CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Seventy-eighth meeting of the Standing Committee
Geneva (Switzerland), 3-8 February 2025

Dalbergia melanoxylon (African Blackwood): A Critical Resource for Musical Instruments

1. This document has been submitted by France* on behalf of a group of musician and musical instrument stakeholders in relation to agenda item 34.3. This document does not represent the official position of the French authorities, which will be communicated at a later date.

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Information Document for the CITES Standing Committee

(78th Meeting, Geneva, 3-8 February 2025)

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A Critical Resource for Musical Instruments

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- League of American Orchestras
- Madinter
- National Association of Music Merchants (NAMM)
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- Pearle*-Live Performance Europe
- Taylors Guitars
- Yamaha Corporation

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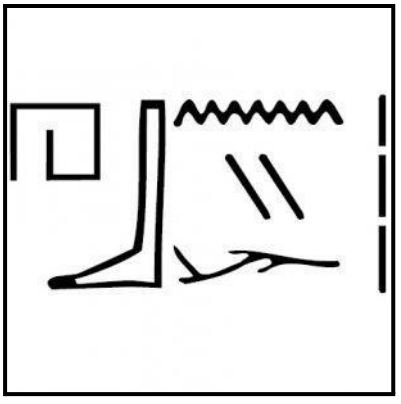
1. Historical and Cultural Importance

Dalbergia melanoxylon, commonly known as African blackwood, Grenadilla, Mozambique ebony, Mpingo or Pau preto, has held immense cultural and economic significance for over 5,000 years. In Ancient Egypt, it was prized for its use in exquisite furnitures, funerary objects, and even construction materials. The term "*ebony*", derived from the Egyptian word "*hbny*", originally referred to this dark, dense wood, reflecting its enduring value.

Since the 1500's, African blackwood has become a highly sought-after material in Europe. Its durability and aesthetic appeal made it essential for crafting royal furniture and artistic creations. By the 18th and 19th centuries, this unique wood established itself as a cornerstone in the evolution of woodwind instruments, replacing European boxwood due to its superior properties【reference 1】.

Figure 1: Historical uses of African blackwood (from left to right): Egyptian Hieroglyphic script for the word hbny' or Ebony, funerary figure buried in the tomb of Pharaoh Amenhotep III (1360 BC), The Pope Sixtus V of Rome's Cabinet (1585)



2. Importance for the Woodwind Instrument Industry

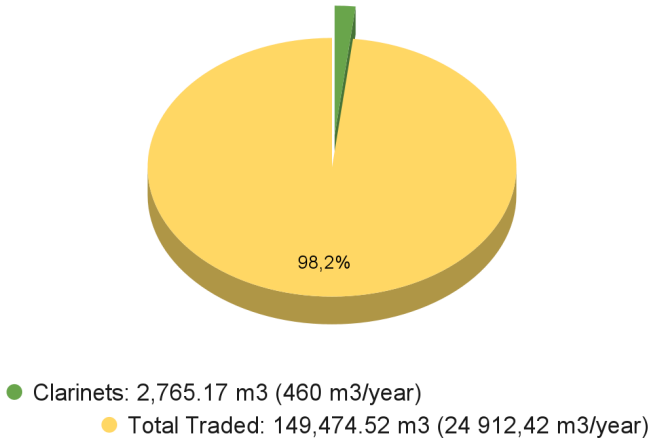
African blackwood possesses unique physical and acoustic properties that make it crucial for professional woodwind instruments such as clarinets, oboes, and flutes. With a density of 1,250 kg/m³ at 12% humidity, it offers unmatched dimensional stability, resistance to warping, and a tonal quality essential for high-quality musical performance.

The evolution of the clarinet highlights the importance of this material. Derived from the chalumeau[1], the clarinet underwent significant transformations to meet the needs of composers and orchestras, starting with the two-key version developed by Johann Christoph Denner[2] in 1690 until the modern clarinet with 17 keys and 6 rings in 1844. From a technical standpoint, these transformations required a material able to withstand the increasing complexity and weight of the instrument's keywork. European boxwood, previously used to produce woodwind instruments, proved inadequate due to its tendency to warp and its limited durability, making African blackwood the preferred choice for stability and performance.

While it is true that entry-level woodwind instruments can be made from plastics (*Acrylonitrile butadiene styrene*, ABS), these are typically designed for students and lack the tonal richness and durability of those crafted from African blackwood. Professional-grade instruments continue to rely on this exceptional wood for its unparalleled properties. More detailed information on woods used and woodwind musical instruments are described in annex 1.

