

AT3 Materials Investigation

The design project is planned to be an indoor entertainment cabinet, *Figure 1*, constructed from materials that meet the strength and property requirements, and will give the cabinet a neutral tone timber finish. These materials will undergo testing to assess if they fit the requirements of this specific project, and the sustainability and ethics of the timbers will be investigated for their environmental, economic or social impacts.

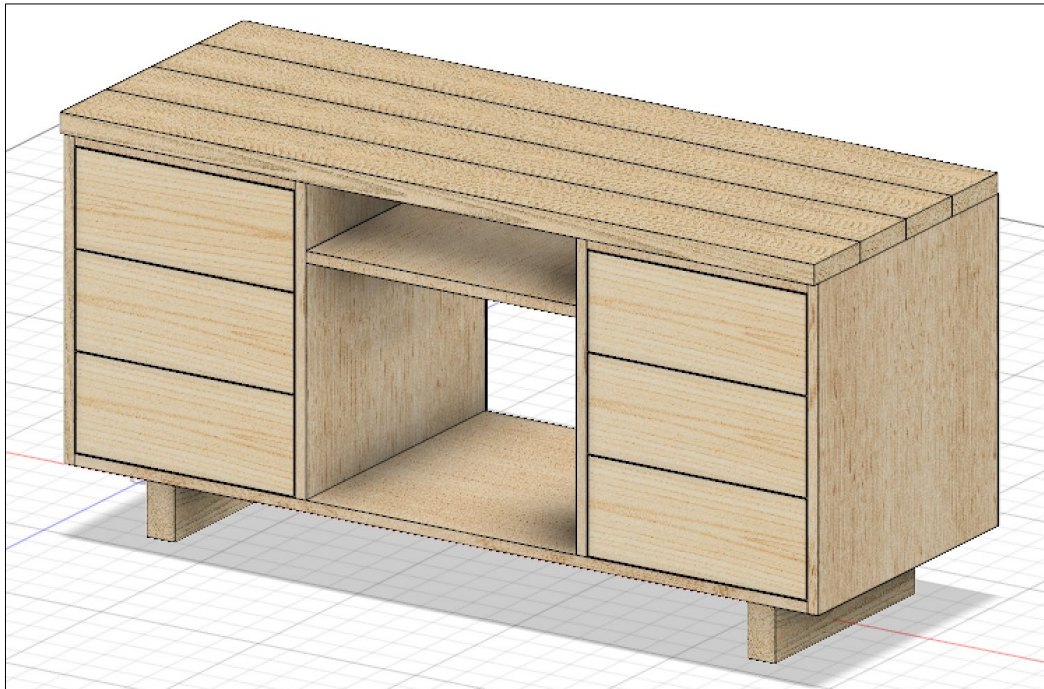


Figure 1 – Design Product: Indoor Entertainment Cabinet

The timbers explored in this investigation are materials to be used in the making of the cabinet. They are required to be materials that have the strength to support a screen as that is part of the cabinet's use. Victorian ash is planned to be used for the top and legs of the cabinet, and Victorian ash veneer particleboard is to be used for the carcass of the cabinet to match with the look. A differing coloured timber is intended to be used for the drawers inside the cabinet, radiata pine.

Veneer Particleboard:

^{1, 2}Particleboard, ³*Figure 2*, is a popular choice because it is generally more economical than solid timbers, provides an option for large panels not available in solid timbers and ⁴is widely available.



Figure 2

¹ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

² Processed Forest Products, 2020, The Environmental Sustainability of Timber Veneer, <https://www.forestproducts.com.au/the-environmental-sustainability-of-timber-veneer/>

³ Hipcouch, 2017, Blockboard VS Plywood - Which is better for your Furniture and Budget? <https://www.hipcouch.com/magazine/blockboard-vs-plywood-which-is-better-for-your-furniture-and-budget> [image]

⁴ Wood Solutions, 2020, Particleboard also known as Chipboard, <https://www.woodsolutions.com.au/wood-product-categories/particleboard>

⁵Normally in different batches of veneers, there isn't a consistent colour pattern, meaning there will be a colour difference between batches of veneers. ⁶Standard particleboard has a short lifespan because it damages quickly with moisture, for example, ⁷water if left on the veneer surface will stain, and veneer generally has less resistance to weight and scratches than thick wood and plywood. However, ⁸particleboard can be found with size variety and a range of hardness's and durability properties.

