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Ecological Restoration in Gautam Buddha's Birthplace Lumbini

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Abstract

The historical information about natural vegetation of Lumbini is not clearly known. Modern day human colonization around Mayadevi temple could have been intensified after Khadga Samsher's visit to Lumbini in 1896, followed by the eradication of Malaria in the Tarai of Nepal around the 1950s. The dense human settlements around the Mayadevi temple (place where Buddha was born) was gradually shifted outside the area of Lumbini Development Trust (LDT) (16 x 4 km2 area), and the area was planted with a huge number of plant species. Hence, the forest within LDT is essentially a secondary forest without a scientific method of forest management (only plantation), as a result some species were not able to get naturally established and disappeared gradually. Studies indicated that there were around 354 species of plants species in LDT (Siwakoti, 2008) however, a recent vegetation survey (Tiwari, 1919) recorded only about 250 species including 39 tree species and other herbs and shrubs (the data is being produced, and needs second round survey to confirm). Some very common plant species have not been found from the region, indicating the heavy anthropogenic pressure including construction activities, grazing, fire, and plantation of trees without knowing microhabitat have taken the toll, and also by the encroachment of alien and invasive plant species both in terrestrial and aquatic environment. It is quite important to update the biodiversity, study regeneration of plant and animal species and management of invasive species in order to restore the natural ecosystems of Lumbini to develop it as both a sacred pilgrimage site and nature reserve. Ecosystem conservation and reintroduction at LDT could be done by following the strong reliance of Gautam Buddha's teaching about nature and life.

Keywords: Lumbini, ecosystem, restoration, heritage, biodiversity, conservation

Introduction

The exact environmental condition of Lumbini during the Buddha's time is still largely unknown and has remained mysterious although the archaeological sequences remain well preserved and present a history stretching back to C.1300 BCE. It is of great interest to know how the surrounding environment might have motivated Siddahrtha to become Gautam Buddha. Various historical annals have mentioned that Siddartha was born in a green lush, quiet and sacred garden of Lumbini (27029'47.8" N & 83016'59.8" E) which lies in the Rupandehi district of central Nepal's Tarai lowland (approx. 150 m asl) region with a typical tropical type of climate and vegetation. The mean maximum temperature in the area is 360 C

during May, mean minimum temperature is 80 C during January and the annual precipitation is about 1700 mm.

The Lumbini Garden is located some 13 km west from Bhairahawa city, the headquarters of Rupandehi district. It is a birthplace of the Buddha, a holy site of pilgrimage for the Buddhists and peace loving people of the world and also recognized as a World Heritage Site in 1997. Buddhist literatures mention that the newly born prince Siddhartha (Buddha) had taken seven steps and uttered some precious words as an epoch-making message to the suffering humanity. It happened in the beautiful *Sal* (Shorea robusta) grove of lush green trees where queen Maya Devi gave birth to the Buddha in 623 BC during that time she took support of the branch of a tree (Brochure, Lumbini Development Trust). There are different views about the identification of the birth tree; some authorities claimed it as an *Asokha tree* (Saraca asoca), whereas others as *Sal tree* (Shorea robusta), Mango tree (Mangifera indica), *Pipal tree* (Ficus religiosa), Banyan tree (Ficus benghalensis), Black berry (Syzygium cumini), etc. (Bidari, 1995). The ancient monuments and records are the witness to glorify the Lumbini as a birthplace of the Lord Buddha. The history of the area between the 15th to 19th centuries is not clear. It had remained neglected and the surrounding vicinity had changed the beautiful garden into cultivated land. Until about 3 decades ago, the area was occupied by cultivated lands and settlements but after the initiation of Lumbini Development Project in 1970 the settlements have been shifted and developed greenery by planting over 3,71,182 tree saplings (Khan & Yoshino, 1995). *Dalbergia sissoo* is the major planted species (about 295,000 saplings) followed by *Shorea robusta, Syzygium cumini, Acacia catechu, Azadirachta indica, Tectonia grandis, Eucalyptus citridora, Callistemon citrinus, Anthocephalus sinensis, Albizia spp., Magnifera indica*, etc.