The woodwind industry's consumption of this species is stable over the years. The worldwide production of clarinets[3] is roughly estimated at 250,000 units per year. This quantity corresponds to 460 m³. But, if we include in the calculation a 20% ratio to take into account the scraps inherent to the manufacturing process, the amount of wood that is required to produce these 250 000 clarinets is roughly equivalent to 553 m³ of sawn wood per year. Figure 2 below shows that the production of woodwind instruments represents more or less **2%** of the global trade in *Dalbergia melanoxylon*, highlighting the minimal relative part of the music industry compared to sectors like furniture manufacturing. The explanation of these calculations is described in annex 2.

Figure 2: Comparison of Clarinets and Dalbergia melanoxylon usage (2017-2022)【reference 2】

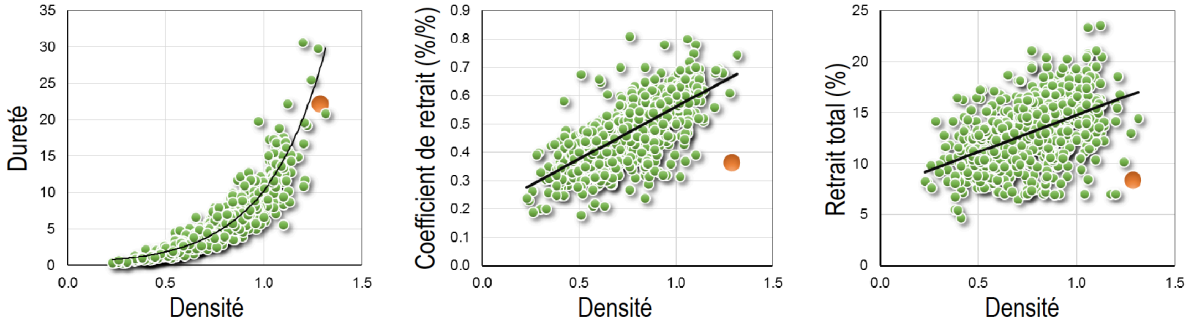


[1] The chalumeau is a very rudimentary woodwind instrument. It has 8 or 9 holes, and it is made up of a body without a bell.
[2] Johann Christoph Denner (1655-1707) was a German maker of musical instruments. He is known as the inventor of the clarinet.
[3] *Clarinets represent roughly 90% of the quantity of woodwind instruments using Dalbergia melanoxylon.*

When selecting suitable wood species for woodwind instruments, workability is the primary consideration. Elastic and damping properties are secondary, as the tube wall's impedance is much higher than that of the air column. Ideal woods should be dense, have a compact structure, straight grain, and excellent dimensional stability, resisting splitting and warping due to moisture changes. They must also support keywork posts without cracking. A smooth interior surface is also crucial, as it affects air column losses【reference 3】.

As shown in figure 3, *Dalbergia melanoxylon* has a high density and hardness able to withstand the keywork and a very good machinability and excellent surface finish. Usually, dense woods have bigger shrinkage and swelling, but this is not true in the case of *Dalbergia melanoxylon.*

Figure 3: Comparison of material densities and stability (African blackwood orange spot vs. 1000 tropical species), source CIRAD database



3. *Dalbergia melanoxylon* and CITES

The trade and conservation of *Dalbergia melanoxylon* have raised international attention in the CITES framework as early as 1994. Efforts to regulate the trade in this species began indeed at the 9th Meeting of the Conference of the Parties (CoP9, Fort Lauderdale, November 1994), when Kenya and Germany proposed its inclusion in the Appendix II of CITES. However, this proposal was withdrawn due to insufficient data and a lack of consensus among affected countries.

The alarming rate of exploitation of a number of Dalbergia species prompted CITES, on the occasion of CoP17 (Johannesburg, 2016), to list all species in this genus in Appendix II of the Convention[4], with annotation #15[5]. The initial text of this annotation made permits compulsory for the international trade in all finished and unfinished products made totally or partially of these species, including musical instruments, which created significant administrative challenges for the music industry. As a result, the trade in finished musical instruments and their accessories has been severely disrupted because of difficulties in obtaining the required permits from the CITES Management Authorities and practical

[4] With the exception of the Brazilian rosewood, *Dalbergia nigra*, which was listed in Appendix I of the Convention since 1992.

