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# The Mystery of Steps on Hiking Trails

Hong Kong's countryside has diverse terrains, with hiking trails weaving through landscapes that are at times gently undulating and at others marked by varying gradients that create rises and falls. Interspersed among these are carefully arranged flights of steps, which accompany hikers throughout their exploratory journeys and form an integral part of the varied scenery.

Steps lead trails upward to higher peaks and downward into deeper valleys, allowing us to reach elevated vantage points for broader, farther views and to savour greater enjoyment and deeper experiences. Yet at times, climbing up or descending them can feel tiring, leaving us with a love-hate relationship towards these features.

Why do we so often encounter endless flights of steps while hiking? Why were they built? What purpose do they serve? How do they affect the hiking experience? And what key factors are considered during construction? These steps hide a series of puzzles along the trail, waiting to be unravelled one by one.

# Why Build Steps on Trails?

## Hikers' Safety and Comfort

Steps are a common feature in Hong Kong's hiking trail network. They are primarily constructed to adapt to the natural terrain and meet the needs of hiking activities, improving trail conditions so that users can enjoy greater safety and comfort. The tread surfaces provide gradual platforms for ascent or descent, enabling trails with steep slopes, rugged ridges or trail sections with significant elevation changes to be accessible to hikers of varying fitness levels and experience.

Moreover, steps enhance trail safety and stability, especially on slippery or undulating terrain, effectively reducing risks of slips, trips, or sprains.



Lantau Trail Section 2



Ma On Shan Country Trail



## Mitigating Soil Erosion on Trails

Steps help disperse the impact of surface runoff on hiking trails, thereby mitigating the soil erosion rate and strengthening the erosion resistance of certain sections. This is particularly valuable for trails that have suffered significant soil erosion from intensive trail use or natural factors like heavy rainfall. By restoring damaged tread surfaces and stabilising soil structure, steps help ensuring the trails remain sustainable for continuous enjoyment.



Hong Kong Trail Section 8

## Steps Become a "Stumbling Block"?

Steps are designed to help overcome sections with significant elevation changes and reduce the need for unnecessary detours, offering many benefits to make hiking smoother. Steps can become a daunting challenge for some people, especially when fatigue sets in after a long hike or when we feel exhausted. Encountering a seemingly endless "heavenly ladder" right in front of you can easily lead to a sigh of resignation.

Whether climbing up or stepping down, the repeated lifting and bending of the legs place considerable strain on the knees and muscles. This is especially noticeable during prolonged ascents on steep flights of steps. It demands greater physical strength and sometimes requires technique, making the climb more likely to cause exhaustion or discomfort.

For elderly hikers, those with lower fitness levels, or individuals with knee problems, frequent ascents and descents can turn the journey into something exhausting, or even prompt them to avoid the trail altogether. Steps also limit accessibility for wheelchair users or people with mobility difficulties.



Although steps play an important role in reducing soil erosion and stabilising hiking trails, they can sometimes have the opposite effect for some trail users. Some people may find repeated climbing or descending of steps too strenuous, so they choose to bypass them by creating shortcuts nearby. These shortcuts or informal trails often cut straight across slopes or through vegetation, trampling and destroying surrounding plants and ground cover. It can deteriorate the stability and sustainability of the original trail that the steps were built to protect.

## Is It Possible to Build Fewer Steps?

Although steps serve an important purpose, they can act as barriers for certain trail users and may even encourage behaviours that harm the natural environment. So, while some steps are unavoidable, is there a way to reduce their number?

This requires careful weighing of pros and cons during trail planning to strike a balance that retains the advantages of steps while minimising their quantity and avoiding potential negative impacts.

First, when designing trail routes, it is preferable to select locations with gentler slopes and steer clear of excessively steep terrain. This approach can reduce the number of steps required, resulting in trails that are easier to maintain and offer a more comfortable walking experience.

On trail sections with gentle terrain, unnecessary steps should be avoided wherever possible. This helps lessen both the physical and psychological burden on hikers while better preserving the natural appearance of hiking trails.

In appropriate locations along the trail, adding drainage channels, check dams, or diversion stones/wooden barriers can effectively manage water flow without relying on steps. These features help dissipate the erosive force of rainwater and surface runoff, mitigate soil erosion, and maintain good trail surface conditions over time.



Luk Keng War Relics Trail (In construction)

To see a thousand miles ahead, one must climb to great heights. Today we can take elevators to reach the top of tall buildings, but ascending mountains inevitably relies on steps, climbed one by one under our own strength. By gaining a better understanding of the purpose and value of steps on hiking trails, we can transform even the longest stairways from something intimidating into a source of safety, convenience, and enjoyment.



