Western Ghats

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: India
Inscribed in: 2012
Criteria: (ix) (x)

Older than the Himalaya mountains, the mountain chain of the Western Ghats represents geomorphic features of immense importance with unique biophysical and ecological processes. The site’s high montane forest ecosystems influence the Indian monsoon weather pattern. Moderating the tropical climate of the region, the site presents one of the best examples of the monsoon system on the planet. It also has an exceptionally high level of biological diversity and endemism and is recognized as one of the world’s eight ‘hottest hotspots’ of biological diversity. The forests of the site include some of the best representatives of non-equatorial tropical evergreen forests anywhere and are home to at least 325 globally threatened flora, fauna, bird, amphibian, reptile and fish species. © UNESCO

SUMMARY

2020 Conservation Outlook

Finalised on 02 Dec 2020

This property was inscribed in 2012 amid some controversy, given the difficulty to decide how best to represent the extraordinary biological richness of the Western Ghats. Finally, a network of 39 separately managed sites, grouped in 7 contiguous clusters, was inscribed and efforts are under way to draw these sites together into a cohesive whole (including corridors to ensure wildlife connectivity) that tells the story of the outstanding value of the Western Ghats. There are also proposals and good potential to further extend the property to better express its Outstanding Universal Value, which need to be re-examined within the constraints of the World Heritage Operational Guidelines vis a vis the state's willingness to include new areas that were previously missed out mainly due to administrative reasons. Traditionally conserved by small populations of indigenous people leading sustainable lifestyles, the area is under increasing population and developmental pressure that requires intensive and targeted management efforts to ensure that not only are existing values conserved, but that some past damage may be remediated. The pressure from human populations in this region should not be underestimated: 50 million people are estimated to live in the Western Ghats Region, resulting in pressures that are orders of magnitude greater than many protected areas around the world. Evidence suggests that forest loss, habitat fragmentation, habitat degradation by invasive plant species, encroachment and conversion continues to affect the property. The challenges are many, but the will by both government and non-governmental groups to ensure the conservation of the Western Ghats is high. However, until more data is accumulated (both on conservation trends and protection and management aspects), and given the number and level of threats that this property faces, its
conservation outlook is still assessed as of significant concern.
FULL ASSESSMENT

Description of values

Values

World Heritage values

► Critical habitat for several globally threatened flagship species
Criterion: (x)

A number of flagship mammal species occur in the Western Ghats property, including parts of the single largest population of globally threatened ‘landscape’ species such as the Asian elephant, gaur and tiger. Endangered species such as the Lion-tailed Macaque, Nilgiri Tahr and Nilgiri Langur are unique to the area. The property is also key to the conservation of a number of threatened habitats, such as unique seasonally mass-flowering wildflower meadows, Shola forests and Myristica swamps (World Heritage Committee, 2013; IUCN, 2012; State Party of India, 2010).

► Exceptionally high levels of plant and animal diversity and endemism
Criterion: (x)

The Western Ghats contain exceptionally high levels of plant and animal diversity and endemism for a continental area and protect one of the best representatives of non-equatorial tropical forest. In particular, the level of endemism for some of the 4-5,000 plant species recorded in the Ghats is very high: of the nearly 650 tree species found in the Western Ghats, 352 (54%) are endemic. Animal diversity is also exceptional, at the time of nomination in 2012, the property recorded amphibians (up to 179 species, 65% endemic), reptiles (157 species, 62% endemic), and fishes (219 species, 53% endemic). Invertebrate biodiversity, once better known, is likely also to be very high (for example some 80% of tiger beetles endemic) (World Heritage Committee, 2013; IUCN, 2012; State Party of India, 2010).

► Exceptionally high levels of speciation and evolutionary radiation
Criterion: (ix)

The Western Ghats is an exceptional example of speciation related to the breakup of the ancient landmass of Gondwanaland in the early Jurassic period and to the formation of India as an isolated landmass and the Indian landmass being pushed together with Eurasia. Favourable weather patterns coupled with the high gradients in the Ghats result in high levels of speciation. The Western Ghats is an “Evolutionary Ecotone” illustrating “Out of Africa” and “Out of Asia” hypotheses on species dispersal. A number of plant genera exhibit massive evolutionary radiation (World Heritage Committee, 2013; IUCN, 2012; State Party of India, 2010).

► Large scale biological and ecological processes constituting one of the best examples of a tropical monsoon system on the planet
Criterion: (ix)

The mountains of the Western Ghats and their characteristic montane forest ecosystems influence the Indian monsoon weather patterns that mediate the warm tropical climate of the region, presenting one of the best examples of the tropical monsoon system on the planet. The Ghats act as a key barrier, intercepting the rain-laden monsoon winds that sweep in from the south-west during late summer, enabling Goa, Kerala and parts of Maharashtra to receive copious amounts of rain, and are thus responsible for large-scale biophysical and ecological processes in the western part of the Indian peninsula (World Heritage Committee, 2013; State Party of India, 2010; IUCN Consultation, 2020).
Assessment information

Threats

Current Threats

The fact that so much biodiversity remains in the Western Ghats, given the tremendous population pressure surrounding the property, is extraordinary. Urbanisation together with agricultural expansion, livestock grazing and infrastructure development such as wind- and hydro-power, are posing serious threats to the species and habitats of the Western Ghats. The loss of forest, forest fragmentation and roads, which fragment the landscapes, are greatly affecting connectivity, threatening migrating species including the Asian elephant. The abundance and proliferation of invasive and inedible plants, both native and exotic, reduces the habitat quality for wild ungulates and forces species such as elephants to forage for food in agricultural fields. A large number of threats, which severely threaten the Outstanding Universal Value (OUV) of the property exist, and require coordinated conservation responses at all levels including political, sociological and biological.

