



# TEACH for ESD

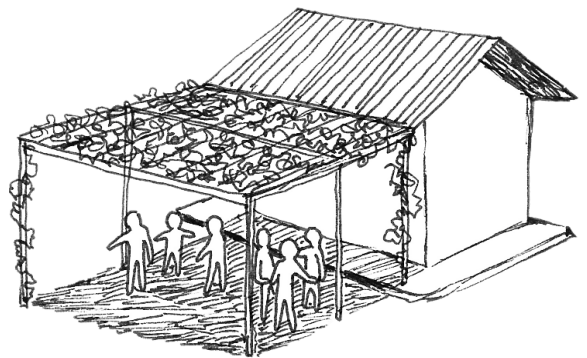
## BRING BIODIVERSITY INTO SCHOOLGROUNDS



Indigenous Gardens

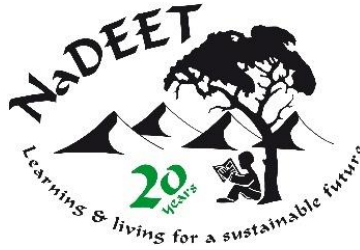


Birds & other Pollinators



Green Infrastructure

Teach for ESD - Toolkit Guide 3.5  
**BRING BIODIVERSITY INTO SCHOOLGROUNDS**



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**Brot**  
für die Welt

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# OVERVIEW

Bringing biodiversity into the schoolground has a range of benefits for both learners, teachers and other living organisms. It has great educational value, and it can support many ESD related activities. Planting more trees and other plants can provide ecosystem services such as shade and contribute both to human well-being and biodiversity conservation.

We can bring biodiversity into our schoolground and contribute to biodiversity conservation by establishing **indigenous gardens**. We can also “entice” more animal species to come into the schoolground by creating habitats and homes for them. We can make a pollinator garden, to attract more **birds and other pollinators**, such as insects. Finally, we can create a better habitat for ourselves, by “building” with **green infrastructure**, to adapt to a changing climate.

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# 1. INDIGENOUS GARDENS

Schools are a focal point of most of our communities. Our schoolgrounds have an important role to play to reflect, but also influence positive environmental attitudes and behaviour. Schoolgrounds that are well-maintained and have an abundance of plants will be attractive and a welcoming place to be. Plants play a pivotal role in establishing and creating habitats for a variety of other organisms, such as insects, reptiles, birds and mammals.



Indigenous gardens provide an opportunity to educate about local indigenous knowledge, thereby passing it on to future generations.

We can therefore maintain and increase biodiversity, by protecting and planting more **indigenous** plants. A diversity of indigenous plants will attract a diversity of indigenous animals. Furthermore, planting indigenous plants creates a **sense of place** and can play an invaluable role in (re)connecting our learners (and ourselves) to the local natural environment.

## INDIGENOUS

Species that originate or occur naturally in a particular place.

## A SENSE OF PLACE

A place's character, which is determined by climate, landscape, indigenous wildlife and vegetation, as well as the colours and tonal values that emanate from the surroundings.

## GOOD PRACTICES HANDBOOK



Read the brochure **Why is important to preserve indigenous trees?** and for more on creating a sense of place read **pg. 1 and 5** in **Chapter 5** from **Eco Awards Namibia's Good Practices Handbook** in **Toolkit 3.6**.

## ESTABLISHING AN INDIGENOUS GARDEN

### RESEARCH & FIELDWORK: WHAT IS INDIGENOUS TO OUR AREA?

Before we start planting an indigenous garden, we should find out what *is* indigenous to our local environment, and what *is not*. This is a great opportunity for an *investigative* project on biodiversity, where we can do research with our learners on the **biome** and **vegetation type** of our school area. We can also learn about our local climate and soil types (see **3.1 - Teach about the Environment**).

We can then complement this with *fieldwork*, such as doing a vegetation survey of a nearby natural area to study local indigenous plants. It is also important that we do a biodiversity audit of our own schoolgrounds before we start planting more indigenous plants. In this way, we can track the changes in plant and animal diversity over time. For resources on fieldwork see **Toolkit 3.9 - Teach in Nature**.



For biomes and vegetation types of Namibia, refer to **pg. 98-100** in **Atlas of Namibia** from **Toolkit 1**.