Lantau Trail Section 2

# Every Step is Hard Work

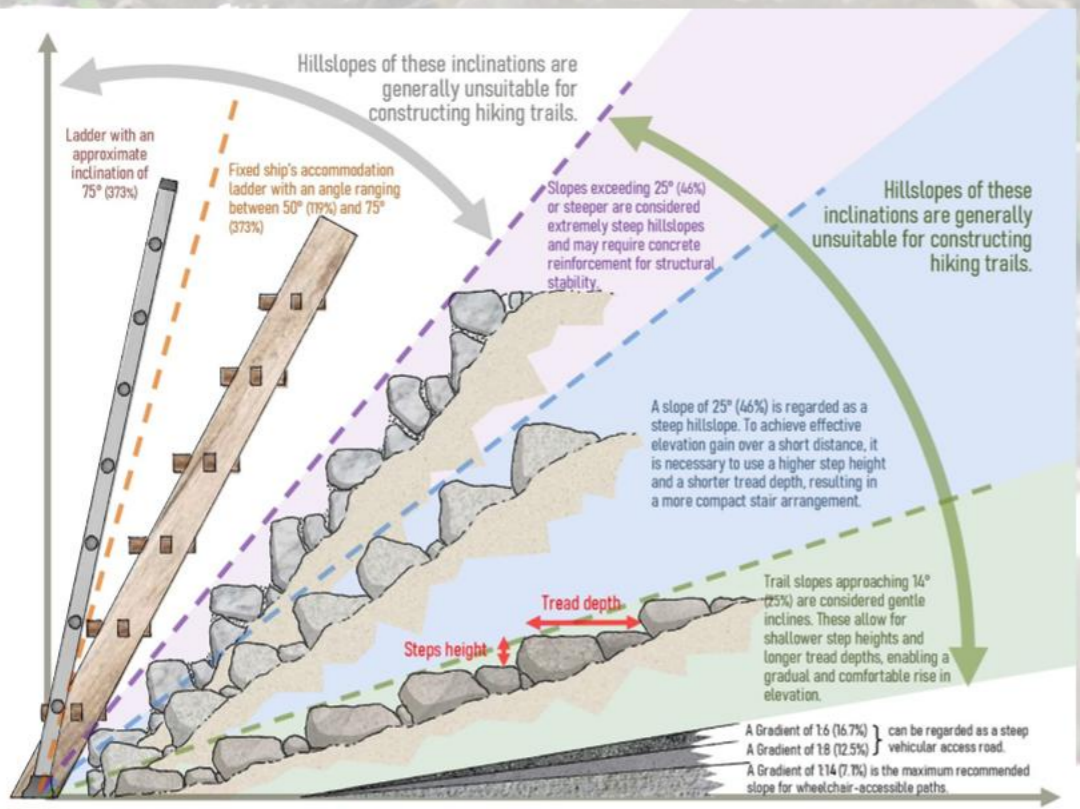
Although steps may look ordinary, their design and construction actually require careful consideration at every stage, even involving precise calculations, while taking into account the complexity of natural landscape and practical construction challenges. They are far from something that can be casually added to a trail on a whim.

## Trail Type

Family Walks and trails leading to picnic or barbecue sites are intended for a wide range of visitors, including the elderly and children. To make it easy for people of all ages to enjoy the countryside, these routes deliberately follow gentle and low-effort trails. As a result, steps are kept to a minimum. When they do appear, they are always gentle, even, and neatly constructed.

Forest tracks designed for patrolling and maintenance vehicles, such as Tai Lam Forest Track or Shing Mun Forest Track, must never include any steps at all.

Country trails and long-distance hiking trails, on the other hand, are mainly for users with higher fitness levels and more hiking experience. These paths often traverse terrain with significant ups and downs, so steps become necessary in places where there are substantial elevation changes.



## Trail Gradient

One of the key factors in planning hiking trails is the gradient of different sections. A slope exceeding 25% is considered steep and may pose safety risks to users. In such areas, steps are often constructed to ensure safer passage.

The steeper the gradient, the closer together the steps need to be placed, and the greater the construction challenges become.



## Materials

Most steps on hiking trails are paved using natural materials such as soil, large rocks, gravels and wood logs. In some trail sections, cement or concrete may be used for reinforcement where necessary. The choice of materials depends on several factors, including the type of trail and the availability of manpower for transporting them.