[5] Annotation #15 (rev CoP18) applies to the taxa *Dalbergia* spp (except for the species included in Appendix I) and to 3 species of Guibourtia: *G. demeusei*; *G. pellegriniana*; *G. tessmannii.* This annotation reads as follows:

All parts and derivatives, except:

a) Leaves, flowers, pollen, fruits, and seeds;

b) Finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment;

c) Finished musical instruments, finished musical instrument parts and finished musical instrument accessories;

d) Parts and derivatives of Dalbergia cochinchinensis, which are covered by Annotation # 4; and

e) Parts and derivatives of Dalbergia spp. originating and exported from Mexico, which are covered by Annotation # 6.

compliance issues as all these documents must be endorsed at borders by the customs, leading to widespread delays and increased costs.

Three years later, taking due consideration of these problems, CoP18 (2019) agreed to amend annotation #15 in order to exempt finished musical instruments, parts, and accessories from stringent export regulations. This adjustment was a pivotal step in solving part of the problems created for the trade by the 2016 decision, while maintaining strict controls over the material, either in its raw or semi-finished forms. This exemption was based on the minimal ecological footprint of the music industry and was very much welcome by the latter. As organisations representing woodwind instrument makers, we felt comforted in our willingness to develop our involvement in the long-term conservation and sustainability of the species we use, a move that we already started in 2017.

In 2023, *Dalbergia melanoxylon* from Mozambique and Tanzania was included in the *Significant Trade Review* (RST), a complex process that requires the collection of many data, several of which have never been recorded and are therefore unknown. As organisations that represent the woodwind instrument sector (an invested user of *Dalbergia melanoxylon*), we wish to involve ourselves more widely in favor of this species, possibly through the *CITES Trees Species Programme*. So far, we have been supporting existing efforts in favor of the conservation of this species in Tanzania, and we would be pleased to extend our involvement to Mozambique as well.

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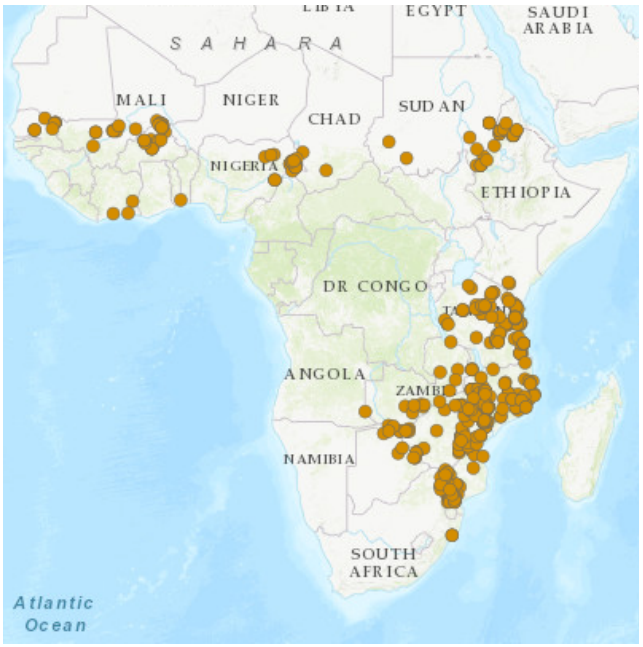
4. Conservation and Threats

The species is widespread across 27, perhaps 28, sub-Saharan countries[6]. Its extent of occurrence is estimated at 18 million km², with an area of occupancy of at least 2,428 km², though it may be larger. The species has also been introduced in India and Australia【references 4,5】.

Figure 4: Global geographic distribution of Dalbergia melanoxylon【*reference 6*】



[6] Angola, Burkina Faso, Botswana, Democratic Republic of the Congo, Central African Republic, Côte d'Ivoire, Cameroon, Eritrea, Ethiopia, Kenya, Mali, Mauritania, Malawi, Mozambique, Namibia, Nigeria, Sudan, Senegal, South Sudan, Eswatini, Chad, Togo, Tanzania, Uganda, South Africa, Zambia, and Zimbabwe.Some sources also list Guinea as a range country for this species.

The conservation status of *Dalbergia melanoxylon* is precarious. The IUCN lists the species as "*Near Threatened*", with an estimated global population decline of 20-30% over the past 150 years. Overexploitation, habitat loss, and illegal logging are the primary threats, in particular in Mozambique and Tanzania, where the majority of harvestable stocks are located.