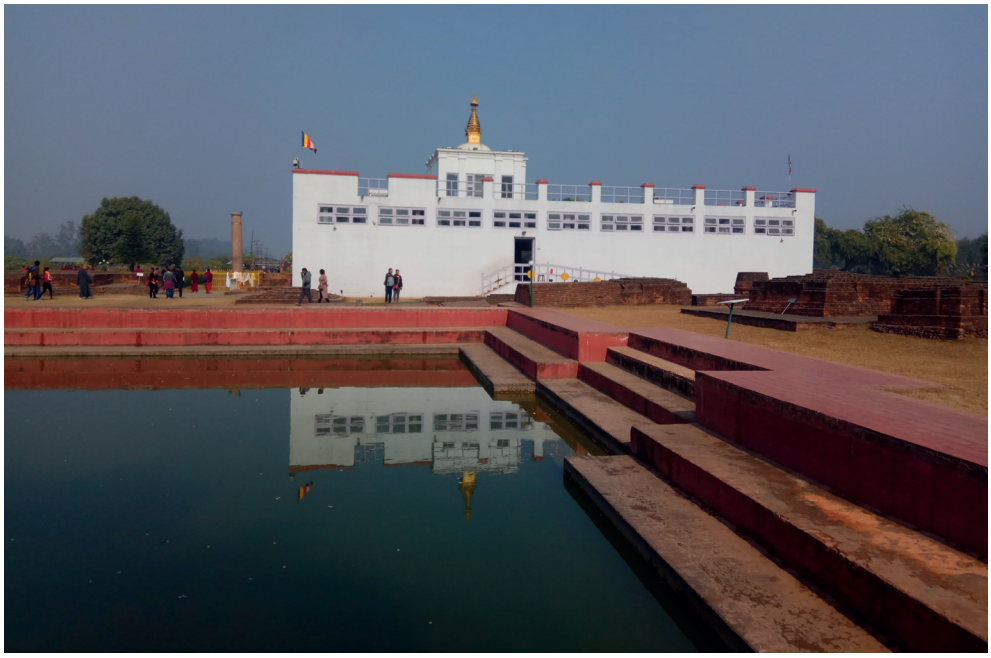

Figure 1: *Beautiful view of Mayadevi temple, Mayadevi pond & Ashoka pillar at Lumbini (Photo collection: A. Tiwari, January 2019)*

Materials and methods

Field data were collected from the Lumbini Development Trust (LDT) zone. We recorded and collected all naturalized plants during the transect walk which was carried out along the forested as well as non-forested areas within the LDT area. For the practical purpose, we divided the transect survey in three zones, Lumbini sacred garden zone, Monastery zone and Crane Sanctuary zone. The collected herbarium specimens of all the plant species (excluding the very common plants) were identified and reconfirmed with the help of standard literature Hooker (1872-1897), Hara et al. (1978), Hara and Williams (1979), Hara et al. (1982), Flora of Bhutan (Grierson & Long, 1983-2001; Noltie, 1994-2000; Pearce & Cribb 2002), Stainton (1972), Polunin and Stainton (1984), Stainton (1988), Wu et al. (1994-2008). We have also observed different ecosystems within the LDT area and reviewed their ecological environment.

Further, we reviewed published and unpublished literature dealing with issues related to Lumbini. Literature was searched by using some key words like Lumbini, the Buddha, history of Lumbini, and history of Nepal. In this study literature published (also conference proceeding, abstract, thesis, projects) up to the end of August 2018 is incorporated. Similarly, for ongoing research, those studies which were recently carried out with LDT are also included.

Discussion and results

Plant diversity in Lumbini

We identified and enumerated all plant species scientifically mentioning their correct scientific name, local name, genus and family. Our study (Tiwari, 2019) enumerated 255 species of flowering plants. Previous study indicated that there were around 354 species of plant species in LDT (Siwakoti, 2008), the reduction in number could be due to the study in a single season. We emphasize that the flora studies should be carried out in different seasons in order to have a complete study of Lumbini flora. Interestingly some very common plant species of the ecological belt have not been found in LDT area, indicating the heavy anthropogenic pressure (construction activities, grazing, fire, and plantation of trees without knowing microhabitat have caused the disappearance or annihilation of these floras; and also by the encroachment of alien and invasive plant species both in terrestrial and aquatic environment. Hence it is quite critical to manage the natural ecosystems of Lumbini to develop it as both a sacred pilgrimage site and nature reserve. Ecosystem conservation and reintroduction at LDT could be done by following the strong reliance of Gautam Buddha's teaching about nature and human life.

