Sustainability

By: Aaron S. Allen and Laurence Libin

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Abstract:

Term encompassing issues of respectful management of natural resources and corresponding ecologies so that they endure. Unsustainable depletion of resources through excessive use or misuse, habitat destruction, climate change, and associated cultural and ecological pressures increasingly concerns instrument makers, consumers, and preservationists, leading them to realign values and practices. Sustainability has become an existential problem for societies that rely on vanishing resources, and for plants and animals that interact in ecosystems, which in turn encompass humans. While cultural aspects of sustainability have been considered in many ethnographic and organological studies, ecological implications require further attention.

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Many kinds of instruments have traditionally incorporated materials from now-endangered or threatened species. These animal and plant materials have been exploited for their tonal properties, durability, or other physical characteristics, and for decorative, symbolic, or economic reasons. The efficacy of instruments played in religious or magical rituals, displayed as regalia, or worshipped in their own right can depend on the use of these rare substances, and the value of collectible instruments is enhanced by their presence.

Most organic materials used in instruments do not raise immediate sustainability concerns; examples include byproducts of domestic livestock such as gut used for strings, skins made into drum heads, and wool felted for piano hammers. Similarly, wild crow quills and boar bristles used for harpsichord jacks can be obtained without endangering species. However, the use of some animal products, such as elephant ivory, sea turtle shell, abalone, and certain reptile skins, has contributed to endangering these species.

Many woods and other vegetal substances used in instruments are plentiful or replenishable, but others such as cane and cork of fine quality for woodwinds are becoming scarce and expensive, as is natural rubber, which is vulcanized to make ebonite (an ebony substitute). Fine-grained spruce resonance wood, used for soundboards and in lutherie, is an extremely select product of old-growth forests in limited microclimates, notably the Paneveggio in northern Italy. Similarly, pernambuco (*pau brasil*), the choice wood for Western string instrument bows, is endemic only to particular areas of Brazil's rapidly shrinking Atlantic Coastal Forest. Rosewoods are prized for percussion bars, guitar bodies, and veneers, but like some endangered tropical blackwoods used for woodwinds, their harvesting for export has been linked to criminal organizations. Jackwood is preferred for the Indian *vīṇā*, which traditionally utilized a single piece of a tree that grew in religious precincts and had a bell hung from its branches so that the bell's resonance would permeate the wood; such carefully tended trees no longer grow large enough to meet demand.

Nonrenewable mineral resources include semi-precious stones used for decoration and apotropaic functions, and metals, both common and rare (e.g. tantalum used in electronic components; gold and silver used for plating and ornaments). Lead, extensively used for organ pipes, and mercury, formerly used in gilding, are potentially harmful to the environment. Whether plentiful or scarce, minerals are normally obtained by mining and processed with energy from fossil fuels, with profound environmental and societal consequences that must be factored into long-range sustainability planning.

High environmental and monetary costs, poaching and other unlawful extraction, threats of extinction, and consequent social pressure have led to conservation efforts aimed largely at developing sustainable substitutes for disappearing traditional materials. Organizations such as the African Blackwood Conservation Project, International Pernambuco Conservation Institute, and Global Trees Campaign (SoundWood) have mounted campaigns to limit unreasonable exploitation by instrument makers, and to replenish supplies, for example by promoting reforestation. Recycling of old and scrap materials and conservative restoration of instruments also extend limited resources. Educational initiatives by conservation groups have marshalled scientific and economic evidence helpful in changing the practices of instrument builders, who in turn can inform musicians about the ecological costs of their instruments.

These efforts were given urgency by implementation of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; enforced since 1975), which governs cross-border export and import of protected species listed in three categories: highly endangered and generally prohibited in international commerce; monitored and strictly regulated; and controlled due to protective domestic legislation within a state. Rigorous Customs enforcement of CITES regulations can result in such actions as stripping of ivory from piano keys and refusal to admit instruments being transported without required permits.

The need for relatively inexpensive, durable, and effective substitutes for scarce raw materials, often from distant colonial sources, led in the 19th century to the development of artificial ivory and tortoiseshell. Even earlier, bone and bovine horn replaced ivory in some applications, though initially for reasons of economy and availability rather than concern for elephants' survival. Mammoth ivory, from an extinct species, became increasingly available in the later 20th century as a consequence of thawing permafrost. Celluloid, ivoroid (trademarked as Ivorine, Ivorite, and other names), Sonorite, carbon fibre, fibreglass, synthetic oils and surface finishes, and artificial skins are among modern materials replacing natural ingredients whose extraction at past rates was unsustainable. These substitutes often have superior qualities; for example, use of hard, stable plastic instead of Brazilian rosewood for percussion bars has proven successful tonally, and tough plastic drum heads and nylon strings are ubiquitous. However, synthetics such as plastics and resins derived from petroleum are not necessarily benign.

Use of substitute materials raises practical concerns: for example, celluloid is dangerously unstable; plastic keys can be slippery; and artificial reeds do not exactly replicate the qualities of cane. Also, synthetics are sometimes considered déclassé. No acceptable equivalents for some scarce materials have yet been developed to satisfy professional demands. Nevertheless, responsible instrument makers and players agree that managing natural resources to ensure sustainability outweighs unavoidable compromises in performance and status.

A related issue concerns preserving traditional instrument-making skills in societies that are themselves under threat. Ancient belief systems and cultural practices (such as ritual use of ivory horns) are also endangered by rapid modernization, missionary activity, mismanagement of resources, and other forces inimical to the survival of native cultures. Designating outstanding artisans as living national treasures and documenting their procedures can encourage a crafts survival or retrieval. However, such steps might be impossible in situations involving secrets and taboos and where instruments' musical and societal functions dissolve. Ethnographers have begun discussing the idea of achieving sustainable music cultures.

While all human activities have environmental consequences, understanding and mitigating their impact is part of ethical instrument making, use, and repair. This is especially the case for instruments manufactured in large numbers or incorporating materials from endangered species. Theoretical and practical work continues in addressing the ecological effects of musical instrument production and collecting.

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