Victorian Ash:

Victorian ash is a ⁹highly valuable hardwood, ¹⁰consisting of two species, *Eucalyptus delegatensis* and *Eucalyptus regnans*, which can also be ¹¹referred to Victorian or alpine ash and goes ¹²under the names of Tasmanian oak or Victorian ash. It is a ¹³readily available timber in Australia as it ¹⁴naturally grows in Victoria, Tasmania and NSW and is grown in plantations in New Zealand. A photo of a Victorian ash tree is shown in ¹⁵Figure 3. It is suitable to be used for ^{16, 17}indoor furniture as it has low to moderate durability which ¹⁸isn't considered enough for outdoor use. The ¹⁹heartwood can have a slight pink colour and a light brown colour which isn't too noticeably different to the sapwood. ²⁰It has very good workability, can be used in a wide



Figure 3

⁵ Laminex, 2015, Laminex Finished Designed Timber Veneers, <https://asset-api-dynamic.localsearch.cloud/2E/GRCL/ED8FB573184A4E76808C9CF746F7312E.pdf>

⁶ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

⁷ Laminex, 2015, Laminex Finished Designed Timber Veneers, <https://asset-api-dynamic.localsearch.cloud/2E/GRCL/ED8FB573184A4E76808C9CF746F7312E.pdf>

⁸ Laminex, 2015, Laminex Finished Designed Timber Veneers, <https://asset-api-dynamic.localsearch.cloud/2E/GRCL/ED8FB573184A4E76808C9CF746F7312E.pdf>

⁹ Dargavel, J., 2005, Forestry: Starting state forestry, <https://www.foresthistory.org.au/AuNZForestHistSeries/anzfh1entire.pdf>

¹⁰ Lust, J., 2014, The Herb Book, https://www.rainforestinfo.org.au/good_wood/oz_pln.htm

¹¹ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

¹² Attiwill, P., 2002, Australian Forest Profiles, https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/publishingimages/forest%20profile%201993-2002/Ash_forests_southeast_Australia_2002.pdf

¹³ Mortlock Timber, n.d., Victorian Ash, <https://www.mortlock.com.au/wp-content/uploads/2014/05/Species-Data-Sheet-Victorian-Ash.pdf>

¹⁴ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

¹⁵ Nurseries Online, 2020, *Eucalyptus regnans*, <https://www.nurseriesonline.com.au/plant-index/australian-native-plants/eucalyptus-regnans/> [image]

¹⁶ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

¹⁷ Kennedy's Timbers, n.d., Victorian Ash, <https://www.kennedystimbers.com.au/wp-content/uploads/2018/05/26.-Kennedys-24th-April-Victorian-Ash.pdf>

¹⁸ Austim, n.d., Victorian Ash: Product Selector, <https://static1.squarespace.com/static/54d95c4ce4b0b3595f748f29/t/5ab1b04c0e2e72b5fe1e8fc6/1521594460562/Vic+Ash+Product+Selector.pdf>

¹⁹ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

²⁰ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

range of different ways and sands, planes, glues and finishes well. ^{21, 22}It has a coarse texture but an even and straight grain.

Radiata Pine:

²³Radiata pine, *Pinus radiata*, is a fast-growing, ²⁴versatile, and medium-density softwood which is grown in Australia in plantations which are cleared in harvest time. ²⁵It is a reasonably priced material compared to the other similar options, is readily available, and ²⁶suitable for a wide range of uses. ²⁷The material has an even texture, ²⁸light brown or ²⁹yellow colouring, which can be seen in ³⁰Figure 4, and is easy to machine and paint.



