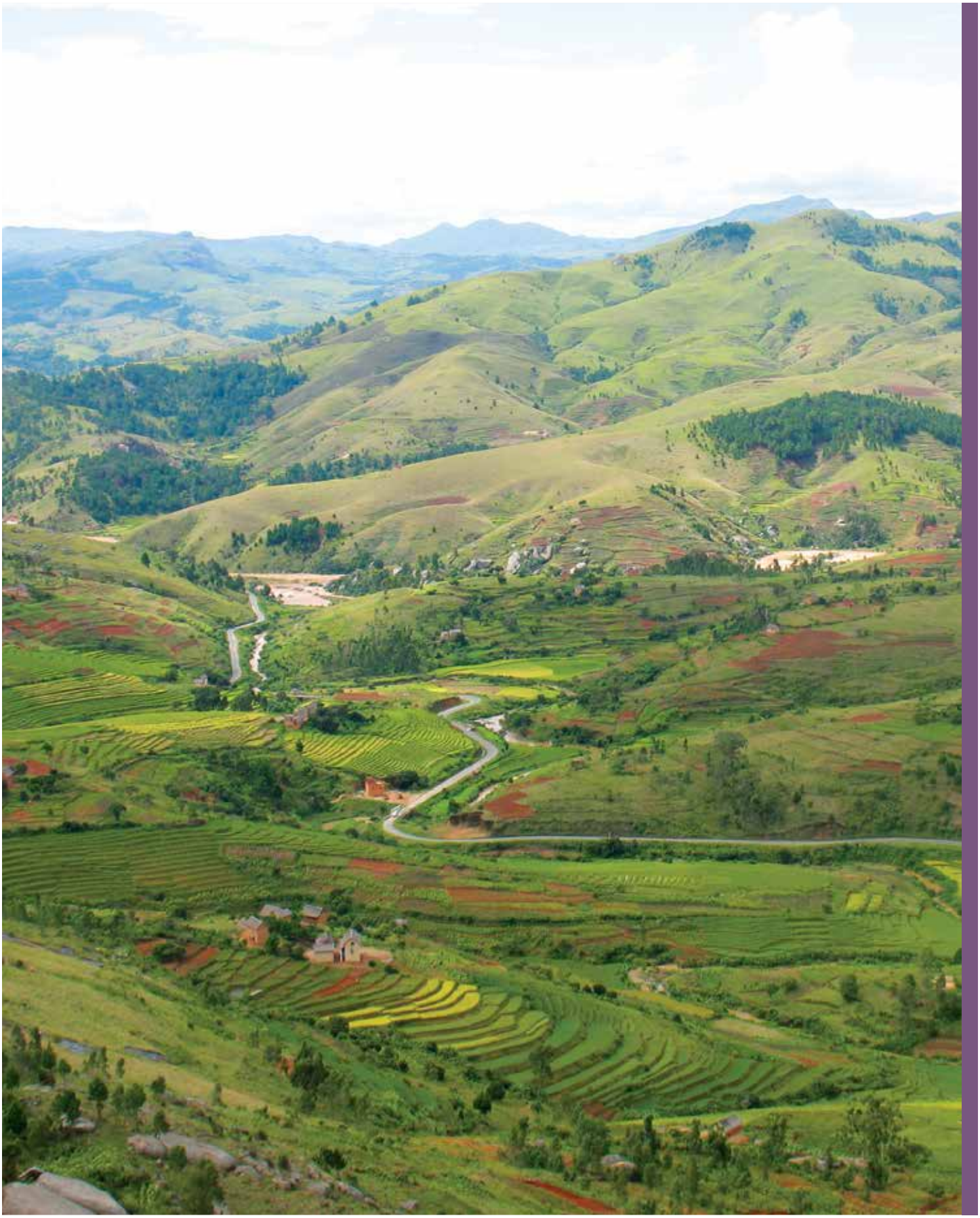
Plant Conservation and the Sustainable Development Goals:

a policy paper prepared for the Global Partnership for Plant Conservation

Suzanne Sharrock,
Botanic Gardens Conservation International, UK,

and

Peter Wyse Jackson,
Missouri Botanical Garden, U.S.A.



Abstract

The Global Strategy for Plant Conservation (GSPC), with its 16 plant conservation targets was originally adopted by the Parties to the Convention on Biological Diversity (CBD) in 2002. It was updated and revised in 2010, with targets set to be achieved by 2020. The GSPC's targets are output oriented, specific and measurable. They address the conservation needs of wild plants as well as those of cultivated crops, pastures and forests. Although it is generally acknowledged that greater progress has been made in conserving threatened plants than would have been made without the GSPC, there is a continued lack of mainstreaming plant conservation at the national level and a lack of comprehensive information on which plants are threatened and where. With the GSPC reaching the end of its second phase in 2020, it is important to consider how plant conservation can enhance its visibility and generate support in the future. The 2030 Sustainable Development Agenda and associated Sustainable Development Goals (SDGs) were developed to succeed the Millennium Development Goals and were adopted in 2015 by the international community through the United Nations. It is expected that the SDGs will shape the actions taken by governments in the future. This paper reviews and highlights the contribution that plant conservation can make to achieving the SDGs The SDG framework provides a helpful point of reference to demonstrate the fundamental importance of plants for the planet, and importantly, if plant conservation is not achieved then the achievement of these goals is put at risk, suggesting that the integration and mainstreaming of biodiversity conservation, ecological restoration of degraded ecosystems and plant protection in particular, are of fundamental importance to the achievement of sustainability on the planet.