Slow growth rates (according to some studies, 70-100 years would be required for the tree to reach maturity) and poor regenerative capacity exacerbate these challenges.

The rise of luxury markets, especially the Chinese Hongmu[7] furniture industry, has further intensified pressure on this species【references 4,5】.This industry primarily focuses on producing high-value copies of pieces of furniture inspired by Ming and Qing dynasty designs. These pieces are cultural icons and symbols of economic status, fueling huge demand for rare hardwoods. *Dalbergia melanoxylon* is one of the 33 species recognized under the *Chinese National Hongmu Standard*, alongside other endangered or near-threatened timbers【reference 7】.

China is, by far, the largest importer of *Dalbergia melanoxylon* at the global level: trade data relating to the seven years period 2016-2022 reveal that while China imported over 499 276 m³ annually, the rest of the world imported an average of 77 732 m³ annually during the same period, i.e. a 6.4 factor【references 2,8】. It is generally assumed that much of this wood is used for crafting luxury furniture and decorative items, and only a small proportion of it is used to make woodwind instruments.

In addition, the demand for Hongmu furniture has encouraged illegal logging activities, particularly in some regions of Mozambique. Poor enforcement of forestry regulations in these areas has further accelerated the depletion of *Dalbergia melanoxylon* stocks.

. Conservation Efforts and Sustainable Practices

5.1 Efforts in Mozambique - The Mozambican authorities have edicted a ban on log exports by Law No. 14/2016 of 30 December 2016【reference 9】. They have also reduced the harvest quotas for the species in different regions of the country in order to adopt a conservative quota as required by the CITES Plants Committee at its 27th Meeting (PC27, Geneva, July 2024). Overall the 2024 quota was reduced by over 62% (from 23 250 m^3/year down to 8 762.50 m^3/year), reflecting the commitment of the authorities to conservation. However, challenges persist, including illegal logging and enforcement gaps in high-risk regions such as Niassa and Cabo Delgado provinces.

5.2 Efforts in Tanzania - Tanzania has adopted similar restrictions on logging, focusing on sustainable forestry practices within *National Forest Reserves* and *Village Land Forest Reserves*. Monitoring systems in reserves like Malehi and Mitarure indicate positive regeneration trends for *Dalbergia melanoxylon*. Despite limited infrastructure for timber processing, Tanzanian authorities have strengthened local forest governance to curb illegal harvesting.【reference 9】

5.3 Role of NGOs and Community Initiatives

5.3.1 African Blackwood Conservation Project (ABCP) - Founded in 1996 by Sebastian Chuwa and James Harris[8]. ABCP's primary activities are concentrated in Northern Tanzania, particularly in

[7] Hongmu, is a Chinese word, which refers to rosewood species used to produce furnitures from Chinese historical tradition.

[8] Sebastian and James were brought together by a television program produced by the BBC in 1992 entitled "*Mpingo-The Tree that Makes Music*"

the Mount Kilimanjaro region, where mpingo populations have been significantly reduced due to habitat destruction. The primary driver of mpingo populations decline in Northern Tanzania is agriculture. As demand for farmland increases, forests are cleared through slash-and-burn agriculture, destroying mpingo habitats as a result. Additionally, shifting cultivation practices prevent forests from regenerating, further reducing mpingo's natural range. While logging and wildfires also contribute to the decline of the species, the rapid expansion of farmland remains the most significant threat to this endangered tree.

ABCP[9] has planted over 2,099,400 trees, with one-third (approximately 700,000) being mpingo trees. These efforts have been crucial in restoring degraded landscapes and ensuring the survival of *Dalbergia melanoxylon*. This project operates a nursery in rural Moshi District, in Kilimanjaro region, where thousands of seedlings are cultivated each year. These seedlings are distributed to schools, churches, private landowners, and public institutions for planting in protected areas. Additionally, ABCP cultivates a variety of native and economically significant tree species[10] that contribute to biodiversity, soil health preservation and recovery, climate resilience, and adherence to these conservation efforts by the local communities who can improve their livelihoods through these actions. The latter is critically important as the organization actively engages (and ultimately depends on) local communities in conservation efforts, promoting sustainable land use practices. By partnering with schools and local institutions, ABCP raises awareness about the importance of tree conservation and the environmental impact of deforestation and paves the way for a more ecological future.