▶ Livestock Farming / Grazing

(Livestock grazing)

Forest fragmentation associated with human population increase in Western Ghats is predicted to increase, further shrinking the availability of suitable habitat outside Protected Areas. In addition, competition with livestock reduces the availability of food in remnant habitats for threatened large herbivores such as gaur and sambar (Punjabi and Rao, 2017). Both biotic and abiotic features have contributed to risks associated across landscapes such as anthrax prevalence in high livestock grazing areas (Walsh et al, 2019). Grazing within the property is a threat. Some protected areas have been declared “grazing free” thanks to ecodevelopment projects, largely financed by the Government. However, in other areas grazing remains a visible impact (IUCN, 2012).

▶ Crops

(Agriculture (plantations))

GIS analysis of six broad landuse classes (estates, forests, forest plantations, reservoirs, scrub and settlements) of the Western Ghats landscape suggest more than 93% of forest cover, however, there are areas of non-conservation land uses within the site (settlements; agricultural areas; reservoirs; and plantations – potentially of coconut, rubber, teak, eucalyptus, cardamom, tea, and coffee) (IUCN, 2012). Coffee, one of the most important tropical crops in terms of global trade, is grown in biodiversity-rich rainforest regions including several areas in Western Ghats (Nesper et al., 2017; Chang et al., 2018). Expansion of coffee plantations has been a major threat to forest biodiversity in the region. Coffee Board of India recorded a loss of 30% of the land in Kodagu, Karnataka region to coffee plantation between 1977 and 1997. While the conversion may have stabilised with no new areas being taken up, further intensification and loss of shade bearing tree cover has implications for decline in biodiversity in coffee plantations. This impacts pest and pollinator populations, reduces tree diversity and depletion of important soil nutrients (Molur et al., 2011; Verma et al., 2018). Pesticide use in the coffee and tea plantations is a huge threat to terrestrial and aquatic species (IUCN Consultation, 2020).

▶ Forestry/ Wood production

(Unsustainable collection of fodder, fuel wood and freshwater biodiversity)

Unsustainable extraction of fuel wood, non-timber forest products and freshwater biodiversity continues to remain a threat and varies in its intensity across the serial sites (IUCN, 2012; Molur et al., 2011). Culturally, energy consumption for cooking / additional heating (e.g. for hot water) in rural households of India is mostly based on fuelwood used in traditional stoves. However, overall land use changes with increased rates of farmland conversion and land privatization, thus restricting access to previously
public forest resources for many villagers in the area, has led to overall decline (Simon and Peterson, 2019).

**Tourism/ visitors/ recreation**

Tourism is increasing disturbance to sensitive areas. Massive pilgrimage tourism within the property is of concern (State Party of India, 2010; IUCN, 2012). Tourism has been promoted beyond the carrying capacity of the settlements and has led to scarcity of water, increased sewage and solid waste and forest degradation (Equations, 2011; Kasturirangan, 2013). There is also some evidence that the heritage tag has led to increase in unregulated tourism (Agarwal, 2014) in hitherto unknown areas, such as the Kas plateau in Maharashtra.

**Renewable Energy**

The Western Ghats forms an important watershed for the entire peninsular India, being the source of 37 west flowing rivers and three major east flowing rivers and their numerous tributaries. Western Ghats also receives rains from the southwest monsoon and the average annual rainfall is 2,500mm. However, rainfall is not uniformly distributed on the windward slopes and there are pockets of very heavy rainfall (>4,000mm) and relatively less rainfall (<500mm) and these regimes have also seen fluctuations due to global climate change (Reddy et al., 2018). Fast running rivers and steep slopes have also provided sites for about fifty major hydropower plants in the Ghats (Kasturirangan, 2013), some which are situated in or just outside the property boundaries with the potential for expansion in response to increased irrigation and hydro-electric demand. Similar pressures may arise for wind power generation, with the construction of a number of new windmills (possibly inside the property, or on its boundaries). Since all infrastructure development is subject to environmental impact assessment, the pressure that this infrastructure will have on the Outstanding Universal Value (OUV) of the property is contested (IUCN, 2012; Jumani et al., 2018).

In addition to this, large scale land cover changes have affected the water sustenance in the region, evident from the quantity and duration of water availability during post monsoon period (Ramchandra et al., 2017). It is estimated that due to forest cover loss, water availability will be reduced to around 65% by 2022 in the coastal zones and around 60% in the Western Ghats due to developmental projects such as dams, hydroelectric projects and monoculture plantations (Ramchandra et al., 2017). In 2018, the Ministry of Environment Forest and Climate Change issued an Eco-sensitive Zone draft notification (Aggarwal, 2018). This latest draft proposes an area of 56,825 square kilometres as ecologically sensitive area (ESA) and environmentally destructive activities like mining and quarrying, thermal power plants, red category industries, residential complexes exceeding 20,000 square metres, etc. are to be prohibited in areas that are notified as ESAs. However, hydropower projects, orange category industries and other existing activities are to be allowed (Aggarwal, 2018). The final notification declaring the ESAs is yet to be finalised.