This paper was presented and reviewed at a conference of the Global Partnership for Plant Conservation on the theme 'Plant Conservation and the Sustainable Development Goals (SDGs)' held on 28–29 June 2016, organized by the Missouri Botanical Garden, St Louis, U.S.A. and held in collaboration with the Secretariat of the Convention on Biological Diversity (SCBD) and Botanic Gardens Conservation International (BGCI). Published in *Annals of the Missouri Botanical Garden* 102(2), 2017.

The photographs in this paper were taken by staff and associates of the Missouri Botanical Garden and reflect various aspects of the Garden's global conservation and capacity building work. The locations and programs represented include Madagascar, Peru, Vietnam, and Turkey. For more information about science and conservation at Missouri Botanical Garden, please visit mobot.org/plantscience.

Background—the need for a focus on plants

The publication of the 1997 IUCN Red List of Threatened Plants which documented almost 34,000 plant species (12.5% of the world's known vascular flora at that time) under threat globally was a key milestone in raising awareness of the crisis facing the world's plant diversity. By 1999, expert botanists were warning that as many as two-thirds of the world's plant species could be in danger of extinction in the 21st century. This led to a resolution from the XVI International Botanical Congress in St Louis, USA calling for a new international initiative for plant conservation. As a result, a draft plant conservation strategy was prepared by the botanical community in consultation with a range of international and national stakeholders. This became the Global Strategy for Plant Conservation (GSPC), with its 16 targets to be achieved by 2010. In 2002 the GSPC was adopted unanimously by the Parties to the Convention on Biological Diversity (CBD), marking the first ever adoption of international targets for biodiversity conservation by the global community. In 2010, the CBD Parties adopted revised and updated targets to 2020 (Annex 1).

The scope of the GSPC

The GSPC's 16 targets, while wide-ranging and broad-based, also aimed to be output oriented, specific and measurable. The targets required both species and habitat-based actions, considering both natural and managed landscapes. They addressed the conservation needs of wild plants as well as those of cultivated crops, pastures and forests. The GSPC targets also addressed the sustainable use of plant genetic resources, linking the GSPC to human livelihood issues and the achievement of other related international targets and goals. Supporting actions related to education, public awareness, networking and capacity building. While the targets were adopted as a 'flexible framework' to guide national approaches to plant conservation, it was recognised that achievement of the targets at the global level would require a unique combination of actions at both national and international levels. In adopting the GSPC, Parties to the CBD were encouraged to adopt GSPC-related targets at the national level.

Benefits of a target-driven approach

At the time of its adoption, the GSPC represented the only set of internationally agreed targets for biodiversity conservation (Wyse Jackson, 2001). It provided a framework for action that was rapidly adopted by many botanical institutions (particularly botanic gardens) and other plant conservation orientated organisations. The GSPC acted as an accessible entry point for many individual institutions to engage with the CBD, highlighting where and how individual plant conservation actors could contribute to the broader biodiversity agenda.

The targets provided a clear focus for activities and stimulated the development of new and innovative approaches in an effort to achieve them. Institutions with a particular interest in plant taxonomy, such as the Royal Botanic Gardens Kew and the Missouri Botanical Garden, focused on Target 1 and in 2010 they were able to launch the Plant List—the first ever synonymised list of the world's plant species. Plantlife International focused its efforts on Target 5 (Important Plant Areas), while Target 8 was widely adopted by botanic gardens around the world as a target for individual and collective *ex situ* conservation efforts, monitored by Botanic Gardens Conservation International.

By 2010, it was clear that the GSPC had been successful in mobilising the botanical community around a common theme involving some, if not all the GSPC targets. It was also generally acknowledged that significantly more progress had been made in many areas of plant conservation than if the GSPC had not been there.

National responses

Although the GSPC targets had proved very successful in stimulating individual institutional action and taking forward plant conservation aims, relatively few Parties developed national responses to the GSPC in the form of national plant conservation strategies or the development of national targets. Most Parties sought to achieve plant conservation within the context of their National Biodiversity Strategies and Action Plans. This often indicated a continued lack of 'mainstreaming' of plant conservation at the national level.