ABCP has received several prestigious awards for their contributions to environmental conservation:

- *Rolex Award for Enterprise* (2002): Recognizing innovative environmental projects worldwide;
- *Arbor Day Award* (2007): Honoring outstanding tree-planting and conservation efforts;
- *Spirit of the Land Award* (2002): Presented during the *Salt Lake City Winter Olympic Games*, recognizing exceptional environmental initiatives.

In its latest report, Michael and Cyril Chuwa, Tanzanian Directors of ABCP[11] highlighted an expansion in its tree-planting efforts, aiming to mitigate climate change and improve local livelihoods. The organization has increased the number of trees planted about 30% compared to 2023, planting a total of 24,674 trees. They expanded its geographic reach in five key districts: Rombo, Kikatiti, Moshi, Mwanga, and Siha. Continuing extended their outreach to new institutions in the Rombo and Siha districts, nurturing even more significant environmental consciousness within the communities, aiming in the future for a total of 100,000 trees to be distributed. Aside from Dalbergia Melanoxylon they first time introduced species such as African Mahogany (Khaya nyasica), Senegalia polyacantha and

[9] Prior to that, Sebastian Chuwa had lived and worked in Ngorongoro as a conservationist. Sebastian's impact was immense. According to the 2014 ABCP newsletter, he was personally responsible for the planting and distribution of 5 million trees, including: 1 million mpingo trees ; 2 million coffee trees ; 2 million other indigenous species.

[10] Here is a list of the main species that ABCP cultivates and promotes, and a brief description of their properties and uses:

- *Dalbergia melanoxylon* has medicinal properties and plays an important ecological role in nitrogen fixation and preventing soil erosion
- *Markhamia lutea* (Nile Trumpet Tree) is a fast-growing tree used in reforestation and urban landscaping, improving soil fertility and providing nectar for pollinators;
- *Grevillea robusta* (Silky Oak) is used in agroforestry for its shade-providing canopy, nitrogen-fixing ability, and windbreak properties;
- *Acacia tortilis* (Umbrella Thorn Acacia) is a keystone species in arid regions, providing fodder for livestock and stabilizing soils against desertification;
- *Azadirachta indica* (Neem Tree) is known for its medicinal properties and pest-resistant qualities, supporting sustainable farming and biodiversity;
- *Terminalia mantaly* (Madagascar Almond) is popular in urban landscaping, providing shade and helping regulate microclimates.

[11] Now known as the African Blackwood Conservation and Ethnobotanical Organization - ABCEO.

Vachellia. These species will expand ecological benefits and enhance local livelihoods by focusing on environmental and economically viable tree species that contribute to biodiversity【*reference 1*】.

This NGO is supported by French woodwind manufacturers, namely Buffet Crampon, Henri Selmer Paris, F. Lorée, Marigaux and musical instrument associations as CSFI[12], APLG[13] and many others.

5.3.2 Mpingo Conservation and Development Initiative (MCDI) - Established in Southern Tanzania, where *Dalbergia melanoxylon* is abundant, MCDI was founded in 1995, originally under the name of the *Cambridge Mpingo Project*[14]. This organisation operates community-based sustainable forestry projects, by empowering local communities to manage their forests sustainably. Since its creation, MCDI has provided much needed economic incentives to the local communities, while reducing illegal logging. The organization also facilitates replanting efforts and capacity building. Through a comprehensive set of actions, MCDI demonstrates the potential for integrating conservation with economic development. The value of MCDI's strategy and actions was duly acknowledged when the *Forest Stewardship Council* (FSC) awarded MCDI the first FSC certificate for community-managed natural forests in Africa in March 2009.

In September 2009, in partnership with Kilwa District Council, MCDI facilitated the first ever commercial timber harvest from a *Village Forest Reserve* in Tanzania, earning communities 100 times more per log than previously. Subsequently, the organization was selected to implement one of nine REDD pilot projects funded by the Royal Norwegian Embassy in Tanzania. This REDD project was launched in January 2010 and covered the period 2010-2014. As with all MCDI's work, it sought to advance forest conservation in Tanzania by generating sustainable income for communities, thus providing incentives for them to manage local forests responsibly. This project was designed to complement the sustainable *Forest Stewardship Council*-certified timber production under the MCDI group certificate, and thus helps to ensure the viability of community forestry as a sustainable enterprise in Tanzania.

