Management options for addressing the persistent and unresolved CITES issue of Madagascar's rosewood stocks and stockpiles

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Abstract

Stocks and stockpiles of CITES (the Convention on International Trade in Endangered Species of wild fauna and flora) listed wildlife, including animal and plant-derived products, remain a complex, unresolved issue. The biggest challenges lie in the prevention of further illegal sourcing of—and trade in—products originating from wild populations of threatened species. Stocks can function as a buffer during lean periods or as a mechanism used for speculation. As we outline in this paper, the current situation in Madagascar precludes non-detriment findings intended to enable sustainable use of standing rosewood populations. Backed by the World Bank, the previous Malagasy government was in the process of promoting the sale of massive stocks and stockpiles of confiscated precious woods in order to attain a zero stocks goal, this being ostensibly in order to halt the illegal sourcing and trafficking of rosewood. We propose and analyse four potential options for stocks management by presenting a framework linking forest management with socio-economic objectives and comparative risks. Destruction (burning) of the known stocks would broadcast a strong conservation message. It has the best chance of halting further sourcing, which happens mostly in protected areas and is therefore illegal. In the option of National trade, a precious timber sector would process the timber held in stocks. This option is the most beneficial alternative for development. Opening the stocks for exportation through international trade, achieves the lowest number of objectives in relation to both forest conservation and socio-economic indicators—and with it, come the highest risks in relation to curbing further illegal logging. Banking represents a fourth option; one which essentially postpones any decision related to stocks management by storing the stocks over extended periods. None of the four management options is able to ensure a sustainable solution that can resolve the issues surrounding the precious timber stocks. The approaches put forward are either simply 'more good', or 'less good'. If any country is seriously interested in conserving its biodiversity, its government has to ensure that no other sectorial changes will counteract, or potentially undermine, the efforts to protect the environment. Stocks management will be on agenda at the upcoming COP18 in Geneva, 17–28 August 2019.

Introduction

Stocks and stockpiles of CITES (the Convention on International Trade in Endangered Species of wild fauna and flora) listed wildlife and forest-derived products present a complex, unresolved issue on a global scale (Frank and Wilcove 2019). The foremost challenge surrounding stocks is the prevention of further illegal sourcing of—and trade in—these threatened products. Stockpiles play a pivotal role of functioning as a buffer for lean periods—or may also be a form of speculation (Mason et al. 2012, 't Sas-Rolfes et al. 2014, Walker 2018). Actors, including operators, officials and traffickers, can bide their time, sitting on stocks while waiting to feed their stored products into the international trade. This

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may happen when legal conditions in a target/source country change, for example to adjust and comply to CITES requests, enabling the exploitation of legal loopholes favouring the sourcing and trading of the products (Naylor 2005, Vigne. and Martin 2011, Vandergrift 2013, Siriwat and Nijman 2018). Alternatively, they can wait until political conditions in source countries deteriorate (this can involve a decline in the state of law and an increase in corruption), facilitating illegal trafficking (Challender and MacMillan 2014, van Uhm and Moreto 2018, Wyatt et al. 2018). Changes in market conditions can also influence the flow of traded goods. This may refer to increased international demand for a specific product, or, to an increase in its rarity (Bulte et al. 2003, Courchamp et al. 2006, Hall et al. 2008, Zhu 2019). Corrupt structures are known to strengthen the resilience of illegal trafficking operations to reduction measures (Wyatt et al. 2017). The illicit trade of plants and animals threatens not just target species, but entire ecosystems and it constitutes one of the key threats to biodiversity (Butchart et al. 2010, White and Heckenberg 2014). Among the most traded and hotly debated wildlife and forest-related products are elephant ivory, rhinoceros horn, pangolin scales and rosewood. The volume of illegally trafficked precious timber is among the highest of any plant-derived products which are traded (Sundström 2016). CITES has been devoting increasing attention to issues surrounding the regulation of trade in high-value hardwood species for the past decades, especially since *Dalbergia nigra*, a rosewood endemic to Brazil, was listed in Appendix I at CoP8 in 1992 (Ugochukwu et al. 2018).