In the lead up to 2010, consultations with the Parties revealed continued support for the GSPC and a desire to take an updated set of GSPCs targets forward to 2020. However at the same time, the CBD's Strategic Plan for Biodiversity and its associated Aichi Biodiversity Targets were also under development. In 2010, an updated GSPC was adopted, and in an effort to give greater focus to plant conservation at the national level, it was emphasised that the GSPC should be implemented within the framework of the Strategic Plan for Biodiversity and that the GSPC targets should be incorporated into updated and revised National Biodiversity Strategies and Action Plans (NBSAPs). To date, however, with some notable exceptions, relatively few countries have done this and specific plant conservation activities continue to be poorly integrated into national biodiversity policies. The resulting inadequate linkages between on-the-ground plant conservation actions and governmental reporting processes means that inspiring activities and encouraging progress towards GSPC targets are often not fully captured in national biodiversity reports.

The reasons for this lack of mainstreaming of the GSPC targets are not entirely clear. It may be in part because much plant conservation action is undertaken within the non-governmental and academic sectors (universities etc.), and also because national biodiversity conservation efforts are often managed by environmental, forestry and agricultural ministries, that may lack a specific botanical focus or expertise. Such governmental bodies often prefer to concentrate on protected areas development and management and the biodiversity legislative and regulatory framework. It may also be in part because many Parties do not specifically connect the importance of plant conservation to national economic development priorities or even to general environmental protection efforts.

The current situation

A review of progress towards the GSPC target was carried in 2014 (Sharrock et al.), indicating that only Target 1 (A World Flora Online) was on track to be achieved by 2020. However, progress is being made towards most of the other targets, but not at a sufficient rate to achieve the targets by 2020. Concern was expressed by the Parties over the lack of progress, particularly with respect to Targets 7 (*in situ* conservation), 10 (invasive species) and 15 (capacity building).

The review indicated that having a specific plant-focused strategy in place has been successful at some levels. It has provided a focus for action at institutional and, in some cases, at national levels. It has brought the plant conservation and botanical community together and allowed common goals and targets to be developed across this community.

Nevertheless, because the GSPC has not been widely acknowledged and implemented at the national level, plants are still neglected in the broader biodiversity and sustainability debate. Lack of available data compared to other components of biodiversity (mammals, birds, amphibians etc.) means that plants are rarely used as indicators of the status of biodiversity and policy makers and the public generally remain blind to the fate of plants.

This is particularly concerning at a time when reports indicate that at least one in five plant species are threatened with extinction and only 5% of all plant species have been assessed for their conservation status at the global level (RBG Kew, 2016). Therefore, despite 14 years of having a specific conservation strategy in place for plants, and one which has been adopted by almost all of the world's governments, large gaps still exist in our information on which species are most at risk and therefore where, and on what species to focus conservation action.

While we can point to a diverse array of excellent plant conservation tools, methodologies, approaches, procedures and initiatives, many of which were developed during the lifetime of the GSPC (www.plants2020.net) efforts to apply them at national and local levels has been, at best, patchy. It is perhaps the failure of the achievement of GSPC targets on education and awareness of plants and their value to humanity, present and in the future, that has led to continued difficulties in raising the profile and support for urgent plant conservation globally.

With the GSPC reaching the end of its second phase in 2020, it is important to consider how plant conservation can enhance its visibility and generate support in the future. In a world where countries are committed to achieving an increasingly complex array of strategies and agreements, careful consideration needs to be given to determining what will be the best approach to ensuring successful plant conservation outcomes in the post-2020 era. Clearly a review is required of whether continuing with a separate strategy for plants is the best or only approach. Could such a strategy be more effectively linked to the achievement of other targets and strategies? If the approach going forward is radically changed from the current framework, and the GSPC is not extended, would it put at risk the current engagement of so many botanical institutions with the CBD? Could it jeopardise some of the gains already made? The Strategic Plan for Biodiversity and Aichi Biodiversity Targets have made some progress in mainstreaming biodiversity concerns into broader societal, economic and development processes. Of particular note has been the way that biodiversity issues have been linked with and incorporated into the Sustainable Development Goals, adopted through the United Nations in September 2015. Reframing the GSPC in the context of these Goals and reaffirming the links between human sustainability and plant conservation may be the best option going forward, particularly if CBD implementation after 2020 adopts a similar approach.

Plant conservation and the 2030 Sustainable Development Agenda

The 2030 Sustainable Development Agenda and associated Sustainable Development Goals (SDGs) were developed to succeed the Millennium Development Goals and were adopted in 2015 by the international community through the United Nations. With 17 goals and 169 targets, the SDGs recognise the inter-relationships between human development and the environmental, economic, social and political context in which it occurs. It is expected that the SDGs will shape the actions taken by governments in the future.

To this end, the remainder of this paper is devoted to reviewing and highlighting the contribution that plant conservation can make to achieving the SDGs –both in general terms for each Goal and as a specific contribution to individual targets under the Goals.

It is notable that some aspects of plant use, sustainability and plant conservation are highlighted by particular SDGs that are not currently specifically addressed in the GSPC.

An overview of links between the GSPC targets, the Aichi targets and SDGs is provided in Annex 2.