## FINDING A SUITABLE LOCATION

Creating a simple map to show the different areas of use (such as parking, administration buildings, classrooms, sport fields, and open areas) and natural, physical features of the schoolground (slope, rocky outcrops, natural wetland, dry riverbed etc.) can help us make informed decisions about where to make new plantings. Perhaps there is an area of the school that already has a few indigenous plants, and we want to add different species of indigenous plants to that area.

Our indigenous plants can also become part of our school's **green infrastructure** - read the last section.



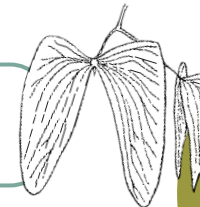
Read **pg. 20 – 21** on how to plan and establish an indigenous waterwise garden, and **pg. 25 – 27** on improving your soil in *Waterwise Gardening in South Africa and Namibia*.

## SOURCING INDIGENOUS PLANTS

In our indigenous planting project, we can choose a variety of different types of vegetation such as trees, bushes and decorative species. Many regional offices and Agricultural Development Centres (ADCs) under the Directory of Forestry have nurseries in Namibia, although they are not exclusively indigenous. We can also reach out to other teachers and community members for seedlings.

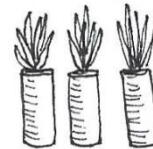


Visit the *Namib Trees* website for their contact information and a list of indigenous plant species that they sell at their nurseries.



Remember that we may not remove indigenous plants - rather we can collect their seeds!

It may be difficult to get indigenous plants locally. A solution to this is for us to start our own indigenous garden **nursery!** We can also start an indigenous **seed bank** and share these with our community!



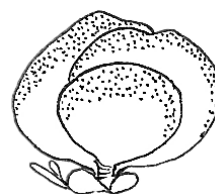
Grow seeds in milk cartons - read **pg. 7** in *Growing Mother-tree Seedlings*. Study **Chapter 1 – 3** in *Growing Rare Plants* to start propagating and growing your own indigenous seedlings.



## SOUTHERN AFRICAN PLANTS SPECIES

If you cannot find plants that are indigenous to Namibia in your local nursery, choose plants that are indigenous to Southern Africa and waterwise (i.e. they do not need a lot of water). A few common examples of Southern African waterwise plants found in many Namibian nurseries are:

- **Paddle plant** (*Kalanchoe luciae*)
- **Spekboom** (*Portulacaria afra*)
- **Pig's ear** (*Cotyledon orbiculata*)





## DON'T PLANT ALIEN INVASIVE PLANTS!

Many of the ornamental plants found in nurseries are *not* indigenous to Southern Africa and are **alien** species. Some alien plant species, especially cacti, can become **invasive**! As we learned in *Toolkit 1 – Environmental Knowledge*, alien invasive species can be a large threat to our indigenous biodiversity! It is vitally important that we do not plant these and that we remove them from our school premises! To identify alien species and alien invasive species, refer to *Toolkit 3.9 - Teach in Nature*.

Did you know that cacti and agave plants are not native to Africa, but were brought here from South America?



## PLANTING

For our indigenous garden to establish itself successfully and thrive, we need to consider the following:

- **WHERE TO PLANT** – Does the plant species need full sun or shade? What kind of soil does it grow in best? How much space will the full-grown plant need?
- **HOW TO PLANT** – To become established, most plants need regular watering in the first few months and depending on the plant, we may need to first improve the soil with compost. See the section on food gardening in *Toolkit 3.7 – Promote Learner Well-being* for tips on making your own compost.
- **WHEN TO PLANT** – the best time to plant is usually before the rainy season. We can also choose to plant indigenous trees in spring, for **Arbor Day** (celebrated in Namibia every 2<sup>nd</sup> Friday in October).



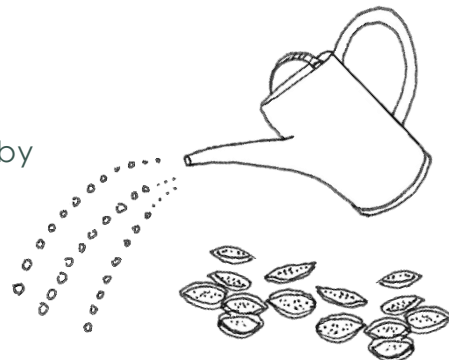
Read **pg. 25 – 32** in *Waterwise Gardening in South Africa and Namibia* for instructions on how to improve your soil and establish your indigenous garden. To plant a tree correctly, read *How to Plant a Tree*, which also has a list of indigenous and exotic trees in Namibia, with their uses.

