

# IO11 Scaffolding

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# General overview and aim

- In this module future teachers in initial teacher education are introduced to support their students in dealing with complex environmental socio-scientific issues (SSI) by providing a scaffolding framework. Educational research has shown that students often struggle with open problems. Meta-knowledge about the process to be followed can support students in dealing with these tasks and in deciding which step they should perform next.
- The intention of this module is to strengthen future teachers' competences in how to use scaffolding and meta-knowledge frameworks to deal with environmental SSI and to develop a deeper understanding of the benefits for their students through meta-knowledge approaches.
- Teacher students learn about scaffolding frameworks by using the topics “forests” and “climate change” as examples of an SSIs with multiple references to life experiences of future science teachers and their future students at school.



# Flowchart and Module plan

Introduction to the topic of the forest

- Activity 1.1 Pictures of forests/forest quiz
- Activity 1.2 Mapping Fields of interest
- Activity 1.3 Connecting forests to curricula

Introducing of scaffolding using the example of the SSI forest

- Activity 2.1: Forest and site
- Activity 2.2: Forests in change
- Activity 2.3: Forest and climate change

Implementation of scaffolding and forest related SSI in classroom

- Activity 3.1: Analysis of forest lessons
- Activity 3.2: Development of SSI lessons based on forest issues

# Guidelines for Methods

## **Immersive:**

- Emotionally, by linking up with personal experiences, taking on different roles and perspectives
- Subject-related, through broad immersion in methods and findings of interdisciplinary multi-perspective mobility research

## **Prioritizing students' active learning:**

- As little direct input from the teacher educators as possible
- Discursive Formats
- Own experience
- Creative elements
- Reflective practices

## 1. Introduction to the topic of the forest

### Activity 1.1 Pictures of forests and forest quiz



Duration: 30 min + 30 min

This is a “warm up” activity. This activity aims to draw attention to the different dimensions of forest. For example, from the perspective of Education for Sustainable Development, the forest has at least the following dimensions: ecological, economical, societal, cultural.

The trainer shows a selection of pictures with different forests. Each participant chooses a picture of their favourite forest and tells a story about it. The intention is to explore students’ previous knowledge, beliefs, experiences, and attitudes related to the topic.

If the trainer wants to draw more attention on the forest dimensions, he/she can include the optional activity “forest quiz”, where students must guess terms relating to forest.

## 1. Introduction to the topic of the forest

### Activity 1.2: Mapping fields of interest



Duration: 30 min + 60 min

These activities intend to give students an idea of the wide range of topics that are related to forests in the broadest sense.

**Who knows about forest?** Students try to give correct definitions for terms related to forest.

**Forest tales:** The students are given the task of collecting information on the topic of forests (newspaper articles, photos, headlines, studies). In small groups they discuss what was decisive for them to choose articles, which of the materials seem credible, which seem interesting for teaching.

The topics addressed are collected and topic clusters are formed to form a pool for further tasks.

## 1. Introduction to the topic of the forest

### Activity 1.3: Connecting forests to curricula



Duration: 30 min

The teacher trainer gives an example how to identify aspects in forest topics that relate to maths and science education. The example given in the outline refers to Austrian curriculum. Following this example groups of two teacher students identify aspects in forest topics that relate to maths and science education according to their national curricula for one subject and grade on their own.

## 2. Introduction of scaffolding using the example of the SSI forest

### Activity 2.1: Forest and site



Duration: 60 min

What does a forest need to grow, and which elements determine its appearance? The intention of this activity is to work out the connection between forest and site.

A forest tree is first used to work out what it needs for its growth. In a next step, the class looks into the question of how different plant species cope with different offers of light, water and nutrients and which species thrive where.

In pairs, students create social media profiles of different forest trees.

## 2. Introduction of scaffolding using the example of the SSI forest

### Activity 2.2: Forests in change



Duration: 90 min

The students compare distributions of forests at different times in earth history using maps and tables. They calculate changes in forest areas during the last century, they discuss causes and consequences of these changes.