SDG 1
End poverty in all its forms everywhere

Millions of people around the world depend directly on wild plant resources for at least part of their livelihoods, be it for food, medicine, building materials, fuelwood or financial income. This is especially true of those living in poverty, particularly in the rural regions of many developing countries. Natural habitats and the wild plants they contain often provide the backstop for communities against famine, shortage or poverty, and play vital roles in supporting livelihoods and well-being. Rarely, however, is local community use of wild plant resources managed in a sustainable manner, so that the resources on which they rely, particularly in times of greatest need, are often being lost. The impacts of climate change and population growth both effects greatly in such situations, making a difficult and dangerous situation often even more critical.

Nevertheless, wild plant diversity used sustainably provides a wide range of options to reduce poverty. As an indication of the value of wild plant resources, wood removals from forests have been valued at just over US$100 billion annually between 2003 and 2007, with around two-thirds of all harvested timber coming from natural or semi-natural forests (FAO, 2010). The cosmetics and perfumery trade is another major user of wild plant resources with global sales in 2011 for the 'natural cosmetics' sector of the personal care industry valued at some US$26.3 billion. The new market segment for 'natural' or 'botanical' ingredients is growing in Europe by 20% each year.

It is of course essential to ensure that it is the poor and most vulnerable that benefit from the use of wild plant resources. Issues such as land ownership and equitable and fair access to resources therefore need to be addressed. Strict conservation measures that aim to protect wild areas from overuse may in practice exclude local people from access to important plant resources, about which they may often hold important traditional knowledge and have developed long-term customary uses. This is addressed through Target 1.4 of Goal 1:

> Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of poverty, inheritance, natural resources, appropriate new technology and financial services, including micro-finance.

Possible plant conservation actions towards SDG 1 could include:

- Studies and model demonstration projects, particularly at community levels, to illustrate, validate and evaluate the contribution of wild plants to human livelihoods in order to inform policy makers.
- Carry out threat assessments of socio-economically important wild plants to guide conservation action.
- Assist indigenous people and local communities to document and safeguard traditional knowledge and practices so that they remain available to support sustainable plant use.

SDG 2
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Plant diversity, in the form of crop species and varieties, provides the majority of the world's people's needs for food, as well as supplying a vast range of other crop and cultivated resources for such purposes as fuel, medicines, fibres, timbers, ornament and much more. With plants being the basis of food systems around the world, access to plant diversity is an essential factor in ensuring improved nutrition and sustainable agriculture.

Of particular relevance to plant conservation activities are two targets:

> Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

> Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

Significant efforts are already underway to ensure the conservation of plant diversity, through the implementation of GSPC Targets 8 and 9, with these targets being directly relevant to the achievement of SDG Target 2.5. The deployment

of genes from wild plants, particularly crop wild relatives, will be essential in achieving SDG Target 2.4. A gap analysis of the coverage of CWR in genebanks as a baseline has been completed, but more work is need for other wild plants.

Target 2.5 is a crucial entry point for botanic gardens to contribute to the SDGs, through their *ex situ* collections.

Possible plant conservation actions towards SDG 2 include:

- Complete a review of the status of *ex situ* plant collections and the distribution of seed banks around the world.
- Further research on the conservation of genetic diversity of species, linking plant conservation, agriculture and forestry.
- Work towards the achievement of GSPC Targets 8 and 9.

SDG 3
Ensure healthy lives and promote well-being for all at all ages

This Goal is closely related to Goals 1 and 2, with sustainable income and good health being components of general well-being. While access to plant diversity can contribute to well-being through opportunities for poverty alleviation and ensuring food security, it also contributes to healthy lives. It is well known that many plants are used either directly as medicines, or form the basis of derived medicines. Indeed it is estimated that one in eight plants (around 45–50,000 species) have a medicinal use. According to the UN's Comtrade database (http://comtrade.un.org/db/),in 2012, global exports of plants whose use was primarily pharmaceutical were valued at US$2.2 billion, while in 2000, global sales of herbal products were valued at US$60 billion (WHO, 2003). Although the majority of commercial material in international trade comes from cultivated sources, both international trade and unsustainable local use put wild medicinal plant resources under pressure. In India for example, around 90% of the medicinal plants used by the country's health industry are harvested from the wild and 315 of the 6,560 known medicinal species are threatened with extinction (Indian Ministry of Environment and Forests, 2014). Plants are also a vastly underexplored resource for bioactive chemical compounds that could potentially become drugs or compounds for drug development (Miller, 2011).

Other recorded health benefits of plants relate to the positive psychological impacts they have. Studies have shown that the presence of plants in hospital recovery rooms and/or views of aesthetically-pleasing gardens help patients to heal faster. It has also been shown that spending time in nature is associated with a positive mood, psychological well-being and vitality.

While there is no specific Target under SDG 3 that relates to plant conservation, the conservation and sustainable use of medicinal plants clearly contribute to the overall goal.

The possible actions under SDG 1 would be relevant here.

SDG 4
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Environmental education and education for conservation, ecological restoration and sustainable development is a key activity for many organisations involved in plant conservation. Of particular relevance is Target 4.7:

> Target 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development and sustainable lifestyles, including among others, through education for sustainable development and sustainable lifestyles, human rights, gender equity, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

While there are many organisations involved in delivering education for sustainable development, there is a need to ensure that the role of plants in underpinning sustainability is included in such programmes.