Figure 4

Mahogany:

³¹Mahogany is a species of hardwood ³²suitable to be used in furniture and is known for its ³³flexibility and hardness properties. It can ³⁴deal well under tension, is resistant against dents and scratches and has a level of flexibility, meaning it can bend to an extent without splintering or shattering like more

²¹ Kennedy's Timbers, n.d., Victorian Ash, <https://www.kennedystimbers.com.au/wp-content/uploads/2018/05/26.-Kennedys-24th-April-Victorian-Ash.pdf>

²² Sculptform, 2017, Vic Ash, https://cdn.sculptform.com.au/app/uploads/2018/09/03163110/Sculptform_Vic-Ash-Data-Sheet.pdf

²³ Lust, J., 2014, The Herb Book: Australian Grown Plantation Timber Species, https://www.rainforestinfo.org.au/good_wood/oz_pln.htm

²⁴ Mead, D., 2013, Sustainable management of *Pinus radiata* plantations, <http://www.fao.org/3/i3274e/i3274e01.pdf>

²⁵ Lust, J., 2014, The Herb Book: Australian Grown Plantation Timber Species, https://www.rainforestinfo.org.au/good_wood/oz_pln.htm

²⁶ Mead, D., 2013, Sustainable management of *Pinus radiata* plantations, <http://www.fao.org/3/i3274e/i3274e01.pdf>

²⁷ Mead, D., 2013, Sustainable management of *Pinus radiata* plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

²⁸ NZ Wood, n.d., Information Sheet: Radiata Pine, <http://www.nzwood.co.nz/wp-content/uploads/2013/07/RadiataPinefactsheet.pdf>

²⁹ Paradise Timbers, n.d, Radiata Pine, <https://www.paradise-timbers.com.au/wordpress/wp-content/uploads/2017/10/Radiata-Pine.pdf>

³⁰ Alibaba, 2020, Radiata Pine Lumber, https://www.alibaba.com/product-detail/radiata-pine-lumber_139544293.html [image]

³¹ Wood Solutions, 2020, Mahogany, Red, <https://www.woodsolutions.com.au/wood-species/mahogany-red>

³² Bolza, K., n.d., Characteristics, Properties, And Uses Of Timbers [pdf]

³³ Isiaka Oluwole Oladele, Joseph Ajibade Omotoyinbo, And Mayowa Pius Borisade, n.d., Mechanical Properties of Mahogany (*Swietenia Macrophylla*) and Araba (*Ceiba Pentandra*) Dusts Reinforced Polyester Composites [online]

³⁴ Isiaka Oluwole Oladele, Joseph Ajibade Omotoyinbo, And Mayowa Pius Borisade, n.d., Mechanical Properties of Mahogany (*Swietenia Macrophylla*) and Araba (*Ceiba Pentandra*) Dusts Reinforced Polyester Composites [online]

brittle hardwoods. It is a ³⁵high-density wood with a ³⁶sustained durability, due to its ³⁷tight, straight grain pattern and minimal soft grain, however, the ³⁸density of mahogany varies depending on its source. For example, ³⁹a study shows an 8.5-year-old mahogany tree grown in a plantation has 70% of the density of naturally grown mahogany timber.

It is also ⁴⁰resists swelling and warping over time so can be used in areas with excess moisture, unlike veneer particleboard, which is explored in the next section.

Testing

Moisture durability of veneer particleboard and solid Victorian ash:

The edges of an offcut of veneer particleboard and solid Victorian ash were placed in a tub filled with water inside to expose the ends of the material in moisture. The below image shows the materials shortly after being placed in the tub (veneer particleboard [left] and Victorian ash [right]). The veneer particleboard can already be seen absorbing the water.



³⁵ H.E. Desch, J.M. Dinwoodie, Building Research Establishment, 1996, Timber Structure, Properties, Conversion and Use [book]

<https://books.google.com.au/books?id=HjldDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false>

³⁶ Leatherman, L., 2020, What Are the Characteristics of Mahogany Wood?

<https://www.hunker.com/13429056/what-are-the-characteristics-of-mahogany-wood>

³⁷ Shaddy, W., n.d., Properties and Characteristics of Mahogany Timber,

<https://homeguides.sfgate.com/properties-characteristics-mahogany-timber-99593.html>

³⁸ Wood Solutions, 2020, Mahogany, Red, <https://www.woodsolutions.com.au/wood-species/mahogany-red>

³⁹ Wood Solutions, 2020, Mahogany, Red, <https://www.woodsolutions.com.au/wood-species/mahogany-red>

⁴⁰ Leatherman, L., 2020, What Are the Characteristics of Mahogany Wood?