For example, on high-usage trails, steps are typically built with a combination of natural materials mixed with a small amount of concrete. This enhances their stability and improves overall safety.

When constructing steps on country trails or long-distance hiking trails, the decision hinges on what materials are readily available on site, along with the terrain, gradient, and alignment of the trail. The preferred option is sturdy, durable, and highly resistant rocks, sometimes weighing 150 kg or more.

However, since these trails are often located in remote areas, transportation poses significant challenges. This places greater limitations on material selection, and considerations such as available manpower and resources come into play. If suitable rocks cannot be sourced locally, lighter and easier-to-transport alternatives such as wood logs are considered instead.

Commonly Used Materials for Handcrafted Trails			
	Rocks	Small stones	Logs
Weight	Heavy	Light	Medium
Stability	Very stable	Loose	Good when properly fixed
Durability	Highly durable	Prone to displacement over time	Prone to rot
Building process	Labour-intensive	Simpler than large stones	Simple
Aesthetics	Highly harmonious with surrounding natural environment		

## User's Comfort

When walking on steps along hiking trails, comfort is one of the key elements that affects the overall user experience. It depends on factors such as steps height, tread depth, overall gradient, and the trail tread conditions.

According to a well-established step formula, the most comfortable feeling is achieved when **2 x steps height + tread depth = 65 to 70 cm**.

However, due to the constraints of the natural terrain in country parks, it is not always possible to make every section of steps perfectly match this ideal formula. In many cases, compromises must be made to balance comfort with practicality and safety in the given landscape.



## Step Design

In addition, the shape and design of the steps also play an important role in affecting the overall hiking experience.

When paving steps on hiking trails, the angle of each step is carefully adjusted. The front edge (or "nosing") of every tread is slightly raised and tilted upward to create a gentle forward-leaning profile. This subtle upward tilt makes it easier for hikers to plant their feet securely when descending, greatly enhancing stability and increasing the sense of safety while walking downhill.



# Building Steps on Rugged Mountain Trails

## LANTAU TRAIL

Lantau Trail is one of Hong Kong's four major long-distance hiking trails. Although its full 70-kilometre route begins and ends on the relatively flat coastal ground at Mui Wo near Silver Mine Bay, it passes through several prominent peaks exceeding 700 meter in elevation, such as Lantau Peak, Sunset Peak, Yi Tung Shan, and Nei Lak Shan, as well as traversing the ridgelines of Kwun Yam Shan, Keung Shan, and Ling Wui Shan. With its continuous high mountains and rugged terrain, constructing the trail required careful handling of steep slopes, user needs, construction materials, manpower, and other practical challenges all at the same time.

Take Lantau Trail Section 2 (Nam Shan to Pak Kung Au) and Section 3 (Pak Kung Au to Ngong Ping) as examples. Section 2 covers only 6.5 km, yet it climbs from just over 100 m above sea level at Nam Shan to a high point of nearly 800 m, before dropping sharply down the southwestern slope of Sunset Peak to around 300 m at Pak Kung Au. Section 3 then continues for 4.5 km, ascending directly to the 934 m summit of Lantau Peak and descending again to over 400 m at Ngong Ping. The elevation changes are dramatic, and in many sections steps were essential to connect the trail.

Anyone who has hiked these stages will surely recall the countless flights of steps that form such a memorable part of the journey.



In theory, the most direct way to route a trail up or down a steep mountainside is in a straight line. However, this approach easily leads to severe erosion and accelerated soil loss. At the same time, excessively abrupt changes in gradient can create significant safety risks for hikers. For these reasons, trails are generally designed with zigzag alignments along ridges or constructed with steps on slopes, so as to eliminate impacts in these challenging sections.

Most sections of the Lantau Trail consist of natural dirt paths combined with stone steps. These were all built by hand by the AFCD trail construction teams. They carried materials on foot and diligently laid each segment and each step. One can well imagine how labour-intensive the construction work must have been.



Lantau Trail Section 2 (Nam Shan to Pak Kung Au)



Building steps on hiking trails are designed to blend harmoniously with the natural environment and to minimise the need for transporting materials from afar. The guiding principle is always "adapt to local conditions and use materials available on site". Yet in particularly remote or high-altitude locations, such as the areas near the top of Lantau Peak, where the soil tends to be sandy and rich in loose gravel, suitable local materials are often not available for construction or repair. In such cases, depending on the terrain and conditions, helicopters may need to be arranged to airlift materials in. Otherwise, they need to be carried uphill by foot, adding greatly to the difficulty.