**Fire/ Fire Suppression**

Occasional wildfires occur in the property (State Party of India, 2010). A study in Western Ghats reported forest burnt areas of 1,896 km2 in 2014 (Reddy et al. 2017). Though when analysed for a period of ten years (2007-2017), no significant trends could be derived using MODIS active fire locations for the last ten years (2007-2016) (Reddy et al. 2017). Overall, fires have been reported to impact diversity, but seedling regeneration has shown positive trends post fire incidents and can recuperate if well protected from grazing and trampling (Verma et al., 2017).
Hunting and trapping, Logging/ Wood Harvesting, Collection of non-timber forest products (NTFPs), Fishing / Harvesting Aquatic Resources, Other Biological Resource Use (Illegal hunting)

According to the Indian Wildlife (Protection) Act 1972, only hunting by Nicobar tribes is allowed. Most parts of Western Ghats are legally designated as Protected Areas and the majority of wild animals are also protected as schedule species under the Indian Wildlife (Protection) Act 1972. Hence, the monitoring and curbing of poaching, snaring etc. has improved within the component parts of the property. However, remaining forest patches in the buffer zone are subject to intense poaching pressure, and the growth of populations around protected areas and other forests has led to increasing human-wildlife conflict. Raiding elephants cause crop loss, and tigers and leopards kill livestock. Compensation for farmers is generally inadequate, and wild animals are often killed or injured in an attempt to reduce further damage (CEPF, 2013). Crop raiding wild pigs suffer from retaliatory killing, often by snaring (IUCN Consultation, 2020).

Although poaching pressure in protected areas may have decreased, large herbivores remain vulnerable to poaching for meat, competition with livestock and opportunistnic snaring outside protected areas (Punjabi and Rao, 2017). Nilgiri langur and Lion-tailed Macaque, a Western Ghats endemic primate, have also suffered from illegal hunting (Kumara and Sinha, 2009; IUCN Consultation, 2020).

Avalanches/ Landslides (Climate change and its impact on flagship species)

Deforestation and changes in land use, combined with big variations in the duration and intensity of rainfall, have led to dynamic changes in the landscape. The impact of natural hazards, such as landslides and artificial flooding, have also intensified due to anthropogenic causes, particularly road construction (SWGM, 2010; Kasturirangan, 2013; Padma, 2018; IUCN Consultation, 2020). Western Ghats report a very high diversity due to endemic radiation in amphibians and with over 236 amphibian species recorded of which 215 (over 92%) are endemic (Katwate and Apte, 2018). Though more than 61% of endemic amphibians known from this region are still under the category of Data Deficient (DD) or Not Evaluated (NE) due to lack of information on the population status, distribution, and possible threats to the species (IUCN, 2018; Katwate and Apte, 2018). However, there are studies that indicate climate change has adversely impacted their numbers (Vijayakumar et al., 2019). Batrachochytrium dendrobatidis (Bd) has been known to infect the Critically Endangered Xanthophryne tigerina and Endangered Fejervarya cf. sahyadris in the coastal plateaus of Western Ghats, where the latter are found (Thorpe et al., 2018). Sony et al. (2018) have also reported on some possible impacts of climate change on the Nilgiri Tahr (Nilgiritragus hylocrius).

Invasive Non-Native/ Alien Species, Problematic Native Species (Invasive species)

Invasive alien species are considered as the second major threat to native flora only after habitat destruction (Rao, 2012). The dominant invasive alien species in Western Ghats, based on highest population density, are Lantana camara, Chromolaena odorata, Ageratum conyzoides, Senna tora, Sida acuta, Mikania micrantha, Hypitís suaveolens and Parthenium hysterophorus. Senna spectabilis is also a huge problem in the moist areas of the lower Nilgiris (IUCN Consultation, 2020). High altitude ecosystems, especially shola-grasslands in Western Ghats, are under severe threat due to invasion by Acacia melanoxylon. Shrub species introduced by the British in the Nilgiri grasslands include Cytisus scoparius and Ulex europaeus (IUCN Consultation, 2020). The ecological impact of alien invasions is highest in the Western Ghats part of Gujarat, followed by Maharashtra, Karnataka and Goa (Reddy et al., 2018; Mesta and Hegde, 2018). Invasive species impact 22% of fishes (Molur et al., 2011). Selective logging and encroachment in the past, along with recurrent fires, have led to the proliferation of Ochlandra reed brakes in the gaps, preventing the regeneration of trees (Giriraj et al., 2008).
To appreciate the scale of human pressure in the Western Ghats there are an estimated 50 million people living in this region (Kasturirangan et al., 2013). The growth of populations around protected areas and other forests has led to increasing human-wildlife conflict. Pressures on the region’s natural ecosystems are intensifying, driven by economic development, population growth and rising demand for power, agricultural commodities and minerals (CEPF, 2013; Gadgil et al., 2011; Kasturirangan et al., 2013; Bharucha et al., 2010; D’Souza, 2020). Residential and commercial development is one of the highest threats to freshwater biodiversity (Molur et al., 2011). Land use change continues to affect the property and is attributed to human development pressure stemming from changing economic opportunities. A 2016 study of land use cover change in Neyyar Wildlife Sanctuary in the furthest south Agasthyamalai cluster shows evergreen forest loss of 10% (likely converted to scrubland due to disturbance) in the period 2001-2015. Similar forest degradation trends have already been reported earlier in specific areas of Western Ghats (Vijayasoorya et al., 2016). Geospatial analyses of forest cover change across Protected Areas in Western Ghats resulted in recording overall loss of evergreen forest from 33.46% (in 1973) to 27.22% (in 2016) in Kudremukh national Park, while Bandipur Tiger Reserve lost deciduous cover from 61.69% to 47.3% due to mining, horticulture plantations and human habitations during the same time period (Ramachandra et al., 2018).