## 2. Introduction of scaffolding using the example of the SSI forest

### Activity 2.3: Forests and climate change



Duration: 230 min

This activity consists of six exercises. First the trainer gives a short input on the influence of the forest on the regional climate, the students explore this by measuring temperature and humidity at different sites. The students receive data on a site and have to make a choice on the appropriate tree species. The following exercises add economical, legal, environmental and social dimensions, that play a role in such decisions using different techniques like group work, role play, discussions.

## Implementation of scaffolding and forest related SSIs in classroom

### Activity 3.1: Analysis of forest and climate change lesson



Duration: 45 min

The Teacher Trainer introduces a range of scaffolding techniques to the students. The students analyse the previous lessons on the topic of the forest and try to identify the scaffolding elements.

## Implementation of scaffolding and forest related SSIs in classroom

### 3.2: Development of SSI lessons based on forest issues



Duration: 180 min

The teacher students choose a topic from the topic pool resulting from Activity 1.2 and give a vote for their preferred topic. For the topic that gets the most votes, the students should work out a scaffold in groups of two. First, they need to consider where suitable data material for the content to be taught could be found. The research and preparation of the data material should be done by the students as homework.

The teacher trainer selects three curriculum objectives that match the content. He presents them to the students in the following practice session. Each group chooses a curriculum objective and thinks about how the chosen topic and the curriculum objective can be linked and how the scaffold should be built up. Using the data material prepared in the homework assignment, the students now plan their lesson. Each group tests the lesson setting of another group and provides feedback.

# Activity 1.1: Pictures of forests



European beech forest (Photo: Hanns Kirchmeir)

# Activity 1.1: Pictures of forests



Coniferous forest (Photo: Michael Huber)

## Activity 1.1: Pictures of forests



Cloud forest, Uganda (Photo: Hanns Kirchmeir)

## Activity 1.1: Pictures of forests



Mangroves, La Mancha/Mexico (Photo: Michael Huber)

## Activity 1.1: Pictures of forests



Eukalyptus plantation, South Africa (Photo: Hanns Kirchmeir)

## Activity 1.1: Pictures of forests



Oil palms (Photo: Hanna Kirchmeir)

## Activity 1.1: Pictures of forests



Timber transport, Ghana (Photo: Hanna Kirchmeir)

# Activity 1.1: Pictures of forests



Wildfire (Photo: Michael Huber)

# Activity 2.1: Forest and site – plant growth

**5 Things Plants Need**

- Water:** Represented by a blue cloud with raindrops and a white faucet with a single drop of water.
- Light:** Represented by a yellow sun and a glowing yellow lightbulb.
- Nutrients:** Represented by a pile of brown soil and three fertilizer containers, one of which is labeled with a blue 'N'.
- Space to Grow:** Represented by a landscape with several yellow trees and a small green plant in a red pot.
- Air:** Represented by a circular icon of a palm tree with wind lines and a person blowing bubbles.

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# Activity 2.1: Forest and site – forests on earth