Stone is the preferred material for paving steps. Generally speaking, larger rocks are most ideal because of their size and weight, providing greater stability and durability, as well as stronger resistance to erosion, which helps extend the maintenance cycle. However, when large stones are fitted together, gaps are usually left between them. These gaps must be filled with smaller stones to create more contact

points and ensure the rocks are tightly interlocked. Only then can the structure achieve full stability, resist being washed away by water, and reduce the long-term need for maintenance costs.



The Lantau Trail has exceptional scenery, which is particularly cherished by hikers. For example, the area around Sunset Peak draws thousands of visitors every November and December to admire the Silver Grass waving across the hillsides. Meanwhile, Lantau Peak is



Silver Grass season at Lantau Peak



Sunset Peak experiences clearly distinct seasonal variations throughout the year. In winter, frost and ice can occasionally form on the exposed surfaces, making the trail treads especially prone to erosion and weathering.

one of the most famous spots in Hong Kong for watching the sunrise, offering breathtaking views as the first light of day breaks over the sea and islands below.

Yet this very popularity comes with its challenges. The heavy foot traffic from so many visitors can significantly accelerate soil erosion around the trail steps. On top of that, the high elevation means these sections are constantly exposed to moist air, and during winter, frost or even thin ice can form on the steps and rocky surfaces. All these factors combine to make the trail more susceptible to erosion and damage. As a result, regular inspection and maintenance become especially crucial.

The most effective method for keeping hiking trails in good condition is regular inspection. By carrying out routine patrols, any signs of damage can be spotted early. Prompt repairs can then be arranged to prevent minor issues from worsening into large-scale deterioration that would require much more extensive work later on.

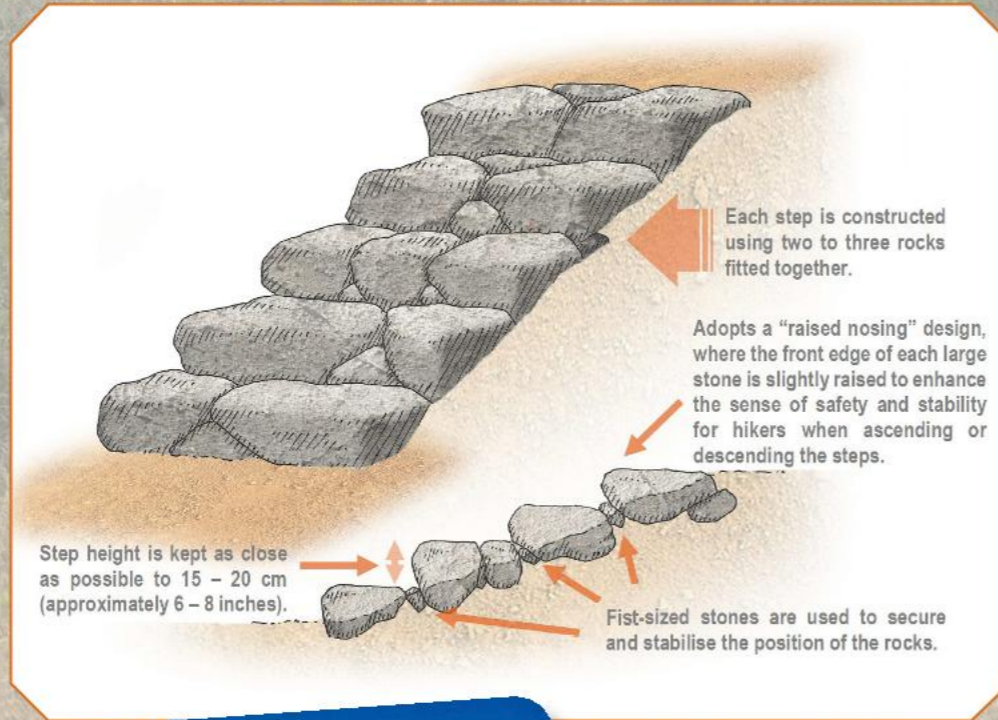
In addition to timely repairs, keeping drainage facilities clear and functioning properly is equally important. This greatly reduces the risk of severe erosion and scouring during heavy rainstorms, helping to minimise the frequency of repairs while allowing the trail to remain safely usable over the long term.

# Trail Classroom: How Much Do You Know About Trail Steps?

While the basic functions of different types of trail steps are largely similar, their materials and designs vary according to the terrain, environment, trail usage, and the specific needs of users. So even though they are all "steps", each type is quite distinct. Next time you're out in the countryside, take a closer look. You'll not only gain some interesting findings, but also add extra enjoyment to your outing!

