A scanning electron micrograph (SEM) showing a cross-section of a plant stem. The image displays a dense network of vascular bundles, each containing xylem and phloem. Two large, dark, irregularly shaped particles, identified as biochar, are visible. One is located in the upper-middle part of the image, and the other is in the lower-left part. The biochar particles appear to be embedded within the plant tissue. The text "Biochar In Stockholm" is overlaid in white on the image.

Biochar  
In  
Stockholm

100 years



15 years



50 years



1980-2012



6 years  
Toffelbacken



100 years



15 years



75 years





conventional construction  
for sidewalks in  
Stockholm  
a completely sealed  
surface where no water  
can be infiltrated or gas  
exchange can take place



Concrete tile

Sand

Asphalt

Roadbed crushed granite fraction 0-63 compacted



More than 40  
years on the  
site



# Compaction of soil and dense surface layers the main reason that trees do not grow in urban environments



- **subgrade**
- sorted stone material 0-8, 0-16, 0-32, 0-63mm
- grain sizes between zero and upper grain fraction are included











Toffelbacken







Sten



# Using a rock based growing substrate as a benefit for both for trees and stormwater management



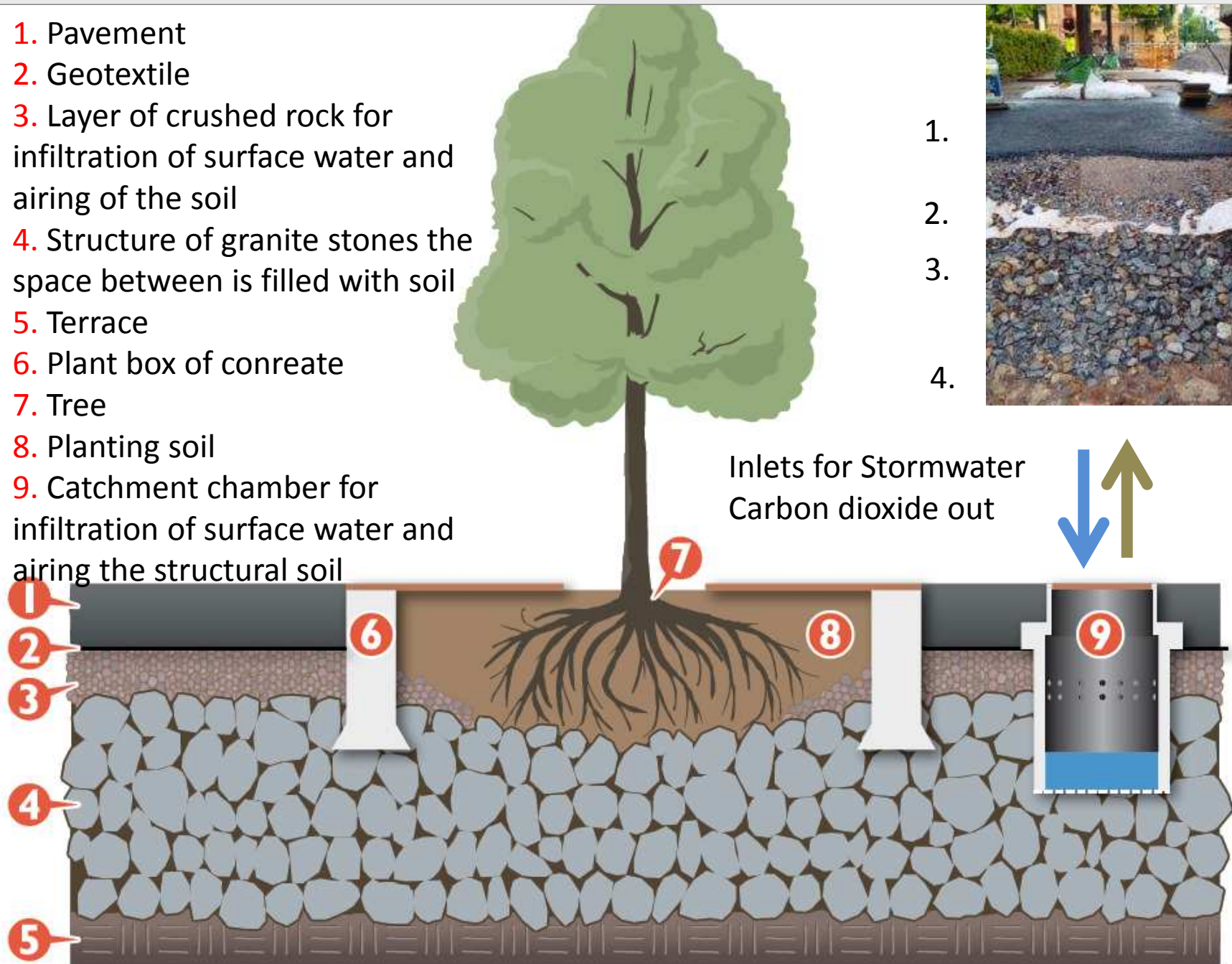


# How to create good growing conditions and taking care of the rain water

1. Pavement
2. Geotextile
3. Layer of crushed rock for infiltration of surface water and airing of the soil
4. Structure of granite stones the space between is filled with soil
5. Terrace
6. Plant box of concrete
7. Tree
8. Planting soil
9. Catchment chamber for infiltration of surface water and airing the structural soil



- 1.
- 2.
- 3.
- 4.





# STOCKHOLM STRUCTURAL SOIL

A construction method that optimises gaseous exchange and use of stormwater runoff to create good conditions for trees in paved areas and provide excellent load bearing capacity for streets while minimising risks of damage to paving and underground pipes

1. Paved surface and base course
2. Stormwater gutter
3. Aeration well: inlet for water and oxygen/carbon dioxide exchange
4. Tree grate
5. Stone mulch, crushed rock 4-8 mm
6. Root collar at nursery growing level
7. Crushed rock 4-8 mm with 95 volume-% biochar with added nutrients.
8. Concrete frame
9. Geotextile
10. Levelling layer, crushed rock 8-16 mm
11. Aeration layer, crushed rock 8-16 mm
12. Stone matrix, crushed rock 90-150 mm with planting soil holed into the voids found in the matrix
13. Biochar
14. Gas exchange (oxygen and carbon dioxide)







Granit 90-150mm  
Each layer 300 mm compacted for stability

Recycled concrete used as a part of the structural  
soil instead of granite