## Activity 2.1: Forest and site – forests on earth



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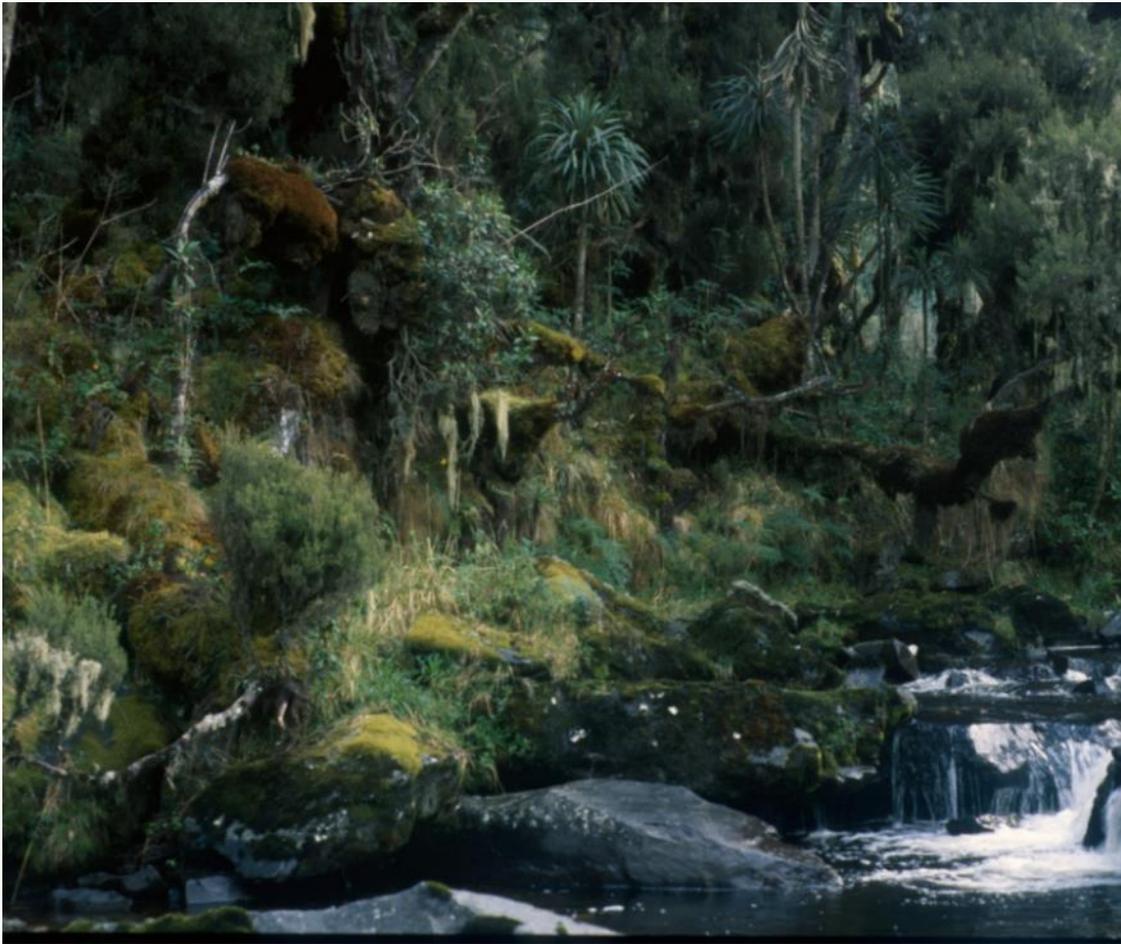
## Activity 2.1: Forest and site – forests on earth