## PROTECTION AND MAINTENANCE

Our planting project must have a plan in place to protect our indigenous garden or plants from being damaged. For young trees this can be a fence to keep out domestic animals and children playing while for a succulent garden it may be sufficient to put a small rock or recycled bottle border. It is important that we ensure that our plants are well-maintained. This will include:

Once established, most indigenous plants will not need much water.

- Watering and mulching
- Giving nutrients, especially for our trees by adding fresh compost every few months
- Pruning, as needed
- Maintaining the protection



## RESOURCES FOR INDIGENOUS GARDENS

Junior Primary

JP

Senior Primary

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Junior Secondary

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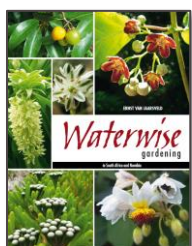
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### Why is it Important to Preserve Indigenous Trees

**BROCHURE:** This brochure answers basic questions relating to the significance and role of indigenous trees in Namibia. It highlights the need to preserve them and gives guidance on their protection and care.

**AUTHOR:** Botanical Society of Namibia (n.d)

Link: <https://botsoc.org.na/namibias-plants/uses-of-namibias-plants>



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### Waterwise Gardening in South Africa and Namibia

**MANUAL:** This excerpt from the first few chapters (pg. 1-33) of the section 'Becoming Waterwise', provides an introduction to waterwise gardening, how to establish and attract wildlife to your indigenous garden.

**AUTHOR:** Ernst van Jaarsveld (2010)

Link: [https://api.pageplace.de/preview/DT0400.9781432303594\\_A21861431/preview-9781432303594\\_A21861431.pdf](https://api.pageplace.de/preview/DT0400.9781432303594_A21861431/preview-9781432303594_A21861431.pdf)



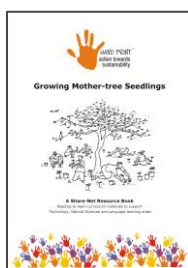
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### Namib Trees – Indigenous Nurseries

**WEBSITE:** Namib Trees now has a handful of nurseries in Windhoek and one desert nursery. This website provides contact information as well as a list of plant species that they sell.

**AUTHOR:** Namib Trees (n.d.)

Link: <https://namibtrees.com.na/>



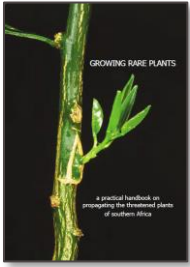
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### Growing Mother-tree Seedlings

**MANUAL:** This resource can be used to inform and teach a lesson to do with tree growing. It includes background reading material and suggests activities to apply and practically engage with this knowledge.

**AUTHOR:** Share-Net, Handprint (2009)

Link: [https://www.sanbi.org/wp-content/uploads/2018/03/11\\_mother-treeseedlings-all.pdf](https://www.sanbi.org/wp-content/uploads/2018/03/11_mother-treeseedlings-all.pdf)



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**Growing Rare Plants:  
A Practical Handbook on Propagating the  
Threatened Plants of Southern Africa**

**BOOK:** This guide shows practically how to successfully propagate threatened plant species in southern Africa, including differing methods depending on the plant, and gives information on the different species.

**AUTHOR:** G. Nichols (2005)

Link: <https://www.sanbi.org/wp-content/uploads/2018/04/sabonet-report-no-36-growing-rare-plants.pdf>



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**How to Plant a Tree**

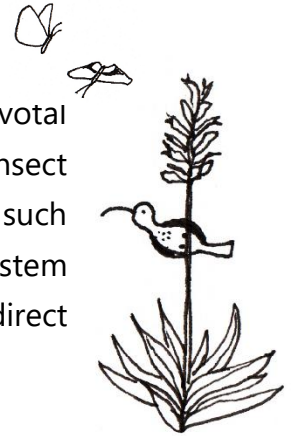
**HOW-TO:** This guide shows how to plant a tree and the specifics around making sure it survives. It also includes a list of common Namibian trees in English and Oshindonga, and their most important uses.