The invasion of plant species is also one of the key factors for threatening plant diversity of Lumbini among different disturbing factors. We reported more than 23 invasive plant species in Lumbini. The number of invasive and alien plant species (IAPS) that we reported in LDT is very close to the total number of IAPS (26 species) reported in Nepal (Shrestha, 2019) showing that the plant invasion in tropical region of Nepal is growing in the recent years and Lumbini is not an exception. Fourteen species of invasive and alien plants were reported from Parsa National Park (627.39 km2) in central Nepal (Chaudhary et al., 2020), similarly, Bhatta et al. (2020) reported 12 IAPS from Bardiya National Park (968 km2) in Nepal which is bigger than Parsa National Park. In this context, 23 IAPS reported from LDT (64.5 km2) is a very high number in terms of plant invasion. We can clearly see the higher impact of IAPS to the natural ecosystem of the LDT region in the future; hence, it is critically important

to address the issues of invasive plant management in the region.

Nature and Buddhism

Lumbini is one of the most sacred places in the world, and people around the globe have developed different visions over centuries about the place where Gautam Buddha was born. However, there are some common understanding in certain attributes and characteristics regarding Lumbini. The Gautam Buddha is not only the Light of Asia but also the light of modern human civilization. Buddhism philosophy talks much about nature and life; however, there still exists antagonistic approaches within Buddhism. 'Pro-Civilization Strand' sees nature as something disagreeable and full of danger and wilder for comfortable living and, hence, developed cities with ideal living conditions, whereas 'Hermit Strand' (full compliance to nature) advocates time in solitude in nature where every living creature is valued as an important component of ecosystem, and is preserved and restored (Schmithausen, 1991). Hence the 'Hermit Strand' concept in association with Buddhist ethos of not killing any living creature and of compassion and benevolence has been described as the main crux of Buddhism and nature.

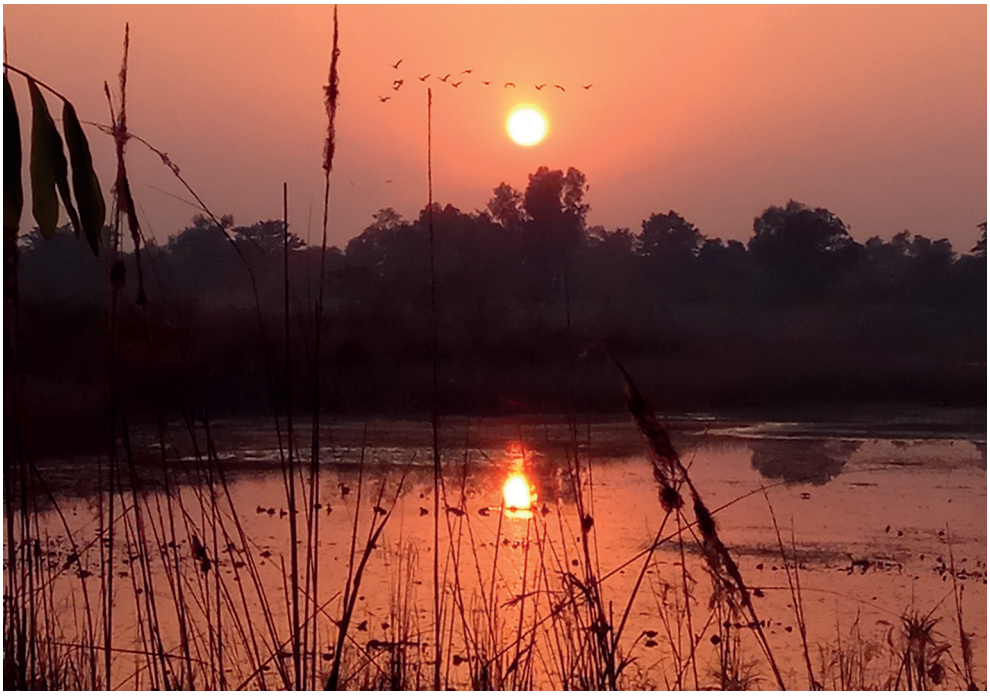

Figure 2: *A panoramic view of Sun set in Lumbini*
(Photo collection: A. Tiwari, January 2019)

Buddhism and the Lord Buddha's teaching can be regarded as a science of human living since long ago. As modern science deals with proof or evidence-based studies, Buddhist eternal teaching requires 'proving before believing' by an individual and hence understanding the basic rationale of Buddhism enables one to not only understand the basics of many scientific explanations but also many social science theories in politics and economics. The understanding of both Buddhism and science is complementary in order to enable any individual to live a full and meaningful human life in today's market economy driven world

which is full of competition, chaos and conflicts.