<https://www.hunker.com/13429056/what-are-the-characteristics-of-mahogany-wood>

The front view in the image below shows the moisture absorption lines on the veneer face the particleboard [left] and the edge of the Victorian ash timber [right] after three days of moisture exposure. The Victorian ash shows a minor absorption reaction to the moisture with a slight increase width.



A side view of the materials, in the image below, shows the face of the Victorian ash [right] having low absorption lines and the particleboard [left] having absorbed a large amount of moisture causing the material to expand and disform. This could be an issue in the design product if the top and legs of the cabinet were constructed of particleboard, since moisture exposure, such as liquid spills, could easily cause the particleboard to deform. This leads to the conclusion if deciding between veneer particleboard and solid Victorian ash for the top and legs of the cabinet, the solid Victorian ash would be the best choice as it has a better response to liquid exposure than particleboard.



Sustainability and Ethical Issues Exploration

Veneer Particleboard:

^{41, 42}Particleboard is created from recycled sawmill wood-fibre waste from cut wood, therefore it has a ⁴³low footprint because there is ⁴⁴no waste when particleboard is manufactured, and no logging is required.⁴⁵ However, the manufacturing of the resins to hold the fibres together and panels requires ⁴⁶excess energy and involves the use of many chemicals. ⁴⁷It is difficult to recycle particleboard that use formaldehyde glues and paints, ⁴⁸which they typically do, into new products ⁴⁹because it damages easily and cannot be planed or cut without exposing the chips. ⁵⁰However, a solution has been found to recycle particleboard back into little chips and particles to create new panels of particleboard. ⁵¹Now new particleboards consist of around 83% fully recycled material, 74% post-industrial material from sawmill waste, saw dust and wood chips, and 9% post-consumer wood waste material. This material is an overall sustainable and ethical choice as it focuses on recycling materials so less extraction is required and provides jobs to manufacture the material.



Figure 4: 'Near Fernshaw' by Louis Buvelot in 1873

Victorian Ash:

⁵²Victorian ash trees are part of the tall straight trees in the ⁵³south eastern regions of

⁴¹ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

⁴² Shaddy, W., The Advantages and Disadvantages of Particle Board, <https://homeguides.sfgate.com/advantages-disadvantages-particle-board-99421.html>

⁴³ Processed Forest Products, 2020, The Environmental Sustainability of Timber Veneer, <https://www.forestproducts.com.au/the-environmental-sustainability-of-timber-veneer/>

⁴⁴ Shaddy, W., The Advantages and Disadvantages of Particle Board, <https://homeguides.sfgate.com/advantages-disadvantages-particle-board-99421.html>

⁴⁵ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

⁴⁶ Abu-Zarifa, A., Abu-Shammala, M., Al-Sheikh, A., 2018, Sustainable Manufacturing of Particleboards from Sawdust and Agricultural Waste Mixed with Recycled Plastics, <http://article.sapub.org/10.5923.j.ajee.20180805.02.html>

⁴⁷ Planet Ark, 2018, Why Recycle, <https://businessrecycling.com.au/recycle/particleboard>

⁴⁸ Ecoset Technology, 2010, A step change in sustainability for wood based panels, <http://www.ecosetechnology.com/en/wood-panels-sustainability>

⁴⁹ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

⁵⁰ Planet Ark, 2018, Why Recycle, <https://businessrecycling.com.au/recycle/particleboard>

⁵¹ Planet Ark, 2018, Why Recycle, <https://businessrecycling.com.au/recycle/particleboard>

⁵² Moore, G., 2018, Victorian ash has a regal presence: the tallest flowering plant in the world, CSIRO, <https://theconversation.com/Victorian-ash-has-a-regal-presence-the-tallest-flowering-plant-in-the-world-96021>

⁵³ Attiwill, P., 2002, Australian Forest Profiles, [https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/publishingimages/forest%20profile%201993-2002/Ash forests southeast Australia 2002.pdf](https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/publishingimages/forest%20profile%201993-2002/Ash%20forests%20southeast%20Australia%202002.pdf)

Australia⁵⁴ known by Indigenous Australians for a long time. ⁵⁵Ash forests also have significant cultural values in Australia with the large old trees in the forests being featured in historic and contemporary artworks, ⁵⁶Figure 4.