## 1. Natural Rock Steps

These rock steps combine excellent durability with a pleasing natural appearance. They are typically used in locations where the slope exceeds 25% and the soil conditions are stable. They can blend seamlessly into the surrounding natural environment. However, despite their high durability, their construction requires considerable manpower. Moreover, it is not always possible to find sufficient supply of suitable rocks on site, which means this type cannot be used on every section of trail.

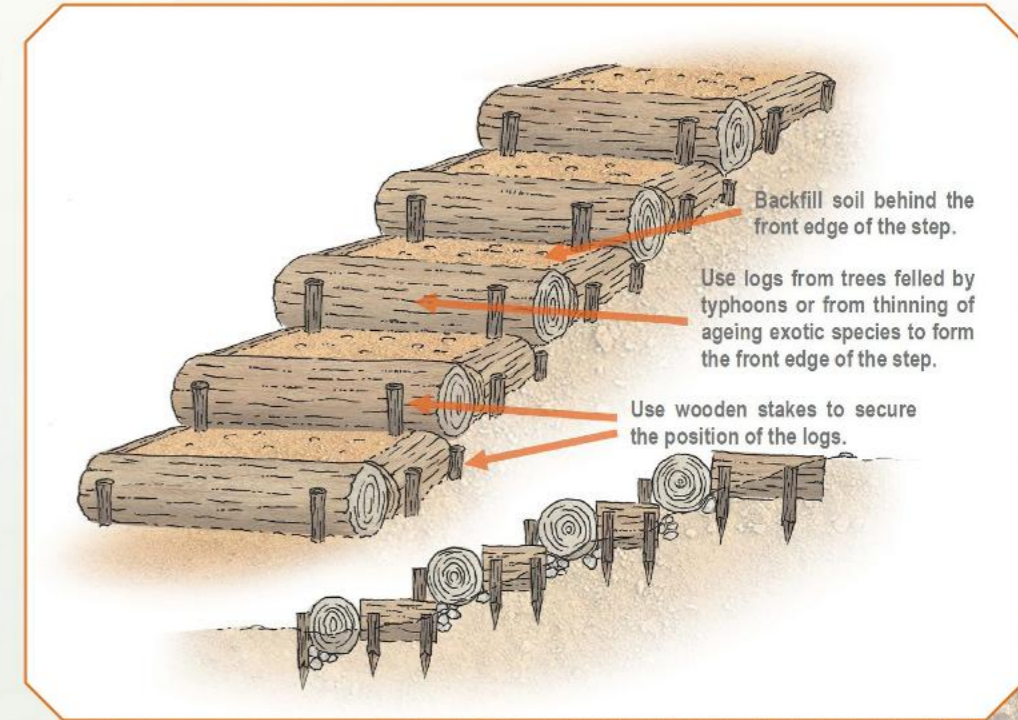


## 2. Wood Log Steps

These steps are commonly found on trails in the forested areas of country parks. Construction is relatively straightforward: the ground is first excavated and shaped into step-like terraces, then wood logs are laid in place. Wooden stakes or iron rods are driven in beside them to secure the logs firmly.