**AUTHOR:** Forest Awareness and Tree Planting Project



## 2. BIRDS & OTHER POLLINATORS

In land ecosystems, plants are the base of food chains and food webs. They also play a pivotal role in establishing and creating habitats: once established, plant communities attract insect communities and other primary consumer animals, which in turn attract their predators, such as reptiles, birds and mammals. Both insects and birds provide us with important ecosystem services – such as pollination for our food crops and pest control - and offer direct observational experiences for our learners (see *Toolkit 3.9 - Teach in Nature*).



### ATTRACTING BENEFICIAL INSECTS & BIRDS

#### POLLINATOR GARDENS

We can establish a **pollinator garden**, by planting a lot of flowering plants in one area. Remember to opt for indigenous and/or waterwise flowering plants! See the previous section on how to establish an indigenous garden.



Read **pg. 22 – 23** for tips on which types of plants attract butterflies and birds in *Waterwise Gardening in South Africa and Namibia* from the previous section.

#### CREATING NATURAL HABITATS FOR INSECTS & BIRDS

In addition to planting indigenous plants, we can create optimal habitats for birds and insects in other ways. Natural features, such as boulders, rocks and tree stumps are liked by both birds and insects (and other animals, like lizards) to perch on.

Building a pond to mimic a natural wetland area can attract a variety of aquatic animals, e.g. frogs, dragonflies, or wetland birds. If our aim is to attract more indigenous species, we need to create habitats that resemble the biome and vegetation type of our area, even if this is an urban environment. For example, if we live in a more arid environment, creating a wetland in our schoolground does not make the most ecological sense. A bird bath is not necessarily a natural feature in arid environments either, however the educational value will be high, when we are able to observe birds more closely.

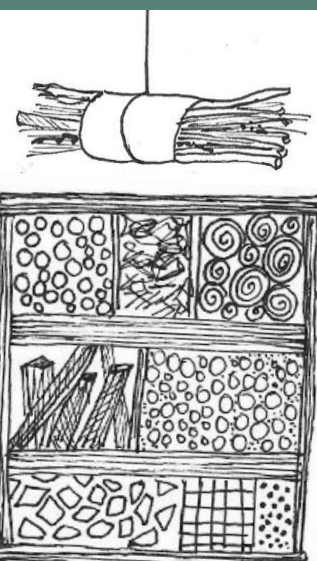


Build a pond with the instructions on **pg. 10** of *Bush Telegraph: Water is Life* in *Toolkit 3.1*. To make your own bird bath use the instruction sheet *Make the Perfect Bird Bath*.



## INSECT HOTELS

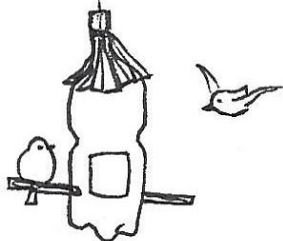
Insect hotels are both creative and educational projects. These little “houses” create homes for a variety of insects. One very important ecosystem service that many insects provide us with is pollination – this can be of particular value if we are establishing a food garden at our school as well.



Watch the video **Easy Bug Hotel** to make insect hotels with younger learners. For older learners, print out the instructions **Make a Bug Hotel**.

## BIRD HOUSES

Birds like to nest in small, elevated and contained spaces. Bird boxes can provide suitable nesting sites, especially if there is not a lot of vegetation (such as large trees) in our schoolground. If a pair of birds decide to breed in our box, it allows learners to observe them up close and to witness their natural reproductive cycle.



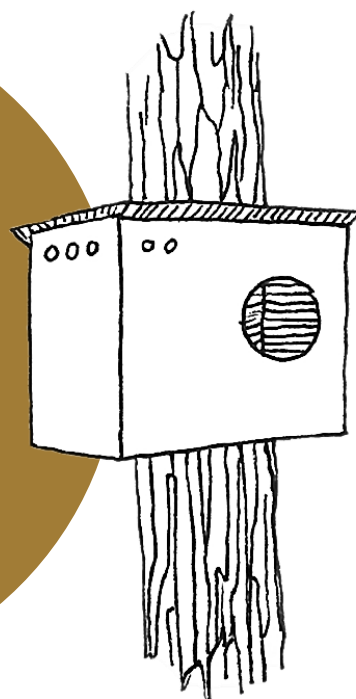
Build your own upcycled bird houses with your learners by following the steps on the instruction sheet **Upcycled Bird Houses**.