⁵⁷Ash trees grow extremely fast meaning they can match the supply demand and ⁵⁸even though they count for less than 10% of Australia's total open forest, they are high in value for their water catchments, fauna and flora conservation, and timber production. ⁵⁹Eucalyptus regnans forests are the most carbon-dense forests on Earth as they store massive amounts of carbon, ⁶⁰especially if the forests haven't been disturbed by logging operations. This is because ⁶¹past and present logging operations have caused a major decrease in the number of large old Victorian ash trees which ⁶²store a high percentage of the carbon biomass of the forests. Old ash trees have many important features where they ⁶³provide habitat for reptiles and plants, and several species of mammals and birds, ⁶⁴including endangered animals and their ⁶⁵much higher reproduction abilities than younger trees. ⁶⁶Even though the large old trees aren't usually cut down during loggings, many of them have been destroyed by high intensity burns lit to regenerate forests after logging. ⁶⁷Between 2004 and 2011, almost 25% of the large old living ash trees died, while being in areas that weren't burned by the 2009 fires. ⁶⁸Also, logging trees before they become large old trees destroys the cycle and reduces the amount of Victorian ash trees that reach that age and can cater to animals and other species that depend on it for habitat. ⁶⁹The large old Victorian ash trees need protection because they take

⁵⁴ Moore, G., 2018, Victorian ash has a regal presence: the tallest flowering plant in the world, CSIRO, <https://theconversation.com/Victorian-ash-has-a-regal-presence-the-tallest-flowering-plant-in-the-world-96021>

⁵⁵ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁵⁶ Buvelot, L., 1873, Near Fernshaw [image]

⁵⁷ Moore, G., 2018, Victorian ash has a regal presence: the tallest flowering plant in the world, CSIRO, <https://theconversation.com/Victorian-ash-has-a-regal-presence-the-tallest-flowering-plant-in-the-world-96021>

⁵⁸ Attiwill, P., 2002, Australian Forest Profiles, https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/publishingimages/forest%20profile%201993-2002/Ash_forests_southeast_Australia_2002.pdf

⁵⁹ VicForests, 2018, Sustainability Report, <https://www.vicforests.com.au/static/uploads/files/vf-sustainability-report-final-wfwzsfzntcyz-wfyegoqtohi.pdf>

⁶⁰ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶¹ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶² Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶³ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁴ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁵ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁶ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁷ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁸ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

⁶⁹ Lindenmayer, D., 2016, The Importance of Managing and Conserving Large Old Trees: A Case Study from Victorian Victorian Ash Forests, <https://www.publish.csiro.au/rs/pdf/rs16006>

centuries to replace and ⁷⁰since European settlement, Australia has lost 22% of Victorian ash forests and the unregulated early timber industry suggests the number of Victorian ash trees declined significantly.

Despite the presence of unsustainable production of Victorian ash timber, ⁷¹it can be found by suppliers from sustainable sources in Australia and is available from ⁷²PEFC (Programme for the Endorsement of Forest Certification) and ⁷³AFS (Australian Forestry Standard) certified forests. Research of the Victorian ash timber, to be used in the design product construction, will be necessary to ensure it is sourced from a sustainable and ethical supplier.

Mahogany:

⁷⁴The supply of high-quality mahogany from plantation forests is significantly decreasing, potentially caused by ⁷⁵current management practices where mahogany often regenerates poorly after logging operations. The trade of mahogany is ⁷⁶predominantly from primary forests which has led to supply declines putting pressure to extract mahogany illegally from National Parks and lands reserved for indigenous people, which is a common practice. This has led to ⁷⁷two of the three mahogany species being listed as an endangered species.

⁷⁸A substantial amount of African mahogany has been produced in the plantings from the late 1960s and early 1970s in northern Australia which has led to a flood of interest about this species. ⁷⁹The first introduction in the late 1960s and early 1970s was unsustainable so a second phase became in northern Australia in 2001 focusing on conservation and tree improvement, however, ⁸⁰sustainable plantation

⁷⁰ Taylor, A., 2013, Australia's tallest trees, <https://www.australiangeographic.com.au/topics/science-environment/2013/02/australias-tallest-trees/>