Although most mines have been excluded from the property, there remain mining concerns in Sindhudurg in Maharashtra. Similarly, Kudremukh National Park has a large iron-ore mine in the centre, which, although the State Party has re-confirmed that “no mining occurs at present”, holds the potential to be reactivated. An additional concern is the liability of mine rehabilitation, which in this case was reported to be the responsibility of the park on land which has been returned to the park (an area of 5,000 ha). All mines within the property require rehabilitation (IUCN, 2012). A newspaper article reports “In the past few years quarrying and sand mining have also encroached into parts of the Ghats” (Rao, 2014), although it is not clear if this occurs within the property or elsewhere in the Ghats. Mining is cited as a major threat, especially as negative externalities are not sufficiently addressed (Gadgil et al., 2011). The main threats impacting freshwater biodiversity are pollution from mining and other industries, habitat destruction and flow modification caused by dams. Energy production and mining impact 6% of fishes, 5% of molluscs and 4% of freshwater plants overall (Molur et al., 2011). As noted above, the report of the High Level Working Group (HLWG) recommends a ‘non-tolerance policy’ with activities like mining or polluting industries (Kasturirangan et al., 2013).

In Western Ghats, the greatest loss due to forest fragmentation has been to the migrating herds of Asian elephants (Midha et al., 2018). The Brahmagiri–Nilgiris–Eastern Ghats population range covers over 12,000 km2 across Karnataka, Kerala and Tamil Nadu, and holds a minimum population of 6,300 elephants. The Nilambur–Silent Valley–Coimbatore population range, with an estimated population of 956 elephants, is spread across Tamil Nadu and Kerala. This range still maintains tenuous links with the Brahmagiri–Nilgiris–Eastern Ghats population across the degrading Kallar corridor. The Anamalai–Parambikulam range is located south of the Palghat Gap, and extends over 5,500 km2 with an estimated population of 2,500 elephants. The Periyar–Agasthyamalai range extends over 5,600 km2 and has an estimated population of 1,800 elephants covering Tamil Nadu and Kerala (Midha et al., 2018; Ravisankar et al., 2019). But the connectivity between Anamalai-Parambikulam and Periyar-Agasthyamalai is broken for all large mammal species. Even the connectivity between Periyar and Agathyamalai is broken for species such as lion-tailed macaque, gaur and elephant (IUCN Consultation, 2020). All this, and the delay in implementing management recommendations, leads to unmanageable trends in land-use pattern, traffic intensity, human–elephant interface, and escalation of costs for management options like land acquisition and engineering structures such as flyovers or ‘elephant
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Other Ecosystem Modifications  
(*Loss in Forest cover*)  
High Threat  
Outside site  

Western Ghats has tropical wet evergreen, semi-evergreen, moist deciduous, dry deciduous and shola forests. The dominant forest type is semi-evergreen forest, which occupies 21,678 km² (35.2%) of the total forest area of Western Ghats, followed by wet evergreen forest (30.6%), moist deciduous forest (24.8%), dry deciduous forest (8.1%) and shola (1.3%). From 1975 to 2013, the spatial extent of forests was reduced with about 6.9% of dry deciduous forests, 6.1% of shola, 2.6% of moist deciduous forests, 2.3% of semi-evergreen forests, 1.4% of wet evergreen forests (Reddy et al., 2016; Reddy et al., 2018). Overall, the area deforested from 1920 to 2013 has been estimated at 35.3% of the total forest (Reddy et al., 2016). However, no net loss of forest area was recorded for the period 2005-2013 (Reddy et al., 2016).

Renewable Energy  
(*Promotion of wind farms as source of renewable energy*)  
Low Threat  
Outside site  

India, an emerging economy, is the world’s fourth largest producer of wind energy and has one of the most ambitious renewable energy expansion targets as part of the Paris Climate Agreement. It plans to triple its existing renewable energy installation base from 59GW to 175GW by 2020 and wind energy is expected to contribute 60GW to this energy transition (Lakhanpal, 2019). The wind power project may lead to loss of tillable agricultural land for farmers, and forced displacement. The project construction phase require acquiring large tracts of land, clearing forest areas, felling of trees, cementing an access road from the lower Ghats to the project site, widening of the access road to allow for wind turbines and construction of a power sub-station and linear transmission lines for power evacuation (MoEF, 2011). The post construction ecological threats are likely to have cascading ecological effects and the reduction in overall abundance of predatory birds, bird mortality and increased noise pollution are currently underestimated (Thaker et al., 2018).

Potential Threats  
Low Threat  

Ongoing pressures for development will continue to place the property under high threat. Reports of proposed expansion and upgrades of industrial developments and power production in areas surrounding the property have the potential to impact on the property given its context within a region of 50 million people. Climate change will probably exacerbate a system already under pressure.

Mining/Quarrying  
(*New/expanded mines, coal fired or hydroelectric installations*)  
Low Threat  
Outside site  

While in theory these should not impact the Western Ghats as new mines and hydroelectric installations would not be allowed in the property itself as per the draft Eco-sensitive zonation, there still remains the possibility that they could be developed around the property. There are reports of proposals to expand coal-fired and hydro-power stations, as well as potentially polluting industrial operations (petrochemical and fertilisers) nearer to Western Ghats, which could then impact the property. Similarly, the location of the renewable energy project on the outskirts of Protected Areas necessitates a renewed focus on the conservation politics related to wind power and renewables projects (Adani Power Ltd, 2015; MoEFCC, 2015; Lakhanpal, 2019).

Overall assessment of threats  
High Threat  

The fact that so much biodiversity remains in the Western Ghats, given the tremendous population pressure both within and surrounding the property, is extraordinary. A large number of threats, which severely threaten the OUV of the property, exist and require coordinated conservation responses at all levels including political, sociological and biological. Ongoing pressures for development such as new road constructions and broadening of existing roads, and power production will continue to place the property under high threat. Urbanisation together with agricultural expansion, livestock grazing
and forest fragmentation are also posing serious threats to the species and habitats of the Western Ghats. Climate change will probably exacerbate a system already under pressure and has the potential to impact on the large scale monsoonal processes, which influence the Western Ghats.

