1. Describe the three levels of biodiversity as used by the United Nations, and using the concept of ecological niche, explain why life on Earth is diverse.

The variety of life on Earth is called biodiversity, and it consists of genetic, species, and ecosystem diversity.

A leading theory to explain the diversity of species is niche theory. An ecological niche is the position and role of a species within its environment, including how it reproduces, how it meets its need for water, food and shelter, how it avoids predators, and what kind of environmental conditions it can tolerate (for example, the optimal temperature range). Niche theory assumes that by specialisation or adaptation towards a specific niche, organisms reduce competition, and allow for co-existence. This adaption can, but does not always, result in speciation: the formation of new species.

1. Explain the two different ways how we can value biodiversity, and give an example for both which were not mentioned in the main text.

Biodiversity is important in many ways, both in the services it provides to humanity (extrinsic value), and in its own right (intrinsic value).

There are many different examples of extrinsic values of biodiversity, for example climate control (e.g. carbon sequestration), soil formation, medicinal resources, purification of water etc. It is key to realize that these are examples of ecosystem services.

An example of an the intrinsic value of biodiversity is that every species, regardless of whether humans have a need for them, have value of their own. Therefore, any species here can be used as an example, as long as you explain that they have value in their own right.

1. The major threats to biodiversity can be remembered using the acronym HIPPCO. List these major threats to biodiversity, and give three examples of these threats which were discussed in this chapter.

HIPPCO stands for:

• Habitat loss and fragmentation

• Invasive species

• Pollution

• Population growth and increasing use of resources (driver)

• Climate change

• Overexploitation

Three examples used in this chapter were loss of habitat (HANPP), invasive species (Nile Perch) and Overexploitation (overfishing of sharks).

1. One way of determining how humans dominate resource use in terrestrial systems is by determining HANPP. What does HANPP stand for, and how does it relate to the NPP from the natural vegetation?

As humans are transforming natural habitats into pastures and croplands, they also dominate the use of NPP within these systems. We can express this proportion as Human Appropriated Net Primary Production (HANPP), which is in indicator for the impact of human land use on the available biomass in ecosystems.

Figure A in Box 2.3 highlights the relationship between HANPP and the natural vegetation. Briefly: The natural (or potential) vegetation within an ecosystem has a potential NPP (NPP0). When humans clear this natural vegetation for agriculture, we replace it with our crops (soybean plants in our example). This now has become the actual vegetation within the system, with a different NPP production (the actual NPP, or NPPact). Part of this NPPact is harvested by the farmer (NPPh: in our example, the beans), while some of the vegetation remains on the field (NPPt: the remainder of the plant). In addition, the full potential of the NPP might have changed due to the land use change (NPPluc). Human appropriated NPP (HANPP: the amount of the NPP within the ecosystem used/affected by humans) then is the sum of NPPh and NPPluc.

1. There are two key approaches used to conserve biodiversity. Explain the difference between these two approaches.

There are two levels at which biodiversity conservation takes place: the ‘species approach’ and the ‘ecosystem approach’. The species approach focusses on areas which hold particular species, for instance rare species or keystone species.

The ecosystem approach targets conservation at the level of communities, habitats, or entire ecosystems, rather than individual species. This approach assumes that conservation money is better spent on an entire ecosystem than individual species, as this holds the possibility of preserving many species simultaneously.