CITES is a result of an IUCN (International Union for Conservation of Nature) resolution drafted in 1963; opened to signatory governments in 1973 and launched in 1975. The three CITES Appendices represent different levels of protection. Appendix I affords the strongest protection for species listed as threatened with extinction and trade in the species or any geographically separate population only allowed in exceptional instances (CITES 2015). CITES Appendix II-listed species are not necessarily threatened now (their protection should thus ensure a sustainable level of harvesting). International trade may, however, be completely banned in case where this may be the only option to ensure survival of target species. In March 2013, Malagasy rosewoods were listed under Appendix II of the CITES, during the Conference of the Parties CoP16 (Decision 16.15; CITES 2016a). During the 2019 CITES CoP18, discussions pertaining to rosewood are anticipated to revolve around whether to move all Malagasy rosewood and ebony species to CITES Appendix I—a measure favoured by the conservation community (Wilmé and Waeber 2019, Waeber et al. 2019)—or, to downgrade these species to CITES Appendix III, which is what the previous Government of Madagascar lobbied for during the 2017 CITES standing committee. Additionally, the music industry is pushing for an amendment of Annotation #15, which would allow for the trading of refined musical instrument parts, despite the CITES

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Appendix II listing (IUCN and Traffic 2019).

Rosewoods belong to the families of Fabaceae, Meliaceae, and Proteaceae (Mabberley 2017). Highly prized on international markets, they are sourced from tropical countries, including Madagascar. During the last decade, rosewood sourcing and trade reached unprecedented levels in Madagascar (Waeber et al. 2018). Simultaneously, corruption increased substantially, resulting in the country being placed within the worst tier (Transparency International 2018). The current rule of law slipped by 8 places, resulting in negative consequences for the environment (Jones et al. 2019). Since the 1990s, Madagascar has experienced chronic political instability. For decades prior to 2013, forest regulations were structured and implemented in such a way as to facilitate sourcing and exporting of rosewood (Innes 2010, Randriamalala and Liu 2010, Waeber et al. 2019). Periodic attempts to halt the illegal logging of rosewood—primarily through confiscation of logs and prosecution of illegal loggers—led to the accumulation of substantial stockpiles of seized rosewood in a number of locations throughout the country (CITES 2016b).

In June 2013, the World Bank issued a call to assess "the options of disposal of the illicit stocks of rosewood and ebony" (World Bank 2013) and by doing so, it created hope for the then Malagasy government and for buyers, to sell off the large stockpiles of confiscated precious timber, despite risks that this would involve in terms of instigating further illegal sourcing of the timber (Waeber and Wilmé 2013). The Malagasy Government of the time proposed three stock management options: sale of the wood in its present condition for international markets; local enhancement of the value of the wood through a national precious timber value-added sector, and destruction of all stocks so as to reach a 'zero stock' situation. The intended goal was to clear all stock and stockpiles under the assumption that a 'zero stock' situation would facilitate more accurate identification of illegally-sourced timber (CITES 2016b).

Under the aegis of the CITES, the government started seizing, inventorying and auditing stockpiles scattered throughout Madagascar in 2014. The highest concentration of stockpiles has been in the coastal north-eastern section of the main sourcing region, which encompasses the Atsinanana UNESCO World Heritage Site. In this World Heritage Site, sourcing hotspots are located within Marojejy, Makira, Masoala, and Mananara Nord protected areas, all of which are IUCN category II parks. According to Malagasy law therefore, any sourced timber coming from protected areas is illegally sourced. Stocks are separated into three categories: (a) seized; (b) declared and unseized (still in possession of traffickers) and (c) concealed stocks (undeclared stockpiles that are hidden by traders). An additional two stock categories can be added: firstly there are the remaining standing trees. For these, there are grounds to conduct an NDF or non-detrimental finding to determine what a

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sustainable level of harvest for export would be. Secondly there is timber, or any product made from rosewood, that has been seized abroad. Stocks and stockpiles are terms loosely defined by CITES (2016c: 3) as referring "(…) to accumulations of specimens (particularly parts and derivatives) detained or stored for a period of time at a point in the supply chain between harvesters and consumers, with stockpiles being larger accumulations than stocks." There is no clearly defined boundary between the two. This issue was raised at the last Standing Committee in Sochi (CITES 2018); it is also an agenda item for COP18 (CITES 2019).

After the banning of precious timber exports from Madagascar on 24 March 2010 (Decree No. 2010-141), several shipments containing rosewood and ebony were intercepted and the consignments seized. Examples of these occurred inter alia in the Comoros (January 2011), Zanzibar (February 2014), Singapore (March 2014), Sri Lanka (April 2014), Kenya (May 2014), and Hong Kong (October 2015) (CITES 2016b). These amounted to some 6000 tonnes. How the countries concerned (i.e., the countries where timber is seized and the countries from which the timber is sourced) proceed with handling these commodities (for example payment for storage or re-patriation) is regulated through the Palermo Convention. Madagascar ratified this agreement in 2005 (Decree No. 2005-021 of 5 January 2005).