**Protection and management**

**Assessing Protection and Management**

**Management system**

All the National Parks and Wildlife Sanctuaries within this serial site are managed as per the prescriptions of their individual approved management plans and Reserved Forests are managed in accordance with their individual approved working plans (State Party of India, 2010). However, these management plans vary from area to area and have prescriptions only to be managed as the category of Protected Area to which it belongs. The duration of each management plan may also vary. The overarching management system of the multi-stakeholder Western Ghats Natural Heritage Management Committee was supposed to guide the management of the property as a whole, but this is yet to be finalised (State Party of India, 2012), and effective coordination of management across the multiple components of the serial site remains a challenge. In spite of these shortcomings, protected areas of Western Ghats are showing a positive trend for biodiversity conservation. Irreplaceable forests with high vulnerability have been reported for ten protected areas in the Western Ghats i.e. Kalakad-Mundanthurai Tiger Reserve, Shendurney Wildlife Sanctuary, Periyar Wildlife Sanctuary, Neyyar Wildlife Sanctuary, Parambikulam Tiger Reserve, Chinnar Wildlife Sanctuary, Anamalai Tiger Reserve, Kurinjimala Wildlife Sanctuary, Eravikulam National Park and Periyar Tiger Reserve (Reddy et al., 2018; IUCN Consultation, 2020).

**Effectiveness of management system**

The Management Effectiveness Evaluation (a global framework to evaluate the performance of protected areas) was undertaken for Protected Areas (PA) during the period of 2009-2010, out of which five PA belonging to the Western Ghats serial site were included (MEE-WII, 2015). Kudremukh National Park, Karnataka, was evaluated between 2012-2013 and the community participation and zonation within the PA and better engagement for community participation was flagged. A phased programme for prioritized rehabilitation of enclaves and afforestation of mining areas were highlighted. Eravikulam National Park and Shendurney Wildlife Sanctuary, Kerala, were evaluated during 2006-2009 and poor staff strength and lack of funds were a cause of concern. Silent Valley National Park, Kerala, was evaluated during 2009-2010 and the management zonation and increasing manpower were highlighted. Relevant research projects needed to be translated into management actions. Peppara Wildlife Sanctuary, Kerala, was evaluated between 2012-2013 and completion of the management plan and habitat restoration were suggested as actionable points. For the remaining sites, the MEE is yet to be carried out.

**Boundaries**

The boundaries of the 39 component parts within the serial site are well protected as they are governed under a number of protection regimes, ranging from Tiger Reserves, National Parks, Wildlife Sanctuaries, and Reserved Forests, although some areas within the boundaries have previously been impacted through anthropogenic modifications. All components are subject to stringent protection under laws including the Wildlife (Protection) Act of 1972, the Indian Forest Act of 1927, and the Forest Conservation Act (1980). It is also noted that the State Party proposed to add an additional five components in the State of Goa, totalling 74,518 ha, as a minor boundary modification before the 41st meeting of the WH Committee; however, the State Party was invited to re-submit the proposal as a new nomination for a significant boundary modification instead (UNESCO, 2017).
Integration into regional and national planning systems

The site is part of the Protected Area network and administered by respective forest departments under National laws including the Wildlife (Protection) Act of 1972, the Indian Forest Act of 1927, and the Forest Conservation Act (1980). Ministry of Environment Forest and Climate Change Govt of India is the overarching national agency that is responsible for monitoring the World Heritage site as a single entity. There is though a need to integrate multiple designations (including heritage site inscription) into a single management approach. Further, the overarching management system of the multi-stakeholder Western Ghats Natural Heritage Management Committee was supposed to guide the management of the property as a whole, which is yet to be finalized (State Party of India, 2012).

Relationships with local people

In the larger sociocultural and geographical context, the Western Ghats hold immense importance for millions of people of southern India (Sinding-Larsen and Larsen, 2017). The Western Ghats are home to a large number of tribal communities living in close proximity to rich biodiverse landscapes, having evolved location-specific and innovative livelihood strategies based on their traditional knowledge (Sinding-Larsen and Larsen, 2017). Moreover, many of the cultural practices of the tribal communities of the Western Ghats are closely interlinked with its natural heritage (Ray, 2019). However, there are some concerns regarding participation and engagement of local communities. Although all 39 component parts in the Western Ghats serial site have participatory mechanisms in place through Village Eco-Development Committees (VEDCs), and the management system supports participatory governance schemes; issues of power negatively influence the eco-development efforts, wherein poor and marginalized people are often inadequately represented or/and unable to influence the decision-making process.

Legal framework

The 39 component parts of this serial property fall under a number of protection regimes, ranging from Tiger Reserves, National Parks, Wildlife Sanctuaries, and Reserved Forests. All components are owned by the State and are subject to stringent protection under laws including the Wildlife (Protection) Act of 1972, the Indian Forest Act of 1927, and the Forest Conservation Act (1980). Through these laws, the components are under the control of the Forestry Department and the Chief Wildlife Warden, thus the legal status is considered adequate. 40% of the property lies outside of the formal Protected Area system, mostly in Reserved Forests, which are legally protected and effectively managed. The Forest Conservation Act (1980) provides adequate regulatory framework to protect them from infrastructure development. The Reserved Forests are extremely important to protect the property’s values and for connectivity. For example, 2014 research into the population status of the endangered Lion-tailed Macaque in Kalakad-Mundanthurai Tiger Reserve noted the critical importance of Reserved Forests in facilitating the movement of these primates within the overall protected area network of the landscape (Sushma et al., 2014). However, concern regarding various pressures including agricultural, industrial and infrastructure development remains (IUCN, 2012).