⁷¹ Victorian Association of Forest Industries, 2014, Submission to the Rural and Regional Committee's Inquiry into the opportunities for increasing exports of goods and services from regional Victoria, <https://www.parliament.vic.gov.au/images/stories/committees/rrc/IEGS/Subs/045.20140505.VAFI.pdf>

⁷² Austim, n.d., Victorian Ash: Product Selector, <https://static1.squarespace.com/static/54d95c4ce4b0b3595f748f29/t/5ab1b04c0e2e72b5fe1e8fc6/1521594460562/Vic+Ash+Product+Selector.pdf>

⁷³ Mortlock Timber, n.d., Victorian Ash, <https://www.mortlock.com.au/wp-content/uploads/2014/05/Species-Data-Sheet-Victorian-Ash.pdf>

⁷⁴ Tomy Listyanto, Ganis Lukmandaru, Chandra Pramadya, Dwi Siswanto, and Nobuaki Hattori, Wood Research Journal, 2010, Relationship between Wood Properties and Developed Drying Schedule of Inferior Teak (*Tectona grandis* L.F) and Mahogany (*Swietenia macrophylla* King), <http://ejournalmapeki.org/index.php/wri/article/view/170/166>

⁷⁵ Rodan, B., Newton, A., Verissimo, A., 1992, Mahogany Conservation: Status and Policy Initiatives, <https://doi.org/10.1017/S0376892900031453>

⁷⁶ Rodan, B., Newton, A., Verissimo, A., 1992, Mahogany Conservation: Status and Policy Initiatives, <https://doi.org/10.1017/S0376892900031453>

⁷⁷ Rodan, B., Newton, A., Verissimo, A., 1992, Mahogany Conservation: Status and Policy Initiatives, <https://doi.org/10.1017/S0376892900031453>

⁷⁸ Nikles, D., Bevege, D., Dickinson, G., Griffiths, M., Reilly, D., Lee, D., 2008, Developing African mahogany (*Khaya senegalensis*) germplasm and its management for a sustainable forest plantation industry in northern Australia: progress and needs, <https://www.tandfonline.com/doi/abs/10.1080/00049158.2008.10676269>

⁷⁹ Nikles, D., Bevege, D., Dickinson, G., Griffiths, M., Reilly, D., Lee, D., 2008, Developing African mahogany (*Khaya senegalensis*) germplasm and its management for a sustainable forest plantation industry in northern Australia: progress and needs, <https://www.tandfonline.com/doi/abs/10.1080/00049158.2008.10676269>

⁸⁰ Nikles, D., Bevege, D., Dickinson, G., Griffiths, M., Reilly, D., Lee, D., 2008, Developing African mahogany (*Khaya senegalensis*) germplasm and its management for a sustainable forest plantation industry in northern Australia: progress and needs, <https://www.tandfonline.com/doi/abs/10.1080/00049158.2008.10676269>

development requires a very strategic approach and extra funding, meaning it is extremely difficult to find a sustainable and ethical supplier of mahogany timber at a moderate budget price.

Radiata Pine:

⁸¹Radiata pine plantations don't assist in protecting and conserving Australia's native flora and fauna, in the sense that ⁸²it is a very nutrient demanding species, however, it is the most common general-purpose timber in the Australian market and the world's most extensively planted exotic softwood. ⁸³In South Australia, there is about 128,400 hectares of softwood plantation forest, mostly radiata pine. ⁸⁴However, dating back to the late 1960's, concerns were risen about negative impacts of radiata pine plantations from the clearing of native forests for them. ⁸⁵Research of the radiata pine plantations showed they supported the habitat of less bird species than native eucalypt forests, however, having a fast growing tree species readily available prevents the demand for other tree species to be harvested that are native and important habitats for other species.

