures - General - Common rules and rules for buildings
SLS EN 1995 Part 1-2	Eurocode 5 : Design of timber structures - General -Structural fire design
SLS EN 1995 Part 2	Eurocode 5 : Design of timber structures - Bridges
SLS 1170 Part 1	Code of practice on identification, grading and marking of imported construction timber - Grading, marking, and guidance on usage
SLS 1170 Part 2	Code of practice on identification, grading and marking of imported construction timber - Nomenclature, identification, and general information
SLS 1170 Part 3	Code of practice on identification, grading and marking of imported construction timber - Properties
SLS 1170 Part 4	Code of practice on identification, grading and marking of imported construction timber - Documentation for grading
SLS 1109 Part 1	Timber preservation by means of copper/chrome/arsenic compositions - Treatment process
SLS 1109 Part 2	Timber preservation by means of copper/chrome/arsenic compositions - Test methods
SLS 1016	Coal tar creosote for use in timber preservation
SLS 859 Part 1-2	Preservative treatment of Coal tar creosote of wood poles for overhead power and telecommunication lines – Treatment process and Testing methods
SLS 1012	Copper/chromium/arsenic based timber preservatives
SLS 985 Part 1 -2-3	Grading of timber - Species of timber, Terminology, Grading of logs
SLS 891	Organic solvent type timber preservatives
SLS 836 Part 1	Methods of testing small clear specimens of timber - Sampling methods and physical tests
SLS 791	Methods of measurement of round wood timber and volume determination
SLS 763	Timber battens for plywood tea chests
SLS 263 Part 1 & Part 2	Building timber Recommendation on sizes - Specification for permissible defects
CS 159	Code of practice for seasoning of timber

Except these standards, some other standards and guidelines such as British (BS EN) standards, Malaysian standards (MS), IAWA list (timber identification) etc are used for different purposes.

10. Role of the State Timber Corporation to improve utilization of Timber in sustainable manner

STC plays a vital role to optimize the timber utilization of Sri Lanka through various kinds of activities as a government body. STC has sole legal authority for timber authentication in Sri Lanka under special gazette No. 1538/7: 2008.02.25 and Green Building Certificate process. Followings are the some activities of STC to maximize the timber utilization of the country.

1. Providing quality timber in different forms to fulfill the national demand to reduce importation of timber (i.e log form, seasoned, unseasoned, or preserved sawn timber, poles, railway sleepers, elephant poles etc.)
2. Engaging management of commercial forest plantations via thinning schedules
3. Under timber certification process, STC issues;
    a. Timber species identification reports
    b. Timber species verification reports
    c. Verification reports of wood preservation (CCB, Boron)
    d. Reports of moisture inspection of woods
    e. Inspection of mechanical and physical properties of timber
    f. Green building certification on timber
4. Conducting awareness programmes related timber technology for public, students and teachers. University students and other various institutes
5. Conducting training programmes on public to promote timber-based industries in scientific manner
6. Actively engages to solve constraints related to usage of timber in public and private sector
7. Actively collaborates to national level policy making on timber, forestry sector, environment
8. Conducting research studies on lesser-known timber species, timber identification, mechanical and physical properties of timber, wood preservation, plantation forestry, furniture manufacturing, forest and economy, timber and climate change etc.
9. Distribution of saplings of timber and other plant species to increase the country's tree cover and to maintain local wood sources

11. Some suggestions for development of timber industries in Sri Lanka

1. To introduce and promote the tree planting and addressing the current timber shortage in country. Eg: promoting tree species technically suitable for structural long length timber
2. Initiating national scale Programme to develop plantation forestry on timber
3. Conduct awareness programs and user guidelines for timber consumers on selecting right species and standard timber.
4. Product diversification to use lesser known timber species along with popular species as raw materials for sustaining the local timber industry;
5. Improved service life of timber and timber products through effective seasoning and chemical treatment.
6. Improve processing efficiency and production of competitive finished products through factory modernization and training of technical personnel.
7. Familiarization of timber products of Eco timber certification from a sustainably managed forest at the expense of the consumer.

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