Stocks of illegally sourced precious timber possess the typical characteristics of a 'wicked problem' (sensu Rittel and Webber 1973), because all of the proposed management solutions risk creating new problems. This exacerbates the complexity of the rosewood trafficking process (Randriamalala and Liu 2010, Schuurman and Lowry 2010, Randriamalala 2013). Our work is based on a longitudinal study focusing on two levels of stocks management: what happens to seized (and inventoried) stocks of CITES-listed species, and what the management options are. We use a scenario-based approach to compare the management options related to objectives and risks based on the logic framework approach (Calvanese et al. 1998). We also report on necessary CITES documents under each CITES scenario and required changes of or modifications to, the current forest legislation.

Methods

This longitudinal study focuses on rosewood stocks accumulated on a regular basis during the period 2009–2018 by means of seizures; confiscations (after declaration) and also, the exceptional allowing of trade ostensibly aimed at reducing stocks. It focuses on stock regulation as is reflected in forest legislation and uses a scenario-based analysis of stock management, in order to assess the potential management options, the objectives achieved and the risks involved. Being central to any wildlife or forest product-related trade, stocks play a pivotal role in the context of CITES. We therefore also compare the stocks management options under the different CITES statuses (Appendix I–III). We review the different

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kinds of permit/s that would be required under each option in order to conduct trading and we discuss the kind of forest legislation adaptations that would be required under the respective [stock] management options. To this end we researched the CITES database; used informal interviews with CITES experts, and we also examined Malagasy forest legislation for decrees and orders in relation to stockpile management.

The identification of the four stocks management options was based on a variety of sources:

- *destruction* of the stocks: Randriamalala et al. (2011); several African countries (e.g., Kenya, Tanzania, Zimbabwe) have burnt stocks of ivory in an attempt to stem trafficking and to reduce further poaching of elephants (Braczkowski et al. 2018).
- *banking* the stocks for an indefinite time: Wilmé et al. (2009), Randriamalala and Liu (2010), Randriamalala et al. (2012), Schuurman et al. (2016).
- *national trade*: Randriamalala and Liu (2010); the situation prevailed during the period of 13 Oct 1986—22 May 1990; Ballet et al. (2010); also involved was the promoting of a certification scheme.
- *exporting*: informal discussions with representatives of the WB, EU, GIZ, USAID, AfD, Ministry of Environment, Madagascar National Parks; Randriamalala and Liu (2010, Suppl. Mat.) revealed 12 proposals and ideas to address the rosewood crisis, including the issues surrounding stocks.

Results

All management options have similar risks, albeit to varying degrees. Banking and destruction of stocks have the lowest risk intensities. The destruction option achieves the greatest number of objectives for the forests, similar to the banking management option, and both achieve some socio-economic objectives (Figure 1). Opening the stocks for exportation through international trade achieves the smallest number of objectives in relation to both forests and socio-economic indicators, despite the assumption that this option results in the highest tax revenues for the government (Figure 1). This option also has the highest risks of destabilizing the political framework and governance as it is associated with the highest opportunities to maximize economic gains. National trade, i.e., selling the stocks for the Malagasy market and processing in-country, is the most beneficial option for development. Comparatively, there are fewer associated risks as revenues will be lower than through exportation option (Figures 1, 2). CITES only applies to products for international trade. All the other management options are regulated under national forestry regulations (Table 1).

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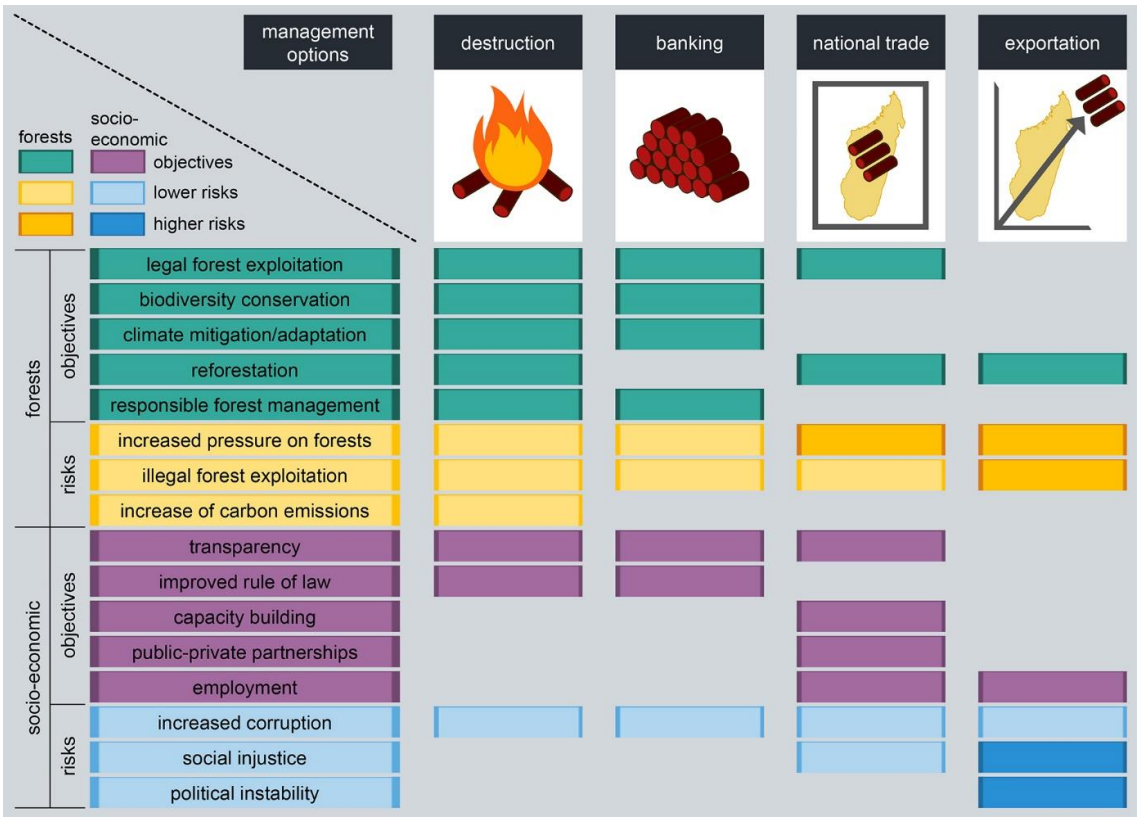