Law enforcement

The property is variably staffed with trained manpower, and only some details on infrastructure and manpower are available (MEE-WII, 2015). Challenges to effective enforcement also remain variable and localized due to high population pressure on the property and its fragmented configuration.

Implementation of Committee decisions and recommendations

Recommendations at time of inscription (2012): to take into account the outcomes of scientific studies of institutes specialized in the field, and their recommendations; to ensure proactive tourism management in anticipation of increased future visitation, and to ensure that visitation remains within the capacity of the property; to ensure any proposed infrastructure developments are subject to rigorous prior impact assessments, to determine if they are appropriate; and to establish improved coordination and integration between the components, particularly through the preparation and
implementation of an overarching management plan or framework for the serial property as a whole (Decision 36COM 8B.10). At the time of this 2020 assessment, no State of Conservation reports have been undertaken for the property and no information is available regarding the progress of implementing these recommendations.

▶ Sustainable use

Some Concern

All 39 component parts in the Western Ghats serial site have participatory mechanisms in place through Village Eco-Development Committees (VEDCs), JFMCs (Joint Forest Management Committees) and the management system supports participatory governance schemes. Similarly, under the Biological Diversity Act, 2002, the National Biodiversity Authority mandates the formulation of people's biodiversity registers (PBR) to ensure protection against biopiracy and to provide legal cover for the intellectual property rights and natural resources of local communities. As per the website of National Biodiversity Authority, PBRs have been prepared for sites in Karnataka (2093), Kerala (1034), Maharashtra (14833), Tamil Nadu (1049), however, further access is unavailable to correlate them to the inscribed sites in Western Ghats. There are though still some concerns about forest loss through conversion and degradation, as well as continued development pressure, in areas surrounding the property (Vijayasoorya et al., 2016).

▶ Sustainable finance

Data Deficient

Funds are made available from budget allocations in Central and State budgets and other centrally sponsored schemes for all site elements of each Sub-cluster (State Party of India, 2010). Government funding mechanisms (both at national and state government levels) provide a more reliable source of funding to sustain and scale up community-based conservation actions than grant funding or philanthropic donations. Consolidated figures were unavailable at the time of the 2020 assessment.

▶ Staff capacity, training, and development

Mostly Effective

Staffing at professional, technical and maintenance levels for the entire property includes Divisional Forest Officer/ Assistant Conservator of Forest (28); Ranger Officer (58); Deputy Ranger (35); Forester (238); Guards (757) and Watchers (125), adding up to a total of 1,241 staff for the entire property (State Party of India, 2010). As such the manpower is variably distributed with some sites being adequately staffed whereas others being short of trained manpower especially at the forest frontline level (MEE-WII, 2015). Some training is provided, however, the challenges of effective enforcement remain high due to the high population pressure on the property and its fragmented configuration.

▶ Education and interpretation programs

Mostly Effective

Interpretation centres and nature education and awareness camps have been designed to sensitize visitors towards nature and to appreciate conservation initiatives. These facilities vary depending on the extent of tourist flow in each of the site elements (State Party of India, 2010).

▶ Tourism and visitation management

Some Concern

Visitor facilities include accommodation in inspection bungalows and dormitories (State Party of India, 2010). There are some concerns about tourism development in areas surrounding the property and increasing pressure and disturbance to sensitive areas (Stakeholder Consultation, 2016). There is a need to manage visitor numbers in some areas, to ensure these remain within the carrying capacity of the site and its related resources and infrastructure.

▶ Monitoring

Some Concern

The Management effectiveness evaluation (a global framework to evaluate the performance of protected areas) was undertaken for Protected Areas during the period of 2009-2010, out of which five Protected Areas belonging to the Western Ghats serial site were included (MEE-WII, 2015). It is expected that this will continue in a phased manner.

Monitoring of key indicators including five mammals, one tree species and Myristica swamp habitats has been proposed (State Party of India, 2010), but no information is available on its progress. Despite a lack of systematic monitoring programs for many species, some of the site's Outstanding Universal
Value (OUV) and species are being monitored through various research projects, such as land use and forest cover (Ramachandra et al., 2018; Reddy et al., 2016), flora (Rao, 2012), freshwater biodiversity (Molur et al., 2011), insects (Sondhi et al., 2018; Sreekumar et al., 2018; Sujitha et al., 2019) and mammals (Kumara and Sinha, 2009; Midha et al., 2018; Sony et al., 2018). However, trends are not clear or evident across all taxa and more systematic surveys are needed, and research also needs to be translated into policy actions.

**Research**

Extensive research is being carried out at individual sites and some of the most relevant up to date literature has been provided in the reference section. Several Centre of scientific research in India support the property such as WII and the National Tiger Conservation Authority (NTCA) (State Party of India, 2010).

**Overall assessment of protection and management**

While it is very difficult to assess the overall protection and management of the property due to the lack of an integrated management and monitoring approach, a Management Effectiveness Evaluation (a global framework to evaluate the performance of protected areas) has been undertaken for some of the component parts of this serial site and it is expected to continue for future cycles. Further, each of the 39 component parts of the property has its own management system and protective measures mandated as per national laws. The issue of functional corridors and protection of buffer zones are expected to get a boost after final notification of the eco-sensitive zone. However, some concerns still remain regarding inadequate engagement with local communities and shortages of trained staff in some areas, leading to challenges with effective enforcement and protection against development pressures.