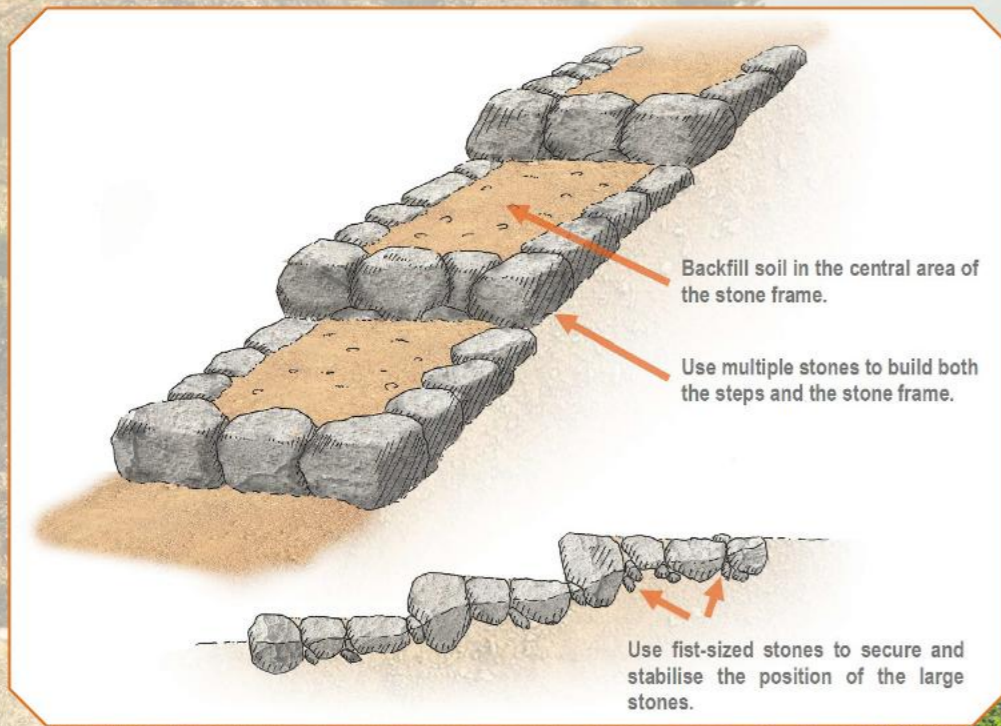
The wood logs used come from trees felled by typhoons or from thinning practices targeting ageing exotic species. The logs are cut to the required size. While this makes the material readily available and eco-friendly, over time the wood will gradually rot and decay due to constant exposure to moisture, making these steps less durable than others. Regular inspection and replacement are therefore essential to keep them safe.

Compared with other construction methods, however, log steps have clear advantages. They can be built and repaired much more quickly, and their natural appearance blends perfectly with the surrounding forest environment, enhancing the overall aesthetic and harmonious feel of the trail.

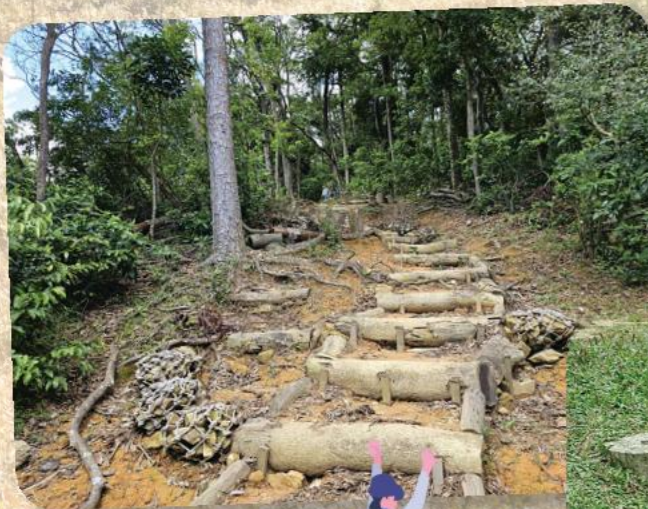


### 3. Stone Frame/ Wood Frame Steps

Soil composition varies across different districts in Hong Kong, and in some trail locations the soil has a particularly high sand content. In these areas, water and soil erosion tends to be more severe. When steps are constructed on such trails, stone frames or wood frames are commonly used to effectively lock the soil in place between the steps and significantly reduce surface runoff and erosion. However, laying stone or wood frames is more time-consuming compared with other step designs, as it requires precise placement of the framing materials to ensure they hold the fill securely and remain stable over time.