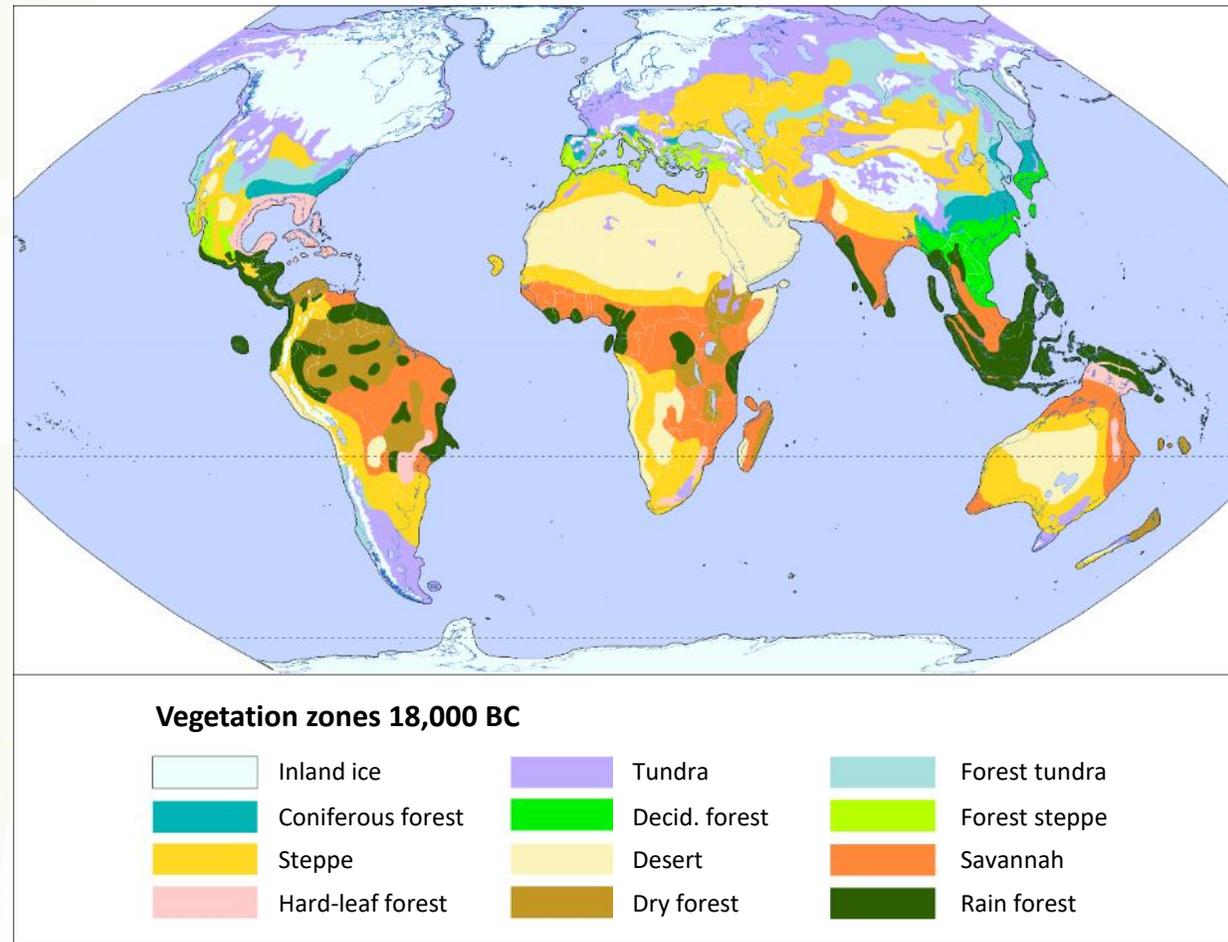
## Activity 2.1: Forest and site – forests on earth



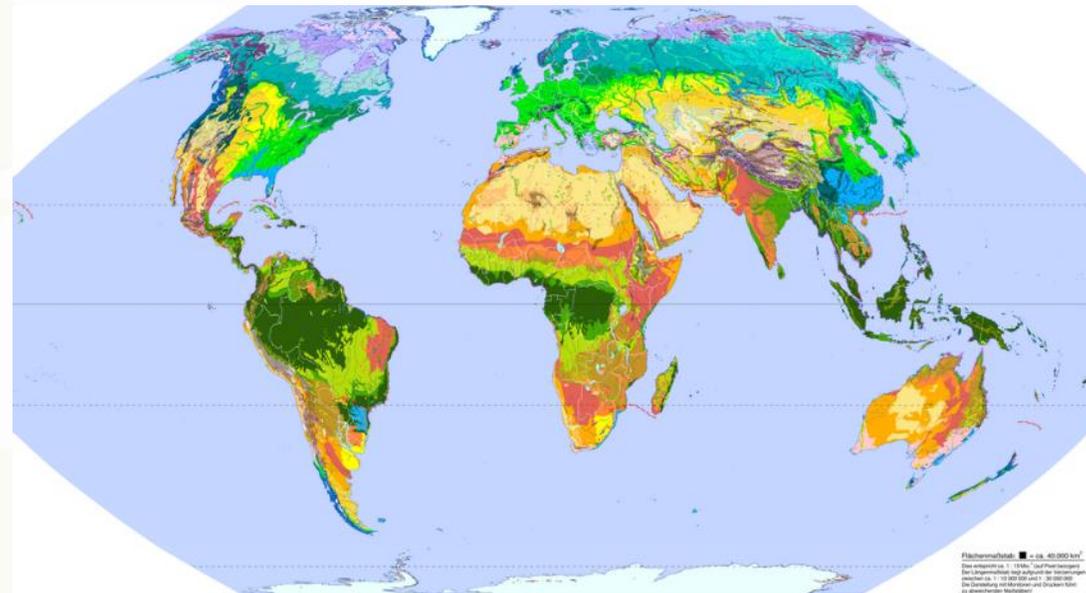
## Activity 2.1: Forest and site – forests on earth