This led, notably, to successive increases of the FSC-certified area of forests managed by several villages under the guidance of MCDI, starting in September 2012 when the FSC-certified area quadrupled with the addition of more than 60,000 hectares in Nanjirinji, a *Village Forest Reserve*. This increase was followed, in October 2013, by the first significant expansion in Angai Forest, Liwale District, funded by the Government of Finland under the *Lindi and Mtwara Agribusiness Support* (LIMAS) programme. It is also worth mentioning that MCDI's actions are supported by a Japanese company (Yamaha Corporation) with the Japan International Cooperation Agency (JICA), the governmental institution responsible for implementing the technical cooperation programs sponsored by Japan. As such, JICA is in charge of the *Japanese Official Development Aid* (ODA) for the purpose of supporting the socioeconomic development, recovery or economic stability of developing regions.

Finally, according to the MCDI website, this organisation is a long-term partner of both the World Wildlife Fund (WWF) and Fauna and Flora International (FFI).

In January 2025, the total area of FSC-certified forests under the guidance of MCDI amounts to 277 193 ha distributed in 17 villages of Southern Tanzania and 20 communities participate in this scheme. For all purposes, the MCDI FSC group certificate is referenced SA-FM/COC-002151.

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[12] Chambre Syndicale de la Facture Instrumentale

[13] 'Association Professionnelle des Luthiers Artisans en Guitare

[14] Between 1996 and 2003, this project organised 6 student research expeditions to Tanzania, involving 56 students from 8 different universities, during which time they changed their name to the *Mpingo Conservation Project* (MCP) (*Mpingo* is the swahili name for *Dalbergia melanoxylon*). This project was radically transformed when, in 2004, they were able to set up a permanent field base in Kilwa District (Lindi Region), and to complement their ongoing research programme with a practical community-based conservation Strategy and related Action Plan, thanks to the top prize they won in the *BP Conservation Awards Programme*. In 2010, they changed their name again, this time to the *Mpingo Conservation & Development Initiative* (MCDI for short) to better reflect what they do.

6. Suggestions and recommendations to the CITES Standing Committee

This section aims at respectfully submitting our suggestions and recommendations to the CITES Standing Committee (SC) members, in the context of their upcoming 78th Meeting (SC78, Geneva, 3-8 February 2025). In particular, these suggestions and recommendations should be considered in the light of document SC78 Doc. 34.3, *Review of Significant Trade in specimens of Appendix-II species - Implementation of the Recommendations of the Plants Committee*, and more specifically of its sections 13 and 15 dedicated to the *Dalbergia melanoxylon* / Mozambique and *Dalbergia melanoxylon* / Tanzania combinations.

To reach the interlinked objectives of safeguarding *Dalbergia melanoxylon* and supporting its sustainable use, our organisations believe that several actions are recommended:

1) **Strengthen Monitoring and Enforcement:**
    a) Enhance capacity-building programs in range states for *Dalbergia melanoxylon*, namely Mozambique and Tanzania to combat illegal logging and improve enforcement of existing regulations.

2) **Promote Sustainable Trade:**
    a) Continue supporting exemptions for finished musical instruments under Annotation #15, given the limited impact of the music industry on global trade volumes.
    b) Foster partnerships between governments, NGOs, and the music industry to fund conservation initiatives.

3) **Foster Reforestation Efforts:**
    a) Invest in research and development for artificial propagation and fast-growing varieties of *Dalbergia melanoxylon* .
    b) Expand community-based replanting programs and provide incentives for sustainable forestry practices .

4) **Include*Dalbergia melanoxylon* into the *CITES Tree Species Programme*:**
    a) The *CITES Tree Species Programme* would provide additional resources and technical support to range states, enhancing their capacity to monitor and regulate the trade in *Dalbergia melanoxylon*.
    b) By including the species into this program, both Mozambique and Tanzania could benefit from increased funding for reforestation projects, better enforcement mechanisms, and improved traceability in the supply chain.
    c) Participation in the program would also foster international collaboration, facilitating the exchange of best practices and innovations for sustainable forestry management.

Our organizations stand ready to consider our possibilities to participate, in the limit of our capacities, to the collective efforts that are required to implement and carry out the ground actions relating, in particular, to items 2.b), 3.a), 3.b) and 4 as identified above. We will also be most appreciative to the Standing Committee for them accepting that we keep on participating in any reflection pertaining to 2.a) above, as we have been doing so since 2017.