The Lord Buddha's teachings are more relevant in today's world than they were about 2500 years back. The economic developments all over the world are increasingly dictating the direction of development at the cost of rampant environmental degradation and loss of biological diversity. However, few Buddhist countries have followed the teaching of the Lord Buddha on leading life along the middle path or the 'noble eightfold path' is a teaching on making choices in life for sufficiency and moderate living, choices which will produce sustainable use of our natural resources that are depleting at an alarming rate. Modern biologists (Prof. Andy Purvis at the Natural History Museum in London, Peter H. Raven at Missouri Botanical Garden, St. Louis and many) have already warned of 6th mass extinction of species due to modern climatic and land use changes, here the Buddhist teaching and modern realization converge; we can no longer senselessly overexploit our resources without sustaining them for the future generations.

The current environmental problems at global or local level are mainly due to anthropogenic causes associated with over-exploitation of resources and excessive emission of noxious gases and effluents. These activities are basically guided by people's making choices based on desire and greed for maximization of return of benefits and excessiveness in one way or another. In this context, the understanding of the Buddhist teaching could greatly help to redirect these trends towards sustainable development for the benefit of humanity as a whole. It has already been evident from the ecological footprints of Buddhist countries, being distinctly modest as they are several fold less than those of developed countries of the world. Most of Buddhist nations do not even use the full ecological capacity available to them despite their poverty, when their counterparts are exceedingly ecologically overshot as a percentage of sustainable level. In the backdrop of growing consumerism and capitalism fuelled by highly developed economics in the post-globalization era, the Buddhist philosophy about nature conservation and right to live for all provides immense inspiration for conserving nature and biodiversity for the sustained future on earth.

Ecological restoration in Lumbini

Lumbini is a Buddhist pilgrimage centre, where the archaeological remains associated with the birth of the Lord Buddha forms a central feature. Lumbini has been inscribed as a World Heritage Site since 1997, and is declared as "Fountain of World Peace" by World Buddhist Federation (1988 December) because of its immense historical and archeological importance (Bhatt, 2006). The restoration of ecology of the Lumbini region is essentially a complicated task because it has to be managed both as a pilgrimage destination and touristic site (Karki, 2005). People of various dimensions of human life and religion are very much interested to visit Lumbini, ranging from adherent Buddhist monks and people of various religions just for recreation purposes. LDT official resources indicated that a large number of visitors of very young age visit Lumbini every year. It is indeed a great opportunity for Lumbini to teach the visitors about humanity and nature as described by Buddhism; so that the visitors would feel eternal peace, tranquility and great reverence to Mother Nature which supports our living on the Earth.

Ecological restoration in Lumbini is essentially important for its sustainability. We can see the greater interest of national and international bodies for the sustained development of Lumbini as the birthplace of Lord Gautam Buddha. It is clear that the problems on development

of Lumbini have already been identified, and we only need commitment for its development. Sometimes, the Kenzo Tange Master Plan (Kenzo Tange is a Japanese architect who was hired to draw up the master plan for LDT is stigmatized as the epitome of moratorium in action in Nepali management system (Rai, 2007). However, it is good news that the remaining development as per the master plant is going to be completed very soon.