If we build larger bird boxes, we might even attract larger birds of prey, such as owls or hawks.



## OWLS NEED HOMES

Throughout history, owls were seen by many as bad omens and are sadly still surrounded by superstition to this day. In addition, habitat loss through human development and the use of poisons and pesticides on farms has led to a decline in owl populations. However, we need owls! They play an important role as pest controllers in both rural and urban areas!



Create a home for an owl and help their populations to recover! Read the information and instructions from **How to Build an Owl Box** and let learners help build it.

RESOURCES FOR BIRDS & OTHER POLLINATORS

Junior Primary

JP

Senior Primary

SP

Junior Secondary

JS

Senior Secondary

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**Make the Perfect Bird Bath**

**HOW-TO:** This guide shows how to make a simple, effective bird bath. It includes the important things to remember when making and placing your bird bath, and what difference these considerations will make.

**AUTHOR:** RSPB (n.d)

Link: <https://rspb.org.uk/helping-nature/what-you-can-do/activities/make-the-perfect-bird-bath>



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**Easy Bug Hotel**

**VIDEO:** This how-to video shows a simple way to make an insect habitat out of upcycled materials that should be easy to source. It goes step by step through the creation process and explains the benefits of building one.

**AUTHOR:** Red Ted Art (2020)

Link: [https://www.youtube.com/watch?v=Smv\\_9vgN39A](https://www.youtube.com/watch?v=Smv_9vgN39A)



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**Make a Bug Hotel**

**HOW-TO:** This explains how to make an insect habitat from easily sourced items. Potentially more suitable to senior primary children or a class group project for junior primary.

**AUTHOR:** RSPB (n.d)

Link: <https://rspb.org.uk/helping-nature/what-you-can-do/activities/build-a-bug-hotel>



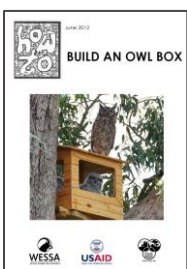
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**Upcycled Bird Houses**

**HOW-TO:** A practical, step by step guide including a materials list, on how to build an upcycled bird house.

**AUTHOR:** Iamsamm, Wordpress (2013)

Link: <https://iamsamm.wordpress.com/2013/01/19/upcycled-bird-houses/>



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**How to Build an Owl Box**

**HOW-TO:** Including some background reading on owl habitats and behaviours, this resource guides on how to build an owl box, from the building plan to construction and the installation process.

**AUTHOR:** Share-Net, WESSA (2012)

Link: <https://safcei.org/wp-content/uploads/2015/06/How-to-build-an-owl-box.pdf>

### 3. GREEN INFRASTRUCTURE

Namibia has been identified as a “climate change hot spot” and in recent years has already experienced the negative impacts of a changing climate, such as stronger winds, severe flooding, longer droughts, and more heat waves. On both a local and global level, biodiversity is critical in combating and mitigating climate change. We can combat both climate change and biodiversity loss with **nature-based solutions**.



As an introduction, watch the video *A Practical Guide to Climate-resilient Buildings* and pay special attention how nature can provide solutions to changing weather patterns.

We can therefore also bring biodiversity into our schoolgrounds for the purpose of using it as a nature-based solution, in the form of **green infrastructure**. By planting different types of plants in specific locations, they can help us to mitigate (reduce) and adapt to more extreme local weather events, such as providing more shade, natural cooling, protection against increasing winds and flood control.

#### GREEN INFRASTRUCTURE

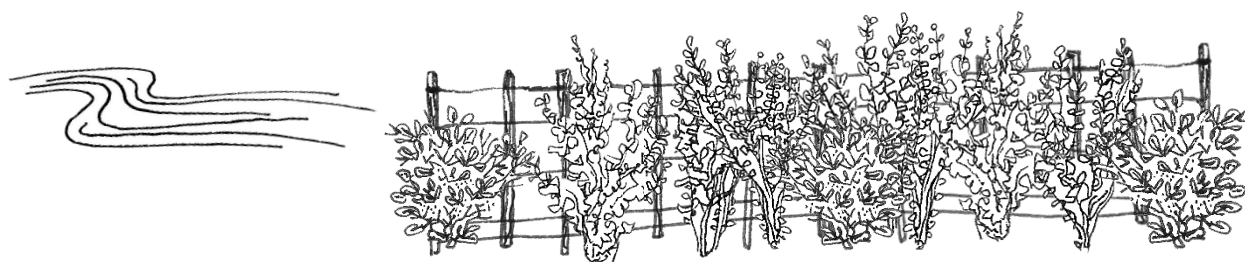
Green infrastructure (GI) is a nature-based solution that makes use of nature’s regulating ecosystem services, such as water purification, flood control, soil stabilisation and passive cooling.