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7. Conclusion

The use of *Dalbergia melanoxylon* for crafting musical instruments is a noble endeavor. It is also a virtuous one; as instrument makers and musicians, we recognize the irreplaceable qualities of African blackwood and are committed to sustainable practices in order to continue accessing this vital resource. These are the reasons why we have already sponsored projects in favor of the conservation of the species for many years.

In that perspective, it is crucial to note that the consumption of *Dalbergia melanoxylon* by the musical instrument industry represents a small and stable volume, unchanged for decades. This sustainable and minimal impact, combined with the industry's willingness to contribute to conservation efforts, exemplifies a responsible and collaborative approach to preserving this iconic species.

As representatives of the musical instrument makers and musicians, we wish to make it clear that the professionals we represent are eager to reinforce their involvement and stand ready to participate in the preservation and conservation of *Dalbergia melanoxylon* so that current and future generations can benefit from high quality clarinets and oboes made from this species, and perpetuate the legacy of the cultural heritage that music represents. As part of this mission, we hope to benefit from the help of CITES to be able to work together to improve the conservation status of *Dalbergia melanoxylon* and ensure its long term survival and sustainable use.

References

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10. Mpingo Conservation and Development Initiative (MCDI) (link)

Annex 1: Timber species used to make woodwind instruments and woodwinds evolution

Timber species used to make woodwind instruments

The wind instruments used in today's orchestras are the result of both the cultural and industrial revolutions in Europe during the 18th and 19th centuries. This era brought not only technical innovation, but an artistic awakening that gave us the symphonic masterpieces created by musical geniuses such as Schumann, Tchaikovsky, Chopin, Beethoven and Wagner. Their music demanded instruments with a greater range and more vibrant tonality and, in the great symphonic orchestras which performed their works, each instrument had to hold its own among dozens of other competing instruments. To this end, the instrument makers of the era introduced new refinements and created entirely new instruments to produce music of such tone and timbre as to execute and enhance musical scores written by the composers of the period.

European woodwinds had traditionally been made from European boxwood (*Buxus sempervirens*), because it was one of the heaviest timbers available within Europe. Although its density made it a good material for woodwind instruments, its tendency to warp over time, even if it had been well dried, was a limiting factor. In addition to the small size and slow growth rate of the tree, its light tan color also became a detriment because modern tastes had turned towards darker toned species. A boxwood wind instrument was easily soiled through years of use.

When trade routes to foreign ports began to be established during the 16th to the 19th centuries, a number of new hardwoods from tropical countries, identified for their density and machinability, were tested and one was found to surpass all others – *Brya ebenus* or cocuswood, indigenous to the Caribbean. It quickly replaced boxwood as an instrument wood. Its color, a rich deep brown to black, also appealed to the tastes of the times. Native to Jamaica and Cuba, like most tree species it is known by several names, notably Jamaican ebony, Ebony cocuswood, Grenadilla and West Indian ebony.

During a relatively brief period, cocuswood was the wood of choice for European woodwind makers but, unfortunately, since its habitat was limited to Cuba and Jamaica and the tree was smaller than blackwood (average diameter of 8-15 cm, as compared to mpingo harvestable size of 24 cm), stands of the tree were soon decimated and no conservation initiatives were instituted, at that time, to protect it for the future. Today, this wood is only available in small quantities at very expensive prices. Possibly because its numbers were depleted many decades ago and it is of little consideration in trade it is not listed by CITES and appears as "*Least Concern*" on the IUCN Red List (updated in 2024).

As a result of cocuswood scarcity, African blackwood began to be used in the manufacture of fine quality woodwind instruments, and today this species is generally regarded as irreplaceable.

Since the middle of the 20th century, entry-level instruments (known as student instruments) can be made of plastic (*Acrylonitrile butadiene styrene*, ABS copolymer). There were also attempts to impose instruments made of metal or ebonite (thermosetting synthetic material) in the first half of the 20th century, but they failed as these instruments did not last.

Woodwinds evolution

Much of the technology and artistry of modern woodwinds were developed in Europe during the 19th and early 20th centuries. Many musicians of the era were also inventors who envisioned modifications

that would produce a better instrument more capable of creating the harmonies and intonations they wished to convey. Therefore artistry and manufacturing progressed in tandem.

A good example to explain why *Dalbergia melanoxylon* is considered as irreplaceable in the manufacture of fine quality woodwind instruments is the clarinet. As previously stated, the clarinet was originally made of European boxwood.