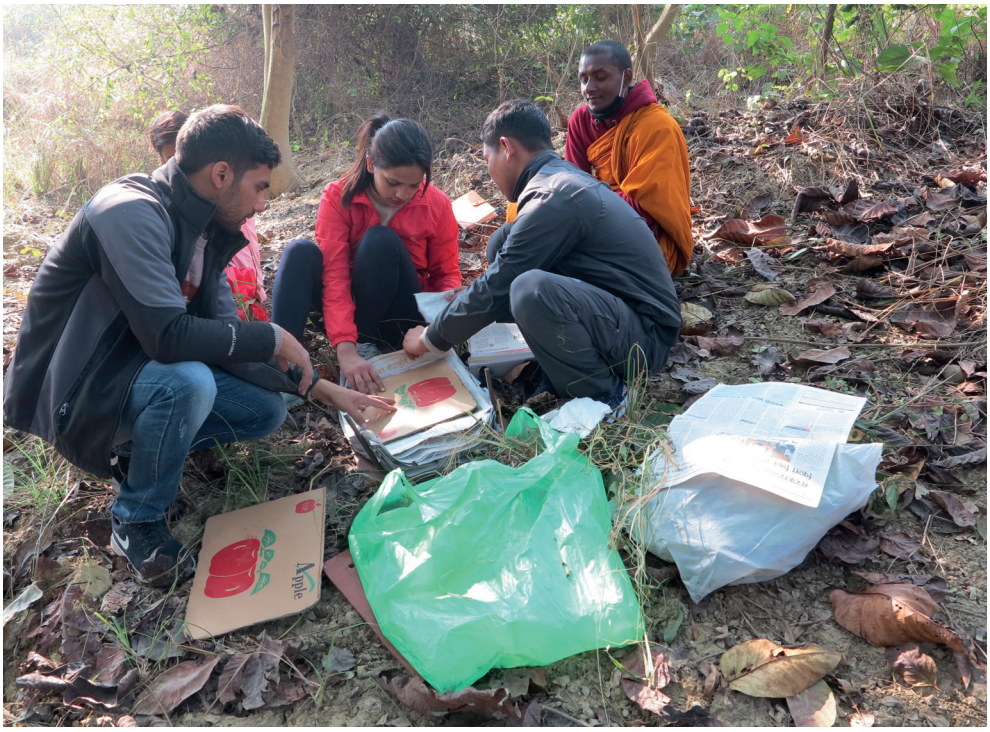

Figure 3: *Students collecting plant specimens during plant documentation (Photo collection: A. Tiwari, January 2019)*

Lumbini has to be developed both as a sacred pilgrimage site for Buddhist practitioners from all over the world and as a learning place for every human about the Buddha's philosophy on nature and life. Hence, the ideal environment of Lumbini requires it to be clean, green, and spiritual. Further, people come to Lumbini to see nature, forests, wetland, birds, animals, butterflies living in close harmony of nature where life of every individual is secured (Rai, 2006). The Buddha's life and enlightenment are closely related to plants and animals. There are stories on which tree he was born, he meditated for such a long time, he got enlightened. Sarus Crane is the tallest flying bird on earth, which is very closely related to the Buddha's enlightenment and his first teaching about right to live, and Lumbini is one of key habitats of Saras Crane (Aryal, 2004; Dahal, 1995). Hence, ecological restoration is of immense importance in Lumbini to teach people about nature and to develop Lumbini as an important destination to visit, stay and for getting enlightenment.

Conservation challenges in Lumbini

Many people may not know that the area of LDT now was dense human settlements with many villages until late 80s, they were gradually evacuated to outer areas of LDT and LDT started ecological restoration in Lumbini. After Kenzo Tange's master plan was implemented

in Lumbini after the 1980s, ecological restoration began, and the chunk of forests as we see inside LDT today is essentially a secondary forest planted for restoration of at least 60 % green zone as described in Kenzo Tange's plan. One should not forget that planting trees does not work for scientific ecological restoration, this can clearly be seen in the case of Lumbini. The data showed that millions of seedlings and saplings were planted in the LDT area, without prior adequate knowledge of the climate, microhabitat, plant physiology and rapidly changing climate in the region. In the name of restoration, only plating trees went on rather than managing forests and trees. Large number of planted tree species can no longer be seen in Lumbini, because they were not planted scientifically and they were not given adequate attention after plantation.