Figure 1. Framework linking forest management and socio-economic objectives and comparative risks.

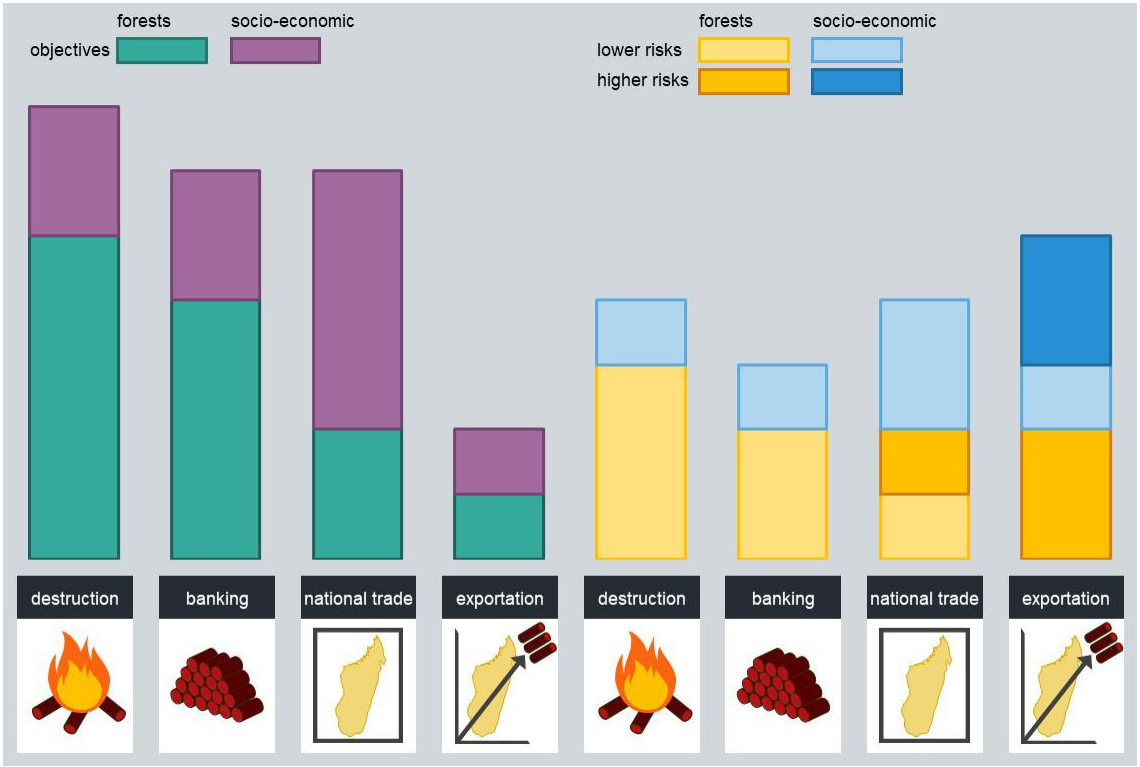

Figure 2. Summary of the objectives that can be achieved and inherent risks for the four management options.

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Table 1. CITES scenarios and stocks management options. What CITES permits or forestry regulation changes are required to allow for the emptying of stocks?