SDG 5
Achieve gender equality and empower all women and girls

There are no targets under this Goal that are specifically related to plant conservation. However, initiatives focused on community-based plant conservation clearly have to address gender issues. Efforts must be made to ensure gender integration into all relevant projects and to support the empowerment of girls and women wherever possible.

SDG 6
Ensure availability and sustainable management of water and sanitation for all

Sustainable forest management and ecological restoration of degraded ecosystems are essential to ensure the supply of good-quality fresh water, provide protection from natural hazards such as flooding or soil erosion and to protect the needs of aquatic species. According to FAO, forested watersheds and wetlands supply 75 per cent of the world's accessible fresh water for domestic, agricultural, industrial and ecological needs (FAO, 2016).

Protecting forests also helps ensure a supply of safe, clean water for the inhabitants of some of the world's largest cities. About one-third of the world's largest cities obtain a significant proportion of their drinking water from forested protected areas. For example, New York City invested nearly US$2 billion in restoring the watershed in the nearby Catskills where water for the city was sourced, realizing that ensuring that water entered the city unpolluted was three times less expensive than treating polluted water. Today, the Catskills not only provided New York City with clean water but are widely enjoyed for outdoor recreation.

However, the contributions of forests in providing clean water depends to a large extent on individual conditions, tree species and age, soil types, climate, management regimes and needs from the catchment. Climate change is expected to have an impact on water catchment areas, affecting both the timing and volume of rainfall.

The importance of forests and other ecosystems in the provision of water is recognised in Target 6.6:

> Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

FAO has developed a 'Forests and Water—five year action plan' which aims to increase international action to address forest-water interactions in science, policy, economics and forest practices. Knowledge of tree species diversity and species-level management would make a valuable contribution to the science goal of the Action Plan.

Possible plant conservation actions towards SDG 6

- Share knowledge on tree species diversity and work to deepen the understanding of forest-water interactions under multiple climate change scenarios
- Undertake and promote watershed restoration studies and projects that incorporate diverse native plant usage

SDG 7
Ensure access to affordable, reliable, sustainable and modern energy for all

Trees and other plants provide an essential source of energy for many communities. Based on the Renewable Energy Policy Network for the 21st Century's (REN21) 2016 report, traditional biomass is the most important single source of renewable energy globally, providing 9% of total global energy supplies in 2015. Furthermore, over two billion people depend on energy from wood collected from natural forests for cooking and/or heating, particularly in developing countries. Many wild plant species and/or the genes they contain hold potential for development as future biomass crops, including some species that occur in marginal or arid lands or wetlands.

The use of renewable energy is promoted in Target 7.2:

> Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.

Although biofuels and biomass are important sources of renewable energy, implementation of bioenergy programmes has attracted considerable controversy. Biofuels have been implicated in 'food for fuel' controversies, food price increases, loss of access to land through 'land grabbing' and loss of biodiversity through conversion of natural ecosystems to biofuel plantations.

While the development of large-scale industrial biomass and biofuel production has an important role to play in sustainable energy provision, the real strengths of using plants for energy is that they can be grown in a wide variety of situations and thousands of different species can be used. This allows the opportunity, for example, to create 'Energy Gardens' for small-scale farms using indigenous species

grown in association with food crops, for example on field edges or as shade. This approach is being developed at the Hassan Biofuels Park in India where it is leading a shift towards pro-poor, community-based biofuel production (Balakrishna et al., 2014).

Possible plant conservation actions towards SDG 7

- Evaluate and promote the use of indigenous oil-producing and other biomass species for small-scale, community-level energy production.
- Ensure sustainable use of firewood by providing training on species selection and providing sustainable alternative species that can be cultivated.

SDG 8
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

This goal is related to sustainable consumption and production through Target 8.4:

> Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.

This is closely linked to SDG 12 (Sustainable consumption and production) and relates to work on the sustainable use of plant resources. The focus for addressing this goal from a plant conservation perspective is on increasing the body of knowledge on sustainable levels of harvesting for species that are harvested from the wild and promoting the use of sustainable harvesting certification schemes such as "FairWild".

SDG 9
Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

This goal includes a target on scientific research:

> Target 9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.

Research on plants provides many opportunities for innovation and technological development. Areas such as biomimicry and bioremediation provide clear examples, and efforts should be made to promote such research. Biotechnology, using genes derived from wild species and crop wild relatives, is also a growth area of endeavour.

SDG 10
Reduce inequalities within and between countries

There are no clear links between this goal and plant conservation and no specific targets to which plant conservation activities could make a contribution, although technology transfer, technical assistance, international networking and capacity building are all areas where botanical institutions can play a part (also see SDG 17).

SDG 11
Make cities and human settlements inclusive, safe, resilient and sustainable

There are two targets within this goal that are particularly relevant to plant conservation activities:

> Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage.
>
> Target 11.7: By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.