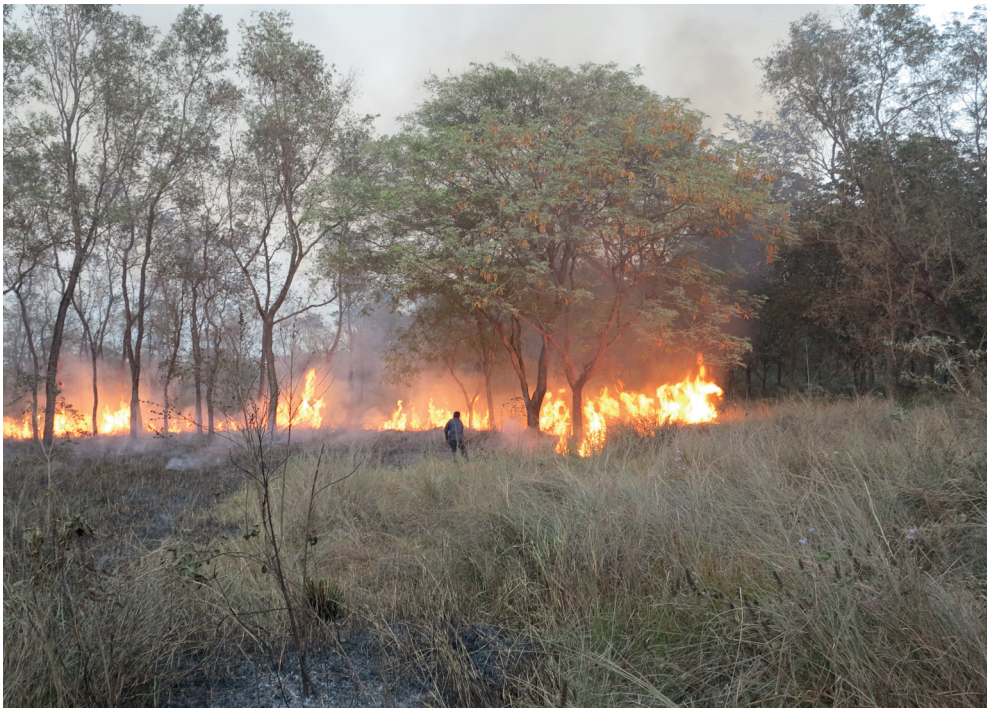

Figure 4: *Forest fire in Lumbini 8th January 2019*
(Photo collection: A. Tiwari, January 2019)

As has been observed in the recent visit to Lumbini (January 1-10, 2019) during plant survey in the LDT area, we have seen various ecological problems of ecological restoration. Wrong preferences of tree species for plantation, lack of proper care for planted trees, grazing of livestock, illegal collection (firewood, grasses), forest fire in winter and pre-monsoon season, plastic pollution, dumping of fungicides and increased vehicular movement inside LDT (even in brick paved footpath) all are posing greater threats to ecological restoration.

There are of course other challenges associated with livelihood of local people in Lumbini as it is fully surrounded by villages, and most villagers still rely on forests of LDT for their survival, because most of them used to be the residents of villages within LDT before they were resettled outside. Hence, more attention is needed to train local people if Lumbini is to be developed, they will be definitely privileged in the other way rather than from the limited resources from the small forest patches of Lumbini.

Figure 5: *Invasive plant species Michania Micrantha challenging the growth of teak (Tectona grandis) tree in Lumbini*
(Photo collection: A. Tiwari, January 2019)

Figure 6: *A lady taking firewood and grass from Lumbini, and the wetland full of water hyacinth invasion*
(Photo collection: A. Tiwari, January 2019)

Conclusion and recommendation

It is very important to recognize that plant diversity is a key foundation for supporting natural ecosystems. Maintenance of plant diversity is the cornerstone of developing Lumbini as per Kenzo Tange's master plan. It is also equally important to recognize the threatened ecosystems around Lumbini due to habitat loss and degradation, unsustainable development works, pollution, alien plant species invasion, and climate change. The current state of the art has been able to prevent the extinction of any plant and animal species, In situ conservation in protected areas and other sustainably managed habitats, and through seed banks, cryopreservation and live plant collection, Ex situ conservation to protect all known rare and endangered species in Lumbini. It should be strictly monitored and implemented that the destruction causing extinction of any known plant species is unforgivable at least within the premises of Lumbini Development Trust. The LDT region as it stands today has all the possibilities to be developed as a unique nature sanctuary that integrates expertise, experience and skills, and resources into effective plant and animal protection, and enables effective integration between scientific research, landscape gardening, conservation, and public education. For example, thousands of waterfowls, eagles, storks, and cranes fly down from Mongolia and Siberia to the wetlands of the Tarai in Nepal; many land in the wetlands of Lumbini garden and enhance the ecological value of the region. The rampant disposal of solid wastes should be strictly prohibited as they have largely impacted natural ecosystems in the region. We could initiate the planting of local plants within the LDT area, and also could introduce tree species which could help restoration of birds, insect pollinators and other life forms. The wetlands of Lumbini are extremely important for bird and aquatic life; hence the invasive plant species should be controlled in order to save ecosystem health.

The regular monitoring of biodiversity (flora and fauna) of Lumbini is very important for proper management. The reference materials (posters, brochures, hooding boards) could be used to educate visitors about the local biodiversity in the region. We could initiate the campaign of restoration of natural ecosystems in Lumbini including forests, grasslands, wetlands which ensure the conservation of biodiversity in the region. Moreover, the Buddha's philosophy of life should be highlighted through wise management of biodiversity in the region so that the visitors could take home a message about loving and caring Mother Nature.

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