Options	Appendix I	Appendix II and III
Destruction	None. CITES not applicable.	CITES not applicable, but solution should not generate profit to the offender and it should not stimulate further illegal trade.
Banking	None, except for science or education, or unless destruction is impractical (so secure storage is the only option).	CITES not applicable but solution should not generate any profit for the offender and it should not stimulate further illegal trade.
National trade	None, dependent upon national law.	CITES not applicable, so dependent upon national law.
Exportation	Prohibited.	As per CITES procedures, i.e., in line with CITES-set export quotas, compliance with Non-Detriment Finding (NDF) and Legal Acquisition Finding (LAF) requirements, and national export permitting procedures.

Discussion

Despite a total ban on the exporting of Malagasy rosewood and ebony since 2010 (Decree N. 2010-141), as well as the CITES Appendix II listing of these products in 2013, during the period 2014–2015 alone, approximately 5000 tonnes of Malagasy rosewood were seized outside Madagascar. According to UK customs officials (Great Britain Parliament 2013), only an estimated 10% of illegal wildlife and forest-derived product shipments are intercepted. This suggests that some 500,000 tonnes of Malagasy precious timber could have been exported illegally during the same period—keeping in mind that it is always a big problem to estimate how much is being smuggled—a figure consistent with the > 1 million tonnes of rosewood imported by China from Africa in this period (Zhu 2019). Since the CITES Appendix II listing, the Malagasy government tried to combat the trafficking of illegal precious timber by introducing a new law in 2016 (Law N. 2015-056), with several amendments to forest legislations detailing the creation of committees and their modalities in order to oversee the process of stock management. However, despite CITES requests for regular, transparent and clear progress reports, the quantity of rosewood in stockpiles remains unknown. It is also not known what proportion of the stocks have been inventoried. At the time of reporting, several stocks had been identified as ‘TBD’ (to be determined) or, not being classified according to the number of logs, but according to the number of containers (MEEF 2018). In various official reports by the Malagasy government, there is no clarity in terms of units used: seizures or stocks are reported in tonnes; in cubic meters, in number of logs, or, alternatively, according to the number of containers involved. This variation and lack of consistency leaves plenty of room for the manipulating of

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statistics, as noticed previously (Randriamalala and Liu 2010).

As stated by Winfield et al. (2016: 30) "The mere existence of stockpiles offers opportunities to launder timber, with logs of lower value being substituted for the more valuable logs within a stockpile." Stocks and stockpiles present a globally unresolved challenge for governance. As is the case with wicked problems, every possible solution seems to come with unanticipated consequences that give rise to new problems with potentially negative outcomes and risks, ultimately worsening the situation.

Destruction option

Destruction of stocks would seem to be the obvious route to end timber trafficking as it broadcasts a potent conservation message and clearly demonstrates the intention of a government to curtail any kind of trafficking. However, as suggested by the previous Malagasy government, the overriding concern with stock destruction is that in the context of extreme poverty, destroying so much potential revenue would be perceived as a cultural and social affront. The people most in need, i.e., the impoverished rural residents, are the people who have been, and are still been, used by traders to extract the timber from the forests illegally. They would most likely not benefit from this option as pointed out by Randriamalala and Liu (2010), Randriamalala et al. (2011), and Randriamalala (2013). No revenue is earned by stockpile destruction and stockpile management, i.e., storage, monitoring, transportation and destruction (e.g., burning) comes at a cost (CITES 2016b).

As suggested by 't Sas-Rolfes et al. (2014), the destruction of ivory stockpiles does not meet the precautionary principle (sensu Dickson 1999), since the objectives achieved by this option are unknown. The burning of ivory stockpiles, as for example undertaken by the Kenya Wildlife Service in 1999 and 2011 was widely broadcasted through the media in order to convey a message of zero tolerance towards trafficking (Braczkowski et al. 2018). However, the confiscation and destruction of stocks can also be viewed as having a negative impact, because poachers may want to compensate for their losses, which potentially instigates more slaughtering of elephants (Collins et al. 2017). A drop in supply (provided other factors remain constant, particularly demand for the commodity) leads to an increase of scarcity, and therefore, to an increase in the commodity's price ('t Sas-Rolfes et al. 2014).

If the exportation of precious wood stocks from Madagascar stops, the demand from China for this product would not simply dissipate—it can easily be substituted with a similar commodity from Africa or elsewhere, as is reflected in the volume of rosewood that has been imported by China in recent years (Zhu 2019). The same precautionary principle can be applied to Madagascar's rosewood stocks. In the current setting, destruction of the stocks would not reduce China's high demand for raw precious timber. Stock destruction therefore, cannot be regarded as a measure

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which can guarantee cessation of further illegal logging. Burning the stocks is viewed as a strong message towards the donors for the funding of conservation programmes in Madagascar. For more than 30 years, the protected areas of Madagascar appear to have been receiving ample funding, but the lion's share of these funds has not been spent on the ground: development activities—which are more expensive—are underfunded, ultimately resulting in poor conservation of the island's natural ecosystems (Waeber et al. 2016). Randriamalala and Liu (2010) have demonstrated that the Chinese vendors financially gained 900 times more than the rural Malagasy people who were logging the trees and moving them out of the forests.