⁸⁶Issues with radiata pine plantations include landscaping, unwanted self-spread of the pine trees, reduction of water flow into streams, ⁸⁷soil degradation and ⁸⁸changes or impacts to existing local communities. ⁸⁹There is a current focus on determining whether the plantations are biologically, economically and socially sustainable. However, there is a ⁹⁰bias in the amount of studies of radiata pine since it is a dominant tree species in the Australian timber plantation industry, and ⁹¹communities are all confident the radiata pine plantations and products are renewable, environmentally friendly and energy efficient. ⁹²Per thousand hectares of radiata pine plantation there are about thirty jobs, and many more outside the plantations meaning the

⁸¹ Lust, J., 2014, The Herb Book: Australian Grown Plantation Timber Species, https://www.rainforestinfo.org.au/good_wood/oz_pln.htm

⁸² Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

⁸³ Government of South Australia, n.d., Forestry in South Australia, https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/documents/Forestry_in_SA_brochure.pdf

⁸⁴ Lindenmayer, D., Hobbs, R., 2007, Fauna conservation in Australian plantation forests, <https://www.agrifutures.com.au/wp-content/uploads/publications/05-128.pdf>

⁸⁵ Lindenmayer, D., Hobbs, R., 2007, Fauna conservation in Australian plantation forests, <https://www.agrifutures.com.au/wp-content/uploads/publications/05-128.pdf>

⁸⁶ Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

⁸⁷ O'Loughlin, C., 1995, The sustainability paradox - an examination of The Plantation Effect - a review of the environmental effects of plantation forestry in New Zealand, N.Z. Forestry, http://www.nzif.org.nz/free_issues/NZJF39_4_1995/8A2968E4-7B20-4A62-9E4A-D6625A35C26D.pdf

⁸⁸ Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

⁸⁹ Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

⁹⁰ Lindenmayer, D., Hobbs, R., 2007, Fauna conservation in Australian plantation forests, <https://www.agrifutures.com.au/wp-content/uploads/publications/05-128.pdf>

⁹¹ Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

⁹² Mead, D., 2013, Sustainable management of Pinus radiata plantations, <http://www.fao.org/3/i3274e/i3274e12.pdf>

Conclusion

The material to be used for the drawers is Radiata pine because of its ⁹³light brown to yellow colouring, ⁹⁴wide availability and general affordability which will assist in keeping within a reasonable budget for the design project.

The cabinet carcass is to be constructed of veneer particleboard with a Victorian ash finish because of its ⁹⁵light brown to pink colouring which will be a contrast to the ⁹⁶light brown to yellow colouring of the Radiata pine drawers. Veneer particleboard is a sustainable choice of a material to be used in the design product as it is ^{97, 98}composed of recycled materials, ⁹⁹minimizing the environmental impact of the material.

The top and legs of the cabinet are to be constructed of solid Victorian ash timber because of its ^{100, 101}durability over veneer particleboard and the ^{102, 103}solid timber features.

⁹³ Paradise Timbers, n.d, Radiata Pine, <https://www.paradise-timbers.com.au/wordpress/wp-content/uploads/2017/10/Radiata-Pine.pdf>

⁹⁴ Lust, J., 2014, The Herb Book: Australian Grown Plantation Timber Species, https://www.rainforestinfo.org.au/good_wood/oz_pln.htm

⁹⁵ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

⁹⁶ Paradise Timbers, n.d, Radiata Pine, <https://www.paradise-timbers.com.au/wordpress/wp-content/uploads/2017/10/Radiata-Pine.pdf>

⁹⁷ The Upstyle: Wood Guide, Particle board, <https://www.woodguide.org/guide/particle-board/>

⁹⁸ Shaddy, W., The Advantages and Disadvantages of Particle Board, <https://homeguides.sfgate.com/advantages-disadvantages-particle-board-99421.html>

⁹⁹ Processed Forest Products, 2020, The Environmental Sustainability of Timber Veneer, <https://www.forestproducts.com.au/the-environmental-sustainability-of-timber-veneer/>

¹⁰⁰ Bayswood Timber, n.d., Victorian Ash, <https://www.bayswoodtimber.com.au/files/VicAsh.pdf>

¹⁰¹ Kennedy's Timbers, n.d., Victorian Ash, <https://www.kennedystimbers.com.au/wp-content/uploads/2018/05/26.-Kennedys-24th-April-Victorian-Ash.pdf>

¹⁰² Kennedy's Timbers, n.d., Victorian Ash, <https://www.kennedystimbers.com.au/wp-content/uploads/2018/05/26.-Kennedys-24th-April-Victorian-Ash.pdf>

¹⁰³ Sculptform, 2017, Vic Ash, https://cdn.sculptform.com.au/app/uploads/2018/09/03163110/Sculptform_Vic-Ash-Data-Sheet.pdf

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