Tsiu Hang Country Trail



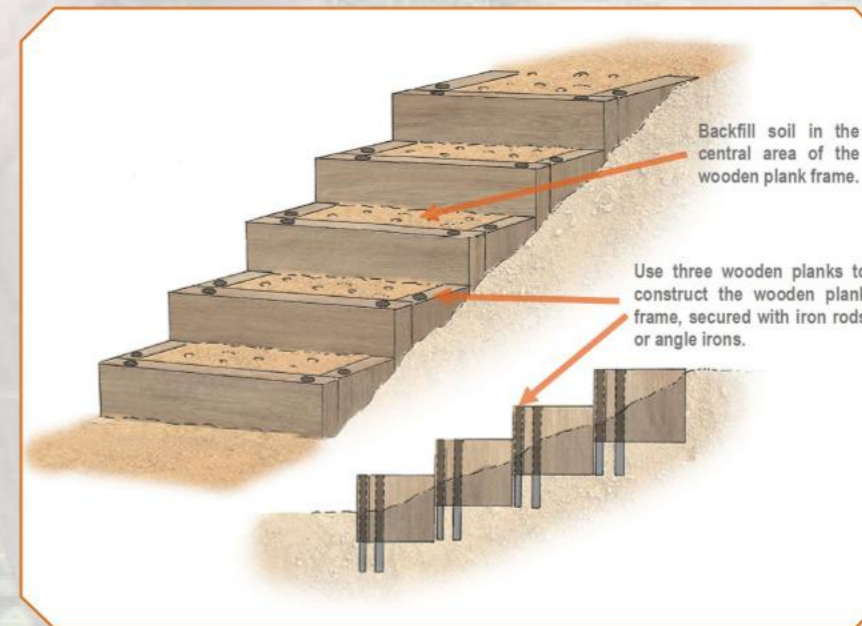
Twisk Country Trail



Lantau Trail Section 2

### 4. Wooden Plank Steps

Wooden plank steps are less commonly seen on hiking trails, mainly because of their lower durability and the need for more frequent maintenance and replacement. The key advantage lies in their modular design, which the planks are prefabricated or cut to standard sizes, making installation straightforward and repairs much quicker and more convenient. However, their appearance tends to be uniform and regular, which some may find less natural compared with other step types.



Robin's Nest Country Trail

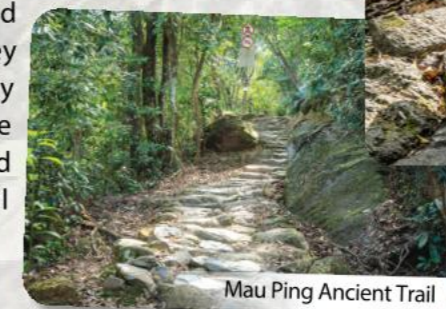
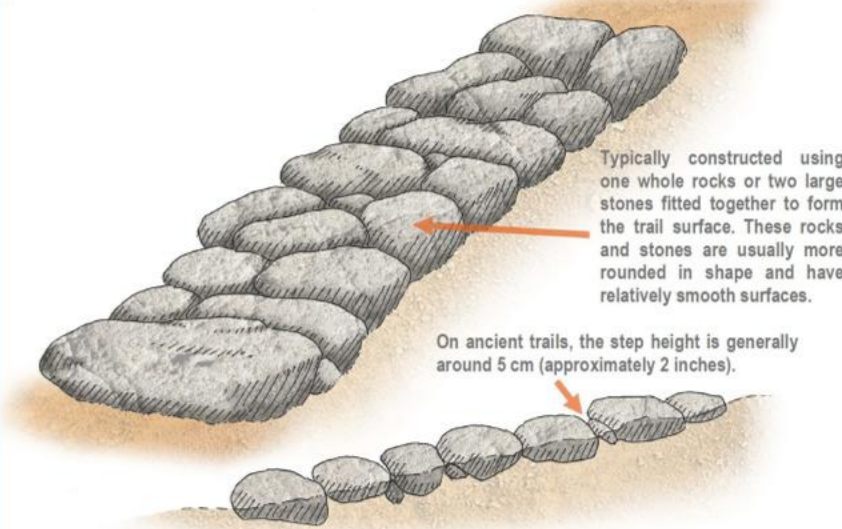


Shing Mun War Relics Trail

### 5. Natural Stone-Paved Ancient Trails

These stone-paved ancient paths are found throughout various districts of Hong Kong. In the past, they served as the main routes for rural villagers, connecting different villages, market towns, and settlements. Along many sections, stone steps were built to accommodate the natural ups and downs of the terrain. Some trails even feature historic guide stones placed along the way to indicate directions or name local landmarks.

The steps on these ancient trails are constructed almost entirely from stone blocks, giving them exceptional durability. Thanks to their sturdy design and the quality of the materials used centuries ago, they require relatively little maintenance and repair compared with modern trail steps.