Banking option

Destruction, together with banking of stocks, appears to be the stock management option which comes with the least risks. Storage of stocks too, has its drawbacks. In contrast to elephant ivory or rhinoceros horn, both of which are products that deteriorate very slowly in storage, loses some of its quality over time. Rosewood has heartwood that is resistant, but not immune, to fungal or invertebrate attack. Degradation of the timber can be slowed considerably by storage in water—as is known from archaeological waterlogged wood (Colombini et al. 2009, Walsh-Korb and Avérous 2019). However even under water, timber is still subject to bacterial attack, which leads to an increase in the wood's permeability. Once the logs are removed from water, degradation in the form of splitting can occur because of the wood suddenly being subjected to drying (Wengert and Denig 1995). Logs can also be stored in sealed containers under anaerobic conditions, which results in minimal deterioration. However as this is a very expensive method, it is rarely undertaken (Riguelle et al. 2017). The value of rosewood declines in proportion to the length of time that it has been placed in storage. According to Rick Hearne (Carver 2018) stocked logs lose ca 10% of their value per annum. Proper storage therefore poses a significant challenge in terms of quality control as well as safety. Deterioration of log quality during storage is a fairly common problem (e.g., Vega et al. 2016). An unknown quantity of inventoried round logs has been held in stocks, in varied condition, for extended periods of time: sometimes, they have been stored for more than 10 years (Carver 2018). Banking would not solve the current issue: rather, it would postpone any decisions that are being made on how to deal with the existing stocks. There is no guarantee that the political and economic conditions in Madagascar will improve in the future. The very existence of the stockpiles encourages loggers to fell more trees to add to their stockpiles, in hopes that permission to sell might eventually be obtained, and/or for the creation of laundering opportunities in which logs can be taken from existing stockpiles, sold illegally and replaced with low-quality rosewood or non-rosewood logs.

Storage of stocks would not reduce the high demand for raw, precious timber from China. Therefore, pressure on the remaining living trees will not be alleviated. It is also

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unclear how the international market will develop in the future: currently, it is predominantly the high demand from China which instigates the illicit rosewood trade. It is well established that the Chinese market is not sensitive to the actual concerned species as long as it has the right properties and colour for furniture. Kosso (*Pterocarpus erinaceous*) from mainland Africa, long ago replaced *Dalbergia* spp. as the dominant tree species utilised for hongmu furniture. Now that kosso is listed on Appendix II, traders are directing their attention to other, non-CITES species like Burmese padauk *Pterocarpus macrocarpus* (Winfield et al. 2016).

National trade option

Establishing a national precious timber sector and domestic trade: This would benefit the entire precious timber sector but it would require legal, financial and organizational structural adaptations, as well as storage centres, along with a strong administrative service which is structured in such a way that it enables for the monitoring and controlling of the process over an extended period of time. Both trading options carry high risk of encouraging further illegal sourcing and the laundering of timber. One mechanism that has been proved to work—albeit with mixed results—is certification (Brown et al. 2008, Cashore and Stone 2012, Douet 2019). As proposed by Ballet et al. (2010), the precious wood sector could engage in a certification scheme, which would facilitate monitoring and transparency. Nevertheless, it is well known that rosewood and ebony are now mostly found inside national parks and special reserves (Randriamalala and Liu 2010), which means that certification is impossible, because by definition the logs extracted from protected areas are illegal.

The Malagasy artisan market workforce, as it was during the early 2000s, did not have the capacity to process the quantities of rosewood held in known stocks. As of June 2019, at the Ministry of Industry, Trade and Crafts, there are some 129 entities registered, mainly in the capital city and its surroundings (108, 84%), and of these only 37 (29%) are registered as companies. Among them a majority are cabinetmakers or carpenters, and many are specialized in producing sculptures and marquetery. Consequently, an industry would need to be created to 'liquidate' the existing stocks and stockpiles. Opening the large stocks to national trade would not prevent the traffickers swiftly registering themselves in the craft industry to acquire the stocked logs in order to funnel them back into the international trade. While this management option has the potential to create employment, there is a high risk that the local craftsmen would be left out. After liquidation, the remaining, living Malagasy *Dalbergia* trees would be under a high level of threat because of the demand for wood. This demand might even increase the level of threat by creating arguments for the need to support local jobs.