A PRACTICAL GUIDE TO CLIMATE-RESILIENT BUILDINGS & COMMUNITIES

#### WINDBREAKS

Planting hedge-like plants along our school fences, food gardens and around other facilities can shelter us or decrease the impact of windstorms. Wind increases evapotranspiration (water loss from leaves), and therefore, by reducing wind, we can reduce water loss from our plants. Choose evergreen shrubs as permanent windbreaks. For added protection against animals, use hedges with thorns.

Wherever you can, use indigenous, waterwise plants for your green infrastructure projects!

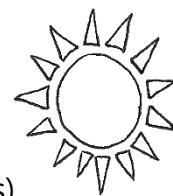


Get directions on how to choose design drought-resistant gardens on **pg. 7, 9-11**; and how to keep the soil moist using mulch on **pg. 14-15** in *Guide to Water Wise Landscaping*.

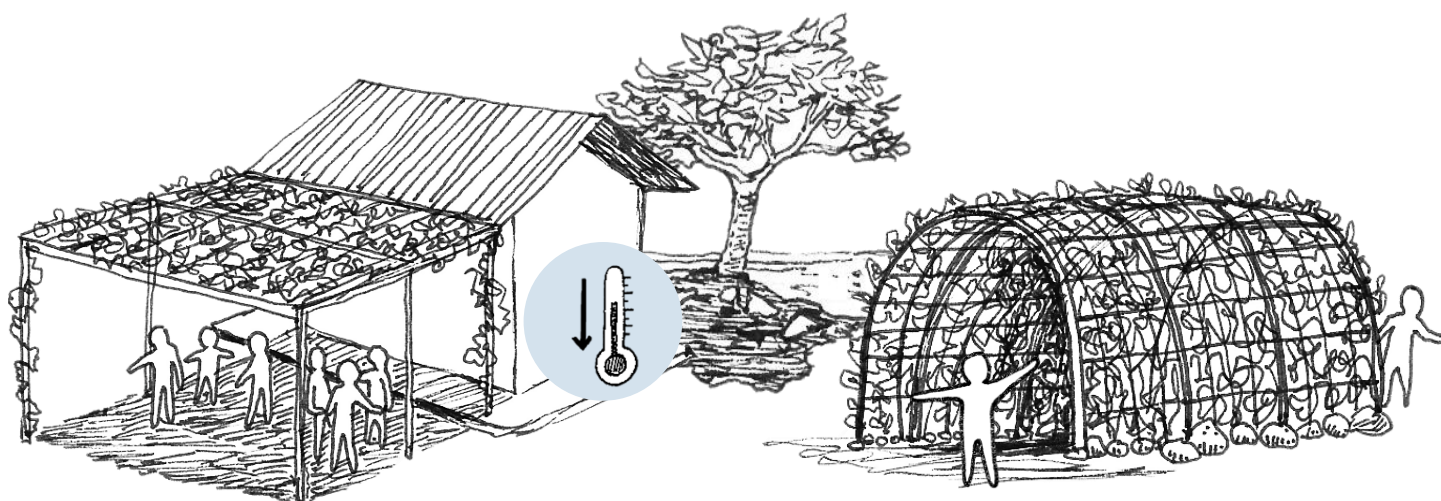


## SHADE

Larger, broadleaved trees provide much-needed shade and through transpiration, cool down the air around them. Planting trees next to classroom windows can act as a “natural air conditioner” (although, keep in mind not to plant too close to buildings or pavements).



As Namibia is located in the southern hemisphere, windows on the north-facing side of a building will be the ones that most likely need shading. Creeper plants are usually fast-growing and can also be used to create shade, or as vertical gardens against a wall, which provides further insulation.



### RESOURCE CHECK

Read more about green infrastructure as a nature-based solution on **pg. 35-38**, then read about different ways of shading on **pg. 48-50** in ***A Practical Guide to Climate-resilient Buildings & Communities***.