The evolution of the clarinet began with its ancestor, the chalumeau. This instrument was very rudimentary, it only has 8 to 9 holes, and is made up of a body without a bell. In an effort to develop the instrument and to meet the needs of the works written for this instrument and for orchestras, the chalumeau was quickly modified at the level of the body and the mouthpiece, but also gradually saw the addition of keys. The paternity of the clarinet, by adding two keys onto the chalumeau, is generally attributed to Denner, a German luthier. Several inventors such as Barthold, Beer, Lefevre[15] then gradually added keys to the clarinet to be able to develop the registers of this instrument and make the different notes more accurate.

After several improvements, particularly on the materials used for the pads and the shape of the keys to be able to fix the pads, Iwan Müller, a Russian musician and composer, carried out research on a new key system so that all the tones became playable. After 6 years of research, Müller presented a clarinet with 13 keys to a committee of experts at the Paris Conservatory in 1812.

From left to right: Denner Chalumeau (1690), Ivan Muller 13 keys clarinet (1812), Albert clarinet (1840), Klosé-Buffet Clarinet called Boehm clarinet (1844), metal Boehm clarinet (1930), modern Boehm clarinet (2000), modern German clarinet (2000)

This is the precise moment in the evolution of this instrument (13 keys) when the need to find more stable and solid materials arose to continue the evolution of this instrument. Indeed, no European wood could support the weight of the keywork and guarantee its proper functioning over the long term. Grenadilla wood became the reference because it is denser: 1250 kg/m3 (at 12% humidity) compared to 1050 kg/m3 for ebony *(Diospyros spp.).* In addition, it has better dimensional stability: 5% tangential, 3% radial when ebony exceeds 10%.

[15] Barthold Fritze (1697-1766) was an organ maker at Brunswick (Germany)
Johann Joseph Beer (1744-1812) was a bohemian clarinet player who added the 5th key on the clarinet
Jean-Xavier Lefèvre (1763-1829) was a French clarinetist and composer of Swiss origin. He is the first clarinet teacher at the Paris Conservatory and the author of a reference method for this instrument.

After the invention of the Boehm keywork system for the flute, Hyacinthe Klosé in collaboration with Louis-Auguste Buffet[16], developed a system using the same idea for the clarinet, that is to say, eliminating the fork fingerings[17]. This keywork then has 17 keys and 6 rings. A patent was then filed by Buffet himself in 1844. This keywork system called Boehm is still used today for the modern clarinet. In 1890, Oscar Oelher, a German clarinet player, invented a system derived from Müller's which is today used in Germany and Austria. After that, other keywork systems were developed, but none of them was adopted.

From the end of the 19th century, Mozambique ebony, *Dalbergia melanoxylon*, established itself as the material for making instruments of the highest possible quality and the use of other woods to make concert instruments was abandoned or became really anecdotal.

Annex 2: Worldwide annual *Dalbergia melanoxylon* consumption for woodwind instruments

A rough preliminary evaluation

The volume of wood that is required, each year, to produce woodwind instruments made of *Dalbergia melanoxylon* is roughly estimated, as a first analysis, to approximately 553 m^3. Details of the calculation are provided in the table below.

This rough evaluation must be considered as a very first preliminary analysis, the result of which must be thoroughly checked.

N°	Description	Numbers
1.	Volume of sawn wood required to make an instrument as a clarinet estimated to be 0.001843445 m3 (from "*Report on the impact of CITES exemptions for Dalbergia and Guibourtia"*, 2025, E-SC78-77-A2 , page 76 / 164).	**0,001843445 m3**
2.	Worldwide production of wooden clarinets estimated at 250,000 units per year (high hypothesis)	**250 000 clarinets / year**
3.	Volume of sawn wood required to make 250 000 clarinets / year	**460 m3**
4.	Hence, the quantity of wood that is required to produce the previously mentioned 250,000 clarinets corresponds actually to 300,000 instruments assuming a scrap ratio of 20% during the manufacturing process of woodwind instruments.	**300 000 clarinets / year**
5.	Volume of sawn wood required to make 250 000 clarinets / year including 20% scrap ratio	**553 m3**

[16] Hyacinthe Eléonore Klosé (1808-1880) was a French clarinetist and composer, professor at the Conservatory of Music of Paris for over 30 years. Louis Auguste Buffet (1789-1864) was a French woodwind musical instrument maker.
[17] Fork fingerings consist of one or more open holes upstream of a closed hole.