Exportation of processed wood is not allowed under CITES Appendix I or Appendix II; the domestic artisans will not be allowed to export any of their products, directly or indirectly through international

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tourists. It is illegal and would remain illegal to carry *Dalbergia* spp. handicrafts out of Madagascar. It has been proposed that an exclusion for handicrafts below a certain weight would be included in the new CITES Annotation #15, but this proposal has received little support, and it has been suggested that it would be unfair to agree on handicrafts but not on furniture.

Consider the case of Siamese rosewood (*Dalbergia cochinchinensis*). Despite its CITES listing, traffickers used a legislative loophole in the international agreement. Annotation 5 of the CITES, permitted the sale of "logs, sawn wood and veneer sheets", while trade was allowed without CITES control in any other "semi-finished" products, i.e., without the need for certification. Traffickers circumvented the constraints implemented by CITES on Siamese rosewood by smuggling illegally-sourced rosewood from Thailand across the border, mostly into Vietnam, where processing factories refined the raw logs in order to trade them legally. While Thailand did request an amendment of the Annotation 5, it may be too late because surviving populations of *D. cochinchinensis* and similar-looking species have likely been pushed either to or close to extinction (Stokes 2017, Siriwat and Nijman 2018). Similarly, if the existing Malagasy rosewood stocks were to be used up by the precious timber sector, it has to be questioned where new timber would come from. The answer is most likely from the country's protected areas (Randriamalala and Liu 2010). This means that the remaining, surviving trees would once again be under threat from loggers. As with Siamese rosewood, other similar, non-rosewood tree species could be targeted, potentially creating conservation issues for them as well.

Considering the magnitude of the current Malagasy rosewood stocks, some of the logs should certainly be secured for a longer period of time (e.g., several years) and the development of a domestic industry of precious timber should be considered in Madagascar, ensuring that the stocks are utilised at a slower pace. Such an industry would benefit mostly the artisanal community, who are restricted to producing goods for the local market, considering that their final products cannot be exported due to CITES restrictions. There is a local demand for rosewood but it is below the magnitude of the current stocks. There is a risk of unsustainability: in 2009, Gabon banned the export of raw timber, with a view to developing its domestic industry. This strategy proved inconclusive in terms of its benefits and efficacy, considering that the demand for raw timber from China and other Asian countries is still high, and no shift in the level of that demand has been observed recently (Douet 2019). After 10 years, the new policies have not enabled Gabon to develop its wood industry successfully.

Exportation option

Emptying the stocks to international markets was the preferred alternative of the previous government, because it is the least costly and fastest option that can be taken in order to reach a zero stocks goal. It brings the highest economic benefits, making it

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attractive to those that will benefit for the sales. Allowing international trade under the current CITES Appendix II status would only be granted under specific circumstances. Every Malagasy species in the genus *Dalbergia* has had Appendix II status since 2013. The Standing Committee has set and maintained the zero export quota because of failure to resolve various scientific and management issues, including the stockpiles, as spelled out in the Action Plan (MEEF 2018) agreed by CITES and reaffirmed at COP17. If the zero quota was lifted, it would still be obligatory for the Malagasy CITES Scientific Authority to carry out a non-detriment finding (NDF), which would be used to set an export quota by the Management Authority.

Export of the stocks is associated with the highest risk of instigating further illegal sourcing of timber, rather than putting an end to it. Historically in Madagascar, it has been shown that this alternative does not bear fruit. For example, in September 2009 (Arrêté interministériel n° 38244/2009 du 21 septembre 2009) and October 2009 (Arrêté interministériel n° 38409/2009 du 05 octobre 2009), Camille Vital, the then Prime Minister of the Transitional Government, agreed to 'exceptionally export' hundreds of containers loaded with Malagasy rosewood and ebony in order to reach the 'zero stocks' scenario by the end of 2009. However, as soon as existing stocks were exported, further logging ensued, creating new stocks (Ballet et al. 2010).

CITES listing of rosewood from Belize in 2013—followed by a national moratorium—did not prevent further exploitation or export from Belize—again, mainly to China. During this period, rosewood was concealed in stockpiles and was then inventoried by the Forest Department, which issued an amnesty in order to allow all the rosewood, classified as 'pre-convention wood' to be exported (Wainwright and Zempel 2018).