**Assessment of the effectiveness of protection and management in addressing threats outside the site**

Politically, the entire Western Ghats is extremely difficult to protect and manage given the large number of different stakeholders operating in the area, the complexity of governance arrangements and the fact that 40% of the original forests have already been destroyed. Functional corridors that assure wildlife movement between protected areas are required and this is a great lacuna in the conservation scenario in Western Ghats and India as a whole. Corridors have been identified, but no sustained and sincere efforts have been taken to establish them. One such example in Western Ghats is the Ariankavu corridor between the Periyar-Agasthyamalai landscapes. The protection and management challenges are compounded by high population pressure and the appetite for development, as well as the apparent weak integration of the site’s management with broader national, state and local development planning.

**State and trend of values**

**Assessing the current state and trend of values**

**World Heritage values**

**Critical habitat for several globally threatened flagship species**

The Western Ghats is key to the conservation of a number of threatened habitats, such as wildflower meadows, Shola forests and Myristica swamps (IUCN, 2012). Several of the flagship species have been well researched and their conservation status ascertained to understand their distribution in the Western Ghats (Sony et.al. 2018, Reddy et.al.2018, Thorpe et.al. 2018). Long ranging mammals such as
Asian elephants have also been radio collared and their movement patterns within and outside Protected Areas are fairly well understood (Midha et al. 2018). However, globally endangered species such as the Asian elephant, gaur and tiger are likely dependent on the larger landscapes of the Western Ghats (IUCN, 2010). Functional corridors that assure good connectivity for wildlife movement between Protected Areas are required, but forest fragmentation associated with human population increase in Western Ghats are shrinking the availability of wildlife corridors and suitable habitats outside Protected Areas. Pressure from surrounding urbanisation, industry and infrastructure development such as wind- and hydro-power, are impacting the integrity of the Western Ghats. Habitat destruction and flow modification caused by dams are some of the biggest threats to freshwater biodiversity (Molur et al., 2011). Although no net loss of forest area has been recorded in recent years (Reddy et al. 2016), more systematic surveys of habitats and flagship species are needed, and research needs to be translated into policy actions.

**Exceptionally high levels of plant and animal diversity and endemism**

The property contains exceptionally rich numbers of species and very high levels endemism across many taxa. Some surveys have been undertaken, but trends are not clear or evident across all taxa. As has been noted, the persistence of these levels of biodiversity is remarkable given the high population pressure of the region. Conservation awakening in the entire landscape is one major reason for this persistence. However, limited data and systematic surveys make it difficult to assess trends, but for the moment the values remain intact.

**Exceptionally high levels of speciation and evolutionary radiation**

The property has large biogeographic scale significance related to the breakup of continents and high levels of speciation and evolutionary radiation among several taxa. Data is lacking for several of the flagship species making it difficult to assess trends, but it appears that these values remain the same as when the property was inscribed.

**Large scale biological and ecological processes constituting one of the best examples of a tropical monsoon system on the planet**

This value pertains to the influences of the Western Ghats on the entire Indian sub-continent. With climate change, this value could deteriorate, but it will take a very long time to ascertain a trend rather than annual fluctuations. For now, the current state is the same as when the property was inscribed.

**Summary of the Values**

**Assessment of the current state and trend of World Heritage values**

While the state of World Heritage values in the property was considered as good at time of inscription and appears to remain so, there is some concern regarding threats from outside the site. The current state and trend of values is difficult to assess with certainty due to the lack of any integrated data. The nomination identified several indicator species for monitoring and provided some distribution maps, however, this was for a relatively small number of species. The capacity for monitoring within the property is high and priority should be given to gaining a more comprehensive understanding of the conservation status of key biodiversity, ecosystems and evolutionary processes in the property.

A number of flagship mammals, including parts of the single largest population of globally threatened ‘landscape’ species occur in the property. These require functional corridors for migration between the component parts of this serial property. However, fragmentation caused by development pressure in the Western Ghats are shrinking the availability of wildlife corridors and
suitable habitats outside Protected Areas. Proposals to extend the property offer good potential to augment the values and ensure improved connectivity across this linear system. Climate change has the potential to impact the large scale monsoonal processes, which influence biological and ecological processes of the Western Ghats.

Additional information

Benefits

Understanding Benefits

▶ Pollination

Honey is produced within the protected areas and the property is an important reserve for other pollinators.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - Moderate, Trend - Increasing
- Habitat change: Impact level - Moderate, Trend - Increasing

▶ Soil stabilisation

The steep and other forested slopes provide soil stabilisation, protection from erosion and ground-water renewal.

Factors negatively affecting provision of this benefit:
- Habitat change: Impact level - Moderate, Trend - Continuing

▶ Carbon sequestration

Large size of forested area provides significant carbon sequestration and improves local impact.

Factors negatively affecting provision of this benefit:
- Habitat change: Impact level - Moderate, Trend - Increasing

▶ Contribution to education

Many of the components have educational centres or even schools inside the property for the local population.

▶ Outdoor recreation and tourism

Beneficiaries include local and regional businesses that rely on tourism, and the tourists themselves.

▶ Collection of resources for the pharmaceuticals industry,
Collection of medicinal resources for local use,
Outdoor recreation and tourism,
Natural beauty and scenery

Tourism has increased since inscription and has largely benefited the local people through additional income. Awareness of the ecological importance of Western Ghats has also increased especially among urban youth and children. Local people are allowed to collect medicinal plants and minor forest produce in the property though it is variably permitted depending upon the component’s PA designation.