## Activity 2.2: Forests in change



# Activity 2.2: Forests in change



Legend (English)

Ice Sheets and Glaciers	Evergreen Taiga	Winter-cold Semidesert	Dry Savanna
Cold Desert	Temperate Mountain Forest	Winter-cold Desert	Xeric Shrublands and Succulents
Lichen and Moss Tundra	Temperate Coastal Rain Forest	Sclerophyllous Vegetation	Trop. and Subtrop. Dry Forest
Dwarf Shrub and Meadow Tundra	Mixed Forest	Hot Semidesert	Moist Savannas
Alpine Tundra	Temperate Broadleaf Forest and Riparian	Hot Desert	Trop. and Subtrop. Moist Forest
Subpolar Meadows, Heaths and Mines	Forest Steppe	Highland Steppe and Desert	Trop. and Subtrop. Rain Forest
Broadleaf Forest-tundra and Riparian Taiga	Grasslands and Salt Marshes	Subtropical Mountain Forest	Tropical Mountain Rainforest
Coniferous Forest-tundra	Shrub and Dry Steppe	Subtropical Moist Forest	Marsh and Swamp
Deciduous Taiga	Desert without Vegetation	Oasis	Mangrove
Mountain Ranges			

## Activity 2.3: Forests & climate change

Which tree species is better suited for this location? Decide and reason your decision!

### Site

**Zone:** Central Europe

**Altitude:** 700m ASL

**Mean annual temperature:** 7°C

**Annual precipitation:** 1100 mm/year

**Soil:** gravel materials of mixed sources, medium acidity, sandy loam

**Soil moisture:** fresh

### Beech (*Fagus sylvatica*)



**Distribution:** in Central Europe 300-1000 m ASL

**Mean annual temperature:** 4-12°C

**Annual precipitation:** 450-2000 mm/year

**Soil:** nutrient-rich, slightly acidic to calcareous, cohesive sandy to loamy

**Soil moisture:** moderate moisture

**Special feature:** young trees tolerate shade; old trees are very competitive in the fight for light and therefore often displace other tree species

### Pine (*Pinus sylvestris*)



**Distribution:** in Central Europe up to 2000 m ASL

**Mean temperature:** summer 9-20°C, winter -20-0°C

**Annual precipitation:** ≥ 400 mm/year

**Soil:** no special demands

**Soil moisture:** dry or wet

**Special feature:** undemanding tree species, tolerates many soils and climates, weak competition at good sites

## Activity 2.3: Forests & climate change

A forest owner hands over his estate to his daughter, a trained forester. Some areas are to be reforested. Which tree species should she choose for the new plantings?

### Site

Alpine foothills, Burgenland, Austria  
Altitude: 300m ASL  
Mean temperature: 9°C  
Annual precipitation: 800 mm/year  
Soil: loam

### Spruce (*Picea Abies*)



**Yearly yield:** 11 m<sup>3</sup>/ha/year  
**Plan age for harvesting:** 80 years  
**Average price per m<sup>3</sup>:** 95 €  
**Risk:** High risk caused by bark beetle, windthrow (loamy soils with low oxygen content leads to very flat root systems near to surface)

### Oak (*Quercus petrae*)



**Yearly yield:** 6 m<sup>3</sup>/ha/year  
**Plan age for harvesting:** 120 years  
**Average price per m<sup>3</sup>:** 115 €  
**Risk:** low risk of windthrow (deep rooting system), low risk of bark beetle, medium risk of other insects

## Activity 2.3: Forests & climate change

A heavy storm knocked down large parts of the forest. Since this is a protective forest, it must be reforested as quickly as possible.

Discuss in groups which aspects you need to consider to make a good decision: site conditions, legal and economic aspects ...



Kosiak, Austria (Photo: Hanns Kirchmeir)



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