The speculative nature of stocks and stockpiles gives rise to seemingly insurmountable challenges surrounding their management. The situation with elephant ivory serves well to illustrate the risks involved. Following the global financial crisis in 2008, investments increased in products with high value such as gold and ivory. As durable products with high value, rosewood and ivory make for attractive, high-benefit investments. In the case of ivory, statistics point towards the theory that increased poaching is feeding illegal stockpiles that are being gathered and utilised for speculative purposes. First, the demand in Asia does not correspond with the influx of Ivory (CITES 2010). There is a gap between the estimated quantity of ivory being imported and amount being processed ('t Sas-Rolfes et al. 2014). According to Stiles et al. (2015), the demand for carvings from 2010–2014 in China was for some 9–12 tonnes per year (3–4 tonnes of which was legal and 6–8 tonnes of which was illegal ivory), whereas the quantity available on the China-Hong Kong/Japan market since 2008 has been, on average, in excess of 200 tonnes a year. Furthermore, the ivory carving capacity within China is believed to be insufficient to process all the ivory that has been imported. This imbalance suggests

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that raw ivory is being stockpiled for speculative reasons rather than going directly to the markets where it would be sold in carved (processed) form. Adding to the argument that China's demand for ivory is lower than the quantities that have been imported is the fact that demand for luxury goods in the country has recently showed a decreasing trend (Balwin 2014, Wendlandt 2014). In recent years, ivory has been advertised as a worthwhile investment, along with art. Consequently, there has been—and is—growing investment in ivory and art in China (Gao and Clark 2014). The rosewood volume needed to match the same values of high-end products such as gold or ivory is much higher, but its propensity to deteriorate and thus lose value over time makes rosewood logs a less attractive long-term investment and speculation commodity. Whether or not the logs may deteriorate over time, depends upon where they are kept. However, processed rosewood may be much less susceptible to deterioration. It could be stored as cants or smaller units. It is unlikely that finished products would be stockpiled, because the amount of work which goes into carving, is a significant outlay that most companies would want to offset with rapid sales. For example, a rosewood suite for sale at the Pingxiang Rosewood market in 2014 (priced at US$32 million) was estimated to take a team of 50 carvers 9 years to complete (APFNet and ECTF 2015).

Speculation pertains to the anticipation of future demand, rather than current demand (Knittel and Pindyck 2016). Therefore, it is not how much rosewood the customers currently want that drives total demand, but rather how high the speculators anticipate the demand will be in the future. The continuing increase in Malagasy rosewood exports suggests that the traffickers believe that prices of rosewood will increase in the future. This may be indicative of two things. Firstly, the traders may not believe that the efforts currently underway to decrease the demand for rosewood are credible. Secondly, they may believe that the supply will decrease in the future. If the demand for rosewood remains consistent but supply decreases, then the prices for rosewood will increase.

Conclusions

The continuing debate over rosewood stocks and stockpile conundrum in Madagascar has been pending now for years, clearly alludes to how seemingly insurmountable a challenge it poses for the Malagasy government. Within this crisis, a core issue lies in the structure and network of the various actors involved. According to Naylor (2005), the illegal and the legal operations in any wildlife and forest product-related trade are conducted by the same actors. In Madagascar, powerful operators are intricately linked with the political elite (Randriamalala and Liu 2010, Randriamalala 2013, Anonymous 2018). It is widely hoped that the new government in Madagascar is willing to tackle these challenges of corruption and in-transparency. A way out of the current deadlock is essential in order to avoid further illegal sourcing and depletion of the

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last standing populations of the target tree species.

Two questions need to be addressed: (i) should short-term economic interests be satisfied, i.e., selling the stocks and stockpiles for national or international markets, or, (ii) should an option with a strong conservation message be developed? Destruction of stocks may be the most favourable solution for the existing stocks. However, there is no single, sustainable solution that can resolve the issues surrounding the precious timber stocks. The various approaches put forward are either 'more good', or 'less good'. In the context of high levels of uncertainty and elevated risks, the best option seemingly points to the destruction of all existing stocks and stockpiles, as that could finally end the illegal traffic and immobilise what Nordstrom (2004) refers to as shadow states and networks. However, if Madagascar can actually overcome these barriers and establish a transparent and accountable precious timber sector, then using the existing stocks—and only those—might be a partial solution, with added value benefitting Malagasy artisans. It is widely recognized that replacement of rosewood and ebony resources takes from 80 to 300 years or more, depending on the species. Therefore, sustainable exploitation of these tree species is impossible and their extraction from the forests is similar to that of mineral resources: the "life expectancy" of these resources is considerably higher than that of any political mandate or the duration of forest legislations and decision-making (Randriamalala 2013). Madagascar's rosewood should therefore be treated as a non-renewable, extractive resource. Sustainable forest management is impossible for rosewood in Madagascar under present conditions, or conditions reasonably foreseeable in the medium term. If a country is seriously interested in conserving its biodiversity—which in most cases is located inside of protected areas—then any government (Madagascar included) needs to ensure that no other sectorial changes (e.g., forest or mining sector) will counteract, or potentially undermine, the efforts to protect the environment.

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