## PAVING

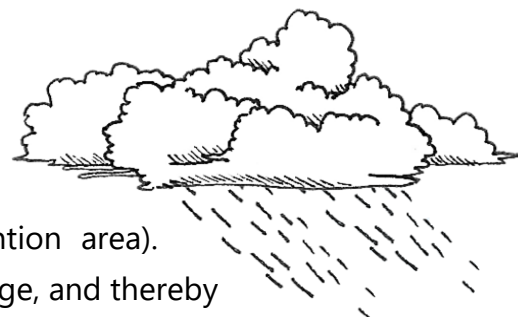
Often paving in a school (and in cities) is seen as a sign of “cleanliness” and of being “more developed” or “progressive”. Even though it is easier to clean, paving heats up much more than natural soil with ground cover. Paving also prevents water from infiltrating the ground and thereby can result in more flooding.

## FLOOD CONTROL

After long periods of drought, due the loss of vegetation cover, floods are more likely to occur when the next heavy rains come.

Especially if our school is situated in a low-lying area or on a slope, it is worth planting a **rain garden** (also known as a bioretention area).

The purpose of a rain garden is to soak up excess water, like a sponge, and thereby prevent or reduce flooding.



**RAIN GARDENS**

*"Rain gardens are typically bowl shaped and shallow, with native, hardy, low-maintenance plants. These gardens are created in lower lying areas where water otherwise drains to storm sewers. A rain garden is not a pond or wetland. They are dry most of the time, holding water for brief periods during and after a rainfall..."*

HOW TO CREATE A RAIN GARDEN: A GUIDE FOR HOMEOWNERS!



How do you go about selecting the best site for your rain garden? Refer to **pg. 3 – 7** in *How to Create a Rain Garden: A Guide for Homeowners!*

**HOW TO SET UP A RAIN GARDEN**

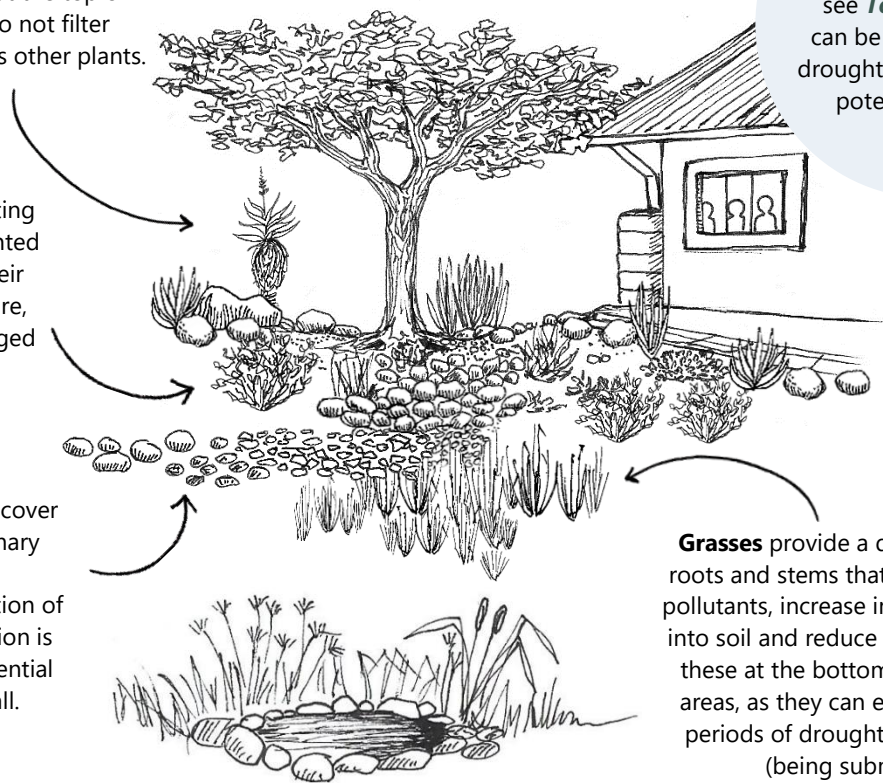
**Succulents** should be planted at the top of bioretention basins, as they do not filter stormwater or build soil as well as other plants.