With respect to Target 11.4, unique plant diversity is clearly part of the world's natural heritage and protecting important areas for plant diversity (including Important Plant Areas [IPAs] and other protected areas, such as national parks and nature reserves) will directly contribute to achieving this target. So far, more than 1,700 IPAs have been identified globally, but very few have adequate protection (RBG Kew, 2016).

Beyond site recognition, the most pressing need is to move towards protection and/or sustainable management of IPAs. One in four European IPAs currently has no legal protection, many have no active management plan and a significant number are imminently threatened.

> Possible plant conservation actions towards SDG 11
> • Continue to identify IPAS and put in place plans to ensure their conservation (GSPC Target 5)

With respect to Target 11.7, botanic gardens and arboreta provide green and public spaces for residents in many of the world's major cities. Efforts are on-going by many such gardens to increase their social role and engage with diverse and 'hard-to-reach' audiences. The benefits of botanic gardens over municipal parks and gardens include the multidisciplinary teams engaged in such gardens (horticulturists, researchers, educators, taxonomists, ethnobotanists, conservation biologists etc.) and the consequent ability to engage in many aspects of sustainable urban life. As well as providing green public spaces, botanic gardens can promote and advise on tree planting and tree health for cities, conservation of urban biodiversity, ecological restoration, sustainable horticulture and urban gardening, management of invasive species and so on.

Suggested action:

- Promote the establishment and development of botanic gardens in urban areas where they are lacking to provide botanical resources centres, as well as public spaces for the local community.
- Promote greening of urban spaces to reduce rainfall runoff, provide shade and promote positive mental health. Actions could include rooftop gardens, urban tree planning and greening of abandoned brown fields.

SDG 12
Ensure sustainable consumption and production patterns

Plant conservation activities clearly have a role to play in contributing to this goal and are mainly related to two targets:

> Target 12.2: By 2030, achieve the sustainable management and efficient use of natural resources.
>
> Target 12.8: By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

These targets also relate to Targets 4.7 and 8.4.

All activities related to the implementation of the sustainable use targets of the GSPC (especially GSPC Targets 11 and 12) are of importance here and efforts should be made to ensure that such activities continue in the future.

> Possible plant conservation actions towards SDG 12:
> • Continue to support activities to ensure that all wild harvested plants and plant-based products are sourced sustainably

SDG 13
Take urgent action to combat climate change and its impacts[1]

Plants, being major regulators of global climate, are of particular importance with respect to climate change. The uptake of carbon dioxide during photosynthesis is the major pathway by which carbon is removed from the atmosphere and made available to humans and animals for growth and development. Forests are especially important, acting as major carbon sinks by soaking up carbon dioxide and storing it as biomass. Conversely, the on-going destruction of tropical rainforests is a major source of carbon emissions. The management of plant diversity will have implications both for mitigating climate change as well as for adaptation.

It is also clear that the survival of tens of thousands of plant species worldwide will be put at risk through the impacts of climate change. New plant conservation efforts addressing these threats will be required, together with more research undertaken on the impacts of climate change on many wild plants, populations and their ecosystems.

Relevant targets under this goal are:

> Target 13.2: Integrate climate change measures into national policies, strategies and planning.
>
> Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

All else being equal, ecosystems with greater plant diversity have a greater capacity to adapt to changing conditions. Thus, any management strategy that maintains or restores the diversity of an ecosystem will have the effect of enhancing its resilience. Other key climate change management strategies may include: removing barriers to plant migration; afforestation to condition soils, improve water infiltration and provide shade; managing pollinator and seed dispersal agents; managing forests in order to reduce the potential for forest fires; managing water to address unpredictable rainfall; restoring degraded areas and removing stresses due to non-climatic effects, such as invasive species.

Possible plant conservation actions towards SDG 13

- Develop guidelines to help countries integrate appropriate plant diversity management strategies into national climate change adaptation planning.
- Ensuring that genetically diverse *ex situ* collections of climate change vulnerable species are developed and maintained as sources for economic usage as well as to support ecological restoration and species recovery.
- Restore forests to sequester carbon.

SDG 14
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Target 14.2 of this Goal is of relevance to plant conservation activity:

> Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.

The conservation and restoration of mangroves and other coastal and near-shore ecosystems are clearly important here and are addressed through GSPC Target 4.

SDG 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss.

Plant conservation activities are highly relevant to all the targets under this Goal. Table 1 shows how the implementation of GSPC targets will contribute to the targets of SDG 15.

[1] The SDGs acknowledge that the United Nations Framework Convention on Climate Change (UNFCCC) is the primary international, intergovernmental forum for negotiating the global response to climate change.