Factors negatively affecting provision of this benefit:
- Climate change: Trend - Continuing
- Pollution: Trend - Continuing
- Overexploitation: Impact level - Moderate, Trend - Decreasing
- Invasive species: Impact level - Low, Trend - Increasing
- Habitat change: Trend - Continuing

**Wilderness and iconic features**
Some of the component parts include sacred groves, waterfalls and/or mountains

**Sacred natural sites or landscapes**
Recent research has demonstrated the importance of sacred groves in the northern parts of Western Ghats (Blicharska et al., 2013)
Factors negatively affecting provision of this benefit:
- Habitat change: Impact level - Low, Trend - Increasing

**Access to drinking water**
Local communities living within the property use water provided by the site. Large dams (e.g. Koyna Dam within Koyna Wildlife sanctuary) are either managed as being done prior to inscription or ceased to function.
Factors negatively affecting provision of this benefit:
- Overexploitation: Impact level - Moderate, Trend - Increasing

**Livestock grazing areas**
Some livestock grazing and fodder collection is allowed for local populations within the property.

**Collection of wild plants and mushrooms**
Local people are allowed to collect wild food plants, mushrooms and medicinal plants in the property.
Factors negatively affecting provision of this benefit:
- Overexploitation: Impact level - Moderate

**Direct employment**
Provision of revenue and jobs through park management, tourism and small enterprises.

**Summary of benefits**
The greatest benefit of the property is the safeguard of an enormous number of endemic species found nowhere else in the world, many of which would disappear if they did not occur in a protected area. The property also provides important ecosystem services, ensuring water quality and soil stabilization. With the sacred sites situated within the property, as well as a wealth of wildlife and spectacular scenery, the property provides important spiritual as well as tourism benefits. The component parts generate employment through park jobs as well as tourism and local enterprises such as the collection of medicinal plants and fruit, and honey production.

**Projects**

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<th>Organization</th>
<th>Brief description of Active Projects</th>
<th>Website</th>
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<td>1</td>
<td>CEPF</td>
<td>See CEPF portfolio of projects</td>
<td><a href="http://www.cepf.org">www.cepf.org</a></td>
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<td>2</td>
<td>ATREE</td>
<td>Ashoka Trust for Research in Ecology and the Environment, Bangalore. Administers CEPF grants but also has its own projects.</td>
<td><a href="http://www.atree.org/sglist">http://www.atree.org/sglist</a></td>
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<td>4</td>
<td>Agumbe Rainforest Research Station</td>
<td>Agumbe Rainforest Research Station (ARRS) is a permanent field station of the Madras Crocodile Bank Trust, located on a 4.5 acre site, in the middle of Someshwara Wildlife Sanctuary and Agumbe Reserve Forest; approximately 1.5 km from Agumbe village, in Shimoga District of Karnataka. ARRS pioneered in radio telemetry studies for the king cobra by radio-collaring two snakes and now continue their work in a wide variety of research, ranging from rainforest ecology, behavioral and population ecology, hydrology, phenology, canopy studies, geo-informatics and socio economics. ARRS also play a vital role in conservation education.</td>
<td><a href="http://agumberainforest.org/arrs/projects/">http://agumberainforest.org/arrs/projects/</a></td>
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<td>5</td>
<td>Institut Français de Pondichéry</td>
<td>The French Institute of Pondicherry (IFP), UMIFRE 21 CNRS-MAEE, is a research institution under the joint supervision of the French Ministry of Foreign Affairs and the French National Centre for Scientific Research (CNRS). It is an integral part of the network of 27 research centres connected to this Ministry. It is also part of the Research Unit USR 3330 “Savoirs et Mondes Indiens” of the CNRS, along with the Centre de Sciences Humaines (CSH) in New Delhi.</td>
<td><a href="https://www.ifpindia.org/projects-list">https://www.ifpindia.org/projects-list</a></td>
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<td>6</td>
<td>Salim Ali Centre for Ornithology and Natural History</td>
<td>SACON came into being at a time when the twin issues, namely the sustainable use and conservation of natural resources, figured in the global agenda. Realizing the indispensability of a holistic approach in avian studies and conservation, the major objectives of SACON have been envisaged encompassing the entire natural history with ornithology at the centre stage: To design and conduct research in ornithology covering all aspects of biodiversity and natural history; To develop and conduct regular courses in ornithology and natural history for M.Sc., M.Phil. and Ph.D. and also, short term orientation courses in the above subjects; To create data bank on Indian ornithology and natural history; To disseminate knowledge relating to ornithology and natural history for the benefit of the community; To confer honorary awards and other distinctions to persons who have rendered outstanding services in the fields of ornithology and natural history.</td>
<td><a href="http://www.sacn.in/ongoing/">http://www.sacn.in/ongoing/</a></td>
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<td>7</td>
<td>Institute of Environment Education and Research, Bharati Vidyapeeth (Deemed to be University) (BVIEER)</td>
<td>A unique educational and research institution, the faculty and students of BVIEER are engaged in projects and programs that have led to influencing environment policy and implementation of environment education at school and college level along with strategies for Protected Area Management especially in Western Ghats.</td>
<td><a href="http://ieer.bharatividyapeeth.edu/index.php">http://ieer.bharatividyapeeth.edu/index.php</a></td>
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<td>8</td>
<td>Nature Conservation Foundation</td>
<td>Nature Conservation Foundation’s primary goal is to contribute to the knowledge and conservation of India’s unique wildlife heritage with innovative research and imaginative solutions. Some of their projects in Western Ghats include landscape level conservation planning for elephants, Lion tailed macaque, leopard, hornbill species and ecological restoration in agroforestry plantations.</td>
<td><a href="https://www.ncf-india.org/western-ghats">https://www.ncf-india.org/western-ghats</a></td>
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<td>SWGM (2010). On the move to Another development in Western Ghats. A programme to support Save Western Ghats Movement to advocate for the rights and livelihoods of people in Western Ghats. Save Western Ghats Movement, Keystone, and The Swallows, India, Bangladesh. 13 pp.</td>
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