**Shrubs** reduce erosion by protecting the soil surface. They are best planted on the slope of a basin where their roots can easily reach soil moisture, but where they are not water-logged for extended periods.

**Mulch** refers to any substance to cover and protect soil. One of the primary functions of mulch in green infrastructure is reducing evaporation of moisture from the soil. This function is crucial in desert areas, where potential evaporation far exceeds rainfall.

**Trees** should be placed on raised surfaces next to the bioretention area, or on raised terraces within them.

Collecting rainwater not only saves water – see **Toolkit 3.6** – that can be used in times of drought, but also reduces potential flooding.



**Grasses** provide a dense network of roots and stems that filter stormwater pollutants, increase infiltration of water into soil and reduce soil erosion. Plant these at the bottom of bioretention areas, as they can endure both long periods of drought and inundation (being submerged).

In addition to soaking up water, rain gardens also help to remove pollutants from stormwater runoff and reduce the amount of soil exposed to the sun, which both decreases evaporation from the soil and increases soil stabilisation!



Read **pg. 9-11** in *Green Infrastructure for Southwestern Neighborhoods* for design guidelines on plant selection and placement. For more background information on bioretention, read **pg. 6**.



RESOURCES FOR GREEN INFRASTRUCTURE

Junior Primary

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Senior Primary

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Junior Secondary

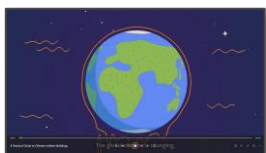
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Senior Secondary

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**A Practical Guide to Climate-Resilient Buildings**

**VIDEO:** This video provides an introduction and tips on how to make buildings climate-resilient, specifically for heat waves, storms and floods. Examples of nature-based solutions are also provided for each scenario.

**AUTHOR:** UNEP (2021)

Link: <https://www.youtube.com/watch?v=qVVwjHqWCI8>



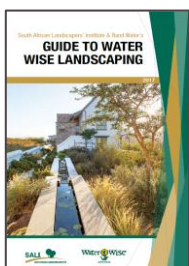
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**A Practical Guide to Climate-Resilient Buildings and Communities**

**MANUAL:** This manual provides in-depth instructions on how best to design and make buildings climate resilient. It includes nature-based solutions, but also provides tips on how to design and build buildings themselves in different climatic regions and for different climate-change scenarios.

**AUTHOR:** UNEP (2021)

Link: <https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/36405/Adapbuild.pdf>



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**Guide to Water Wise Landscaping**

**MANUAL:** This guide provides a background on how waterwise gardening can help adapt to climate change's effect on water resources. It outlines eight principles for waterwise landscaping.

**AUTHOR:** South African Landscapers' Institute & Rand Water's (2017)

Link: [https://waterwise.co.za/export/sites/water-wise/industry/Water-Wise-Guide-to-Landscaping/downloads/2017\\_SALI\\_WW\\_Guide\\_Part\\_1.pdf](https://waterwise.co.za/export/sites/water-wise/industry/Water-Wise-Guide-to-Landscaping/downloads/2017_SALI_WW_Guide_Part_1.pdf)



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**How to Create a Rain Garden: A Guide for Homeowners!**

**HOW-TO:** This is a simple guide for homeowners or landscape professionals on how to create a rain garden. It can be applied to schools as well.

**AUTHOR:** Essex Region Conservation Authority (nd)

Link: <http://detroitriver.ca/wp-content/uploads/2015/03/Rain-Garden-Manual-single-pg.pdf>



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**Green Infrastructure for Southwestern Neighborhoods**

**MANUAL:** This in-depth guide provides background information on green infrastructure (GI) and how to design bioretention areas.

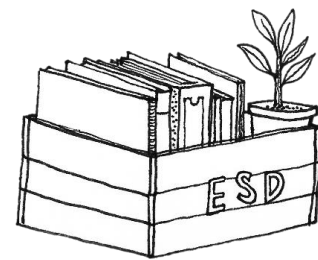
**AUTHOR:** Watershed Management Group (2012)

Link: [https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/wmg\\_green%20infrastructure%20for%20southwestern%20neighborhoods.pdf](https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/wmg_green%20infrastructure%20for%20southwestern%20neighborhoods.pdf)



# TEACH for ESD

BRING BIODIVERSITY INTO SCHOOLGROUNDS  
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