Table 1: Relationship between the targets of SDG 15 and the targets of the GSPC

SDG 15 Target	GSPC Target
15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity
15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration
15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods and strive to achieve a land degradation-neutral world	Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration
15.4: By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration
15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	Target 2: An assessment of the conservation status of all known plant species, as far as possible to guide conservation action Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity Target 7: At least 75 per cent of known threatened plant species conserved *in situ* Target 8: At least 75 per cent of threatened plant species in *ex situ* collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes
15.6: Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	
15.7: Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products	Target 11: No species of wild flora endangered by international trade Target 12: All wild harvested plant-based products sourced sustainably
15.8: By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded
15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	

SDG 16
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

There are no clear links between this goal and plant conservation and no specific targets to which plant conservation activities could make a contribution.

SDG 17
Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The Global Partnership for Plant Conservation (GPPC), founded in 2004 to support worldwide implementation of the GSPC, is itself an example of a global partnership to support sustainable development. A number of targets are of particular relevance:

> **Target 17.6** Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.
>
> **Target 17.9** Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation.

Next steps

Evidence-based policy making

The sustainable management and use of plant diversity underpins a number of the SDGs and this provides an opportunity to clearly define the links between plants and human well-being.

Targeted global research could provide the scientific evidence of these linkages and be used to support environmental policy decisions that ensure plants are recognised in the global poverty reduction arena.

Indicators

In order to measure progress towards the SDGs and their associated targets, indicators will be required. Some of these have already been identified, but many gaps remain. Even where indicators do exist, these are not always comprehensive.

For example, for Target 15.1, two indicators have been proposed:

- Indicator 15.1.1: Forest area as a proportion of total land area
- Indicator 15.1.2: Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.

In the case of Indicator 15.1.2, data are proposed from WCMC—the World Database of Protected Areas, Birdlife (Important Bird Areas) and the Alliance for Zero Extinction. Important Plant Areas are not included in the analysis and therefore progress, or lack of it in this area, will not be obvious to governments and policy makers.

Indicators relating to areas of land subject to ecological restoration activities, particularly when these fall outside the scope of national protected areas, may also be a valuable new indicator for development or consideration.

As many of the SDG targets lack indicators, this might provide an opportunity to develop and make available global plant-related datasets to support relevant indicators. This approach was also highlighted at the last GSPC Liaison Group meeting (June 2015) with the recommendation:

Conclusion

The Sustainable Development Goals can certainly provide an important reference point for plant conservation and the achievement of the GSPC targets up to and beyond 2020 and can play a valuable and sometimes a central role in helping the achievement of several goals.

The SDG framework may also provide a helpful point of reference to demonstrate the fundamental importance of plants for the planet, contributing to the achievement of sustainable development, helping to alleviate poverty, providing new sustainable livelihoods and contributing to human wellbeing.

Importantly, if plant conservation is not achieved then the world puts at greater risk the achievement of these goals, suggesting that the integration and mainstreaming of biodiversity conservation, ecological restoration of degraded ecosystems and plant protection in particular, are of fundamental importance to the achievement of sustainability on the planet.

It is clear that plant resources and wild habitats will require increasingly active management, including protection of remaining natural and semi-natural lands, as well as ecological restoration and more broadly, the restoration of natural capital, which includes ecological restoration, ecological and economic rehabilitation of production systems and related activities. Safeguarding the components of biodiversity, both *in situ* and *ex situ* will also play a part in ensuring that not only does this biodiversity remain available to support present-day and future use, but also that such biodiversity will be available for restoration and management purposes.

"To provide additional guidance on global data sets relevant to the targets of the Strategy and related Aichi Biodiversity Targets to facilitate national reporting on those issues."

Over the coming years it will be valuable for botanical institutions to further define their roles in SDG achievement and promote greater awareness and support for plant conservation within this new framework and priorities for global development.

Redefining the objectives and targets of the GSPC up to 2030 will be an essential part in continuing to mobilize thousands of institutions and organisations throughout the world, as well as the thousands of scientists, citizen scientists, ecologists, horticulturists, educators and activists within them, to continue support the objectives and work programmes of the Convention on Biological Diversity, closely aligned with the Sustainable Development Agenda and its Goals as well as the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC).

Literature cited

Aronson, J., S.J. Milton & J. Blignaut (editors). 2007. Restoring Natural Capital: Science, Business and Practice. Island Press, Washington, DC.

Balakrishna, G., K. T. Prasanna, G. C. Vijaya Kumar, C. Haleshi & K. Rajesh Kumar. 2014. Hassan Biofuel Park—A concept for promotion of replenishable green energy. BGjournal 11(1): 23–26.

FAO. 2010. Global Forest Resources Assessment 2010 Main Report. Food and Agriculture Organisation of the United Nations, Rome. http://www.fao.org/docrep/013/i1757e/i1757e.pdf. Accessed 7 November 2016.

FAO Forest and Water Programme. http://www.fao.org/in-action/forest-and-water-programme/en/. Accessed 7 November 2016.

Indian Ministry of Environment and Forests. 2014. India's 5th National Report to the Convention on Biological Diversity p27. https://www.cbd.int/doc/world/in/in-nr-05-en.pdf. Accessed 7 November 2016.

Miller, J. S. 2011. Nature's Potential: How Many Drugs Could Come From Plants? Monogr. Syst. Bot. Missouri Bot. Gard. 118: 125–140.