Mau Ping Ancient Trail

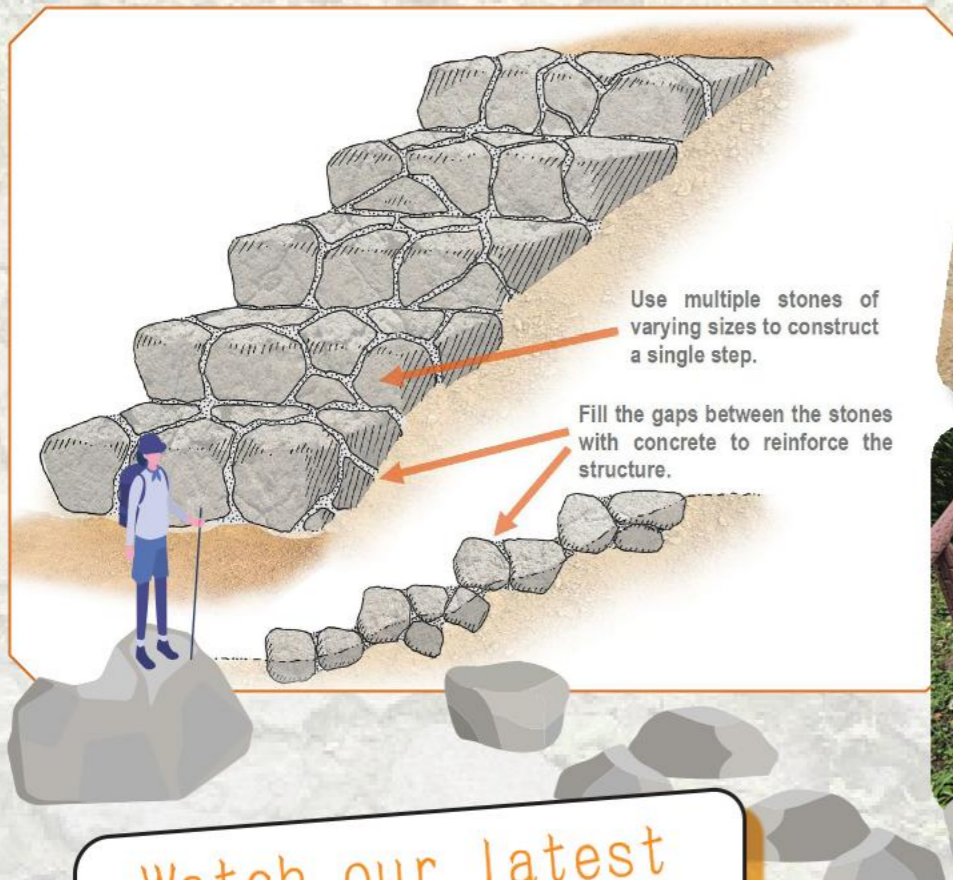


MacLehose Trail Section 5

## 6. Concrete-Reinforced Stone Steps

These steps are most commonly found on Family Walks or in picnic and barbecue sites. During construction, natural stones are first laid to form the basic step structure. Concrete is then applied to reinforce the steps and fill any gaps between the stones. This process significantly enhances safety and overall stability.

As a result, the finished surface is generally smooth and even, making these steps especially suitable for users of all ages. They have high durability and good drainage performance, which helps prevent water accumulation and reduces the risk of slips in wet weather. However, because of the visible use of concrete, the appearance tends to look more man-made and less naturally integrated into the surroundings compared with purely stone or wood log steps.



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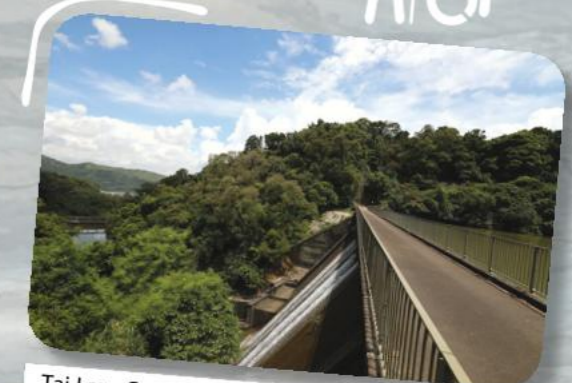
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# Accessible Routes in Country Parks

In recent years, AFCD has incorporated accessible and inclusive design elements into new and enhancement projects in country parks. In 2022, we launched four accessible routes in country parks, namely: Shing Mun Country Park (Paperbark Tree Forest), Tai Tam Country Park (Tai Tam Tuk Reservoir), Aberdeen Country Park (Aberdeen Upper Reservoir), and Tai Lam Country Park (Tsing Tam Upper Irrigation Reservoir). These routes aim to promote the rich natural resources to physically-challenged persons and facilitate their enjoyment of nature. When planning accessible routes, we take into account trail conditions (e.g. gradient and width of the trail), transport connections, and potential obstacles outside country parks (e.g. width of pavements and the presence of lamp posts or signage along the way). We will continue to identify suitable accessible routes and scenic spots, while integrating accessible elements into country park facilities to offer wheelchair users a more inclusive outdoor experience.

Country parks have a range of barrier-free facilities, including accessible toilets, barrier-free barbecue sites, electric wheelchair charging spots, etc. Visitor centres are also equipped with barrier-free access and related facilities to meet the needs of wheelchair users.



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