RBG Kew. 2016. The State of the World's Plants Report—2016. Royal Botanic Gardens, Kew, UK.

Renewable Energy Network. 2016. Renewables 2016, Global Status Report. http://www.ren21.net/status-of-renewables/global-status-report/. Accessed 7 November 2016

Sharrock, S., S. Oldfield & O. Wilson. 2014. Plant Conservation Report 2014: A review of progress in implementing the Global Strategy for Plant Conservation 2011-2020. Secretariat of the Convention on Biological Diversity, Montreal, Canada and Botanic Gardens Conservation International, Richmond, UK. Technical Series No 81.

UN COMTRADE database. http://comtrade.un.org/db/. Accessed 7 November 2016.

WHO. 2003. WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. http://apps.who.int/medicinedocs/en/d/Js4928e/. Accessed 7 November 2016.

Wyse Jackson, P. S. 2001. The needs for targets in the implementation of the Convention on Biological Diversity. Pp. 1–4. In: Secretariat of the Convention on Biological Diversity (2001). Assessment, Conservation and Sustainable Use of Forest Biodiversity. (CBD Technical Series no. 3.), SCBD, Montreal, Canada, P 130.

Annex 1: The 2020 targets of the Global Strategy for Plant Conservation

Objective I: Plant diversity is well understood, documented and recognized

Target 1: An online flora of all known plants.

Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action.

Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared.

Objective II: Plant diversity is urgently and effectively conserved

Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration.

Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity.

Target 6: At least 75 per cent of production lands in each sector managed sustainably, consistent with the conservation of plant diversity.

Target 7: At least 75 per cent of known threatened plant species conserved *in situ*.

Target 8: At least 75 per cent of threatened plant species in *ex situ* collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes.

Target 9: Seventy per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge.

Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded.

Objective III: Plant diversity is used in a sustainable and equitable manner

Target 11: No species of wild flora endangered by international trade.

Target 12: All wild harvested plant-based products sourced sustainably.

Target 13: Indigenous and local knowledge innovations and practices associated with plant resources, maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care.

Objective IV: Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes.

Objective V: The capacities and public engagement necessary to implement the Strategy have been developed

Target 15: The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy.

Target 16: Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy.

Annex 2: Links between the Sustainable Development Goals and targets, the GSPC targets and the Aichi Targets

SDG	Relevant SDG target	Link to plant conservation	GSPC target	Aichi target
1. No poverty	1.4…access and control over… natural resources	Poorest populations are most dependant on wild plant resources – food, medicine, timber, fuel etc.	13	18—Traditional knowledge respected
2. No hunger	2.4…sustainable food production systems… 2.5…maintain genetic diversity of seeds, cultivated plants…	Biodiversity is the foundation of sustainable agriculture & contributes to food security.	6, 8, 9	7—Sustainable agriculture, aquaculture and forestry
3. Good health		Plants are the basis of many traditional and modern medicines		
4. Quality education	4.7…all learners have the knowledge and skills needed to promote sustainable development…	Learning about the importance of plants is part of education for sustainable development	14	1—Awareness increased
5. Gender equality		Community plant conservation projects must address gender issues		
6. Clean water and sanitation	6.6 Protect and restore water-related ecosystems….	Plant diversity (especially forests) help provide clean water	4	14—Ecosystem services
7. Renewable energy	7.2…increase share of renewable energy	Plants are an essential source of renewable energy		
8. Good jobs and economic growth	8.4…decouple economic growth from environmental degradation	Research is needed to identify sustainable harvesting levels for socioeconomic important species	12	4—Sustainable consumption and production
9. Innovation and infrastructure	9.5 Enhance scientific research…	Plant-based research can lead to innovation and development.		
10. Reduced inequalities				
11. Sustainable cities and communities	11.4…protect natural heritage 11.7…universal access to green and public spaces	Important plant areas are important areas of natural heritage Urban botanic gardens with enhanced accessibility will address this target	5 14	11—Protected areas
12. Responsible consumption	12.2…sustainable management of natural resources 12.8…people have relevant information for sustainable development	Support needed for the sustainable use of plant diversity Education for sustainable development	6, 11, 12 14	4—Sustainable consumption and production 1. Awareness increased
13. Climate action	13.2 Integrate measures into national policies 13.3 Improve education and awareness…	Plants are major regulators of global climate and are involved in both mitigation and adaption Education for sustainable development	14	
14. Life below water	14.2…manage and protect… coastal ecosystems	Plants such as mangroves are important in coastal areas	4	10—Protection of coral reefs…
15. Life on land	All targets	Plant diversity supports all life on land	2, 4, 5, 7, 8, 10, 11, 12	2, 5, 10, 12, 14, 15, 16, 17
16. Peace and justice				
17. Partnership for the Goals	17.6…enhance…international cooperation…on science, technology… 17.9…enhance international support for…capacity building…	Plant conservation organisations are well networked and work together at various levels	15, 16	19. Knowledge improved, shared and applied

The Global Partnership for Plant Conservation