Spatial Units: Group Exercise 1: Calculate area of each EU and EU type

Note: One BSU = 250m*250m = 6.25 ha
EAU area = 288 BSUs = 18 km²
1 ha = (100m x 100m) = 10,000m²
1 km² = 100 ha = 1,000,000m²

Instructions: (1) Count the BSUs in each EU and record in the BSU Count column of the EU Table.
(2) Calculate the area for each EU
(3) Add the BSU Count and Area for each EU type and record in the Summary Table
Spatial Units: Group Exercise 2: Calculate average rainfall (mm/year) for each EU

Instructions: (1) For EU02 only, count the number of BSU in each rainfall band. Record in the BSU Count column of the Rainfall Table. Count partial BSUs as well.
(2) Calculate the Total rainfall
(3) Calculate the Total BSU Count for EU02.
(4) Calculate the Average rainfall for EU02 (Total rainfall/total BSU count)
Spatial Units: Group Exercise 3: Calculate average production (Tonnes/ha) for EU01

### Farm productivity

<table>
<thead>
<tr>
<th>Farm</th>
<th>Production (tonnes)</th>
<th>BSU Count</th>
<th>Productivity (tonnes/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6,500</td>
<td>33</td>
<td>12.31</td>
</tr>
<tr>
<td>B</td>
<td>9,000</td>
<td>32</td>
<td>17.58</td>
</tr>
<tr>
<td>C</td>
<td>3,200</td>
<td>15</td>
<td>13.33</td>
</tr>
</tbody>
</table>

Instructions: (1) Count the number of BSUs in each farm (A, B, and C). Record the results in the BSU Count column. (2) Calculate the Productivity of each farm (A, B, and C). Record in the result in the Productivity column. (3) Calculate the Total Production for EU01. Calculate the Total BSU Count for EU01. (4) Calculate the Average Productivity for EU01.
### Classification: Group Exercise 1: Classify Land Cover into SEEA Classes

#### SEEA Land Cover Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Artificial surfaces (including urban and associated areas)</td>
<td>The class is composed of any type of areas with a predominant artificial surface. Any urban or related feature is included in this class, for example, urban parks (parks, parkland and laws). The class also includes industrial areas, and waste dump deposit and extraction sites.</td>
</tr>
<tr>
<td>02 Herbaceous crops</td>
<td>The class is composed of a main layer of cultivated herbaceous plants (graminoids or forbs). It includes herbaceous crops used for hay. All the non-perennial crops that do not last for more than two growing seasons and crops like sugar cane, where the upper part of the plant is regularly harvested while the root system can remain for more than one year in the field, are included in this class.</td>
</tr>
<tr>
<td>03 Woody crops</td>
<td>The class is composed of a main layer of permanent crops (trees or shrub crops) and includes all types of orchards and plantations (fruit trees, coffee and tea plantation, oil palms, rubber plantation, Christmas trees, etc.).</td>
</tr>
<tr>
<td>04 Multiple or layered crops</td>
<td>This class combine two different land cover situations: Two layers of different crops. A common case is the presence of one layer of woody crops (trees or shrubs) and another layer of herbaceous crop, e.g., wheat fields with olive trees in the Mediterranean area and intense horticulture, or oasis or typical coastal agriculture in Africa, where herbaceous fields are covered by palm trees. Presence of one important layer of natural vegetation (mainly trees) that covers one layer of cultivated crops. Coffee plantations shadowed by natural trees in the equatorial area of Africa are a typical example.</td>
</tr>
<tr>
<td>05 Grassland</td>
<td>This class includes any geographical area dominated by natural herbaceous plants (grasslands, prairies, steppes and savannahs) with a cover of 10 per cent or more, irrespective of different human and/or animal activities, such as grazing or selective fire management. Woody plants (trees and/or shrubs) can be present, assuming their cover is less than 10 per cent.</td>
</tr>
<tr>
<td>06 Tree-covered areas</td>
<td>This class includes any geographical area dominated by natural tree plants with a cover of 10 per cent or more. Other types of plants (shrubs and/or herbs) can be present, even with a density higher than that of trees. Areas planted with trees for afforestation purposes and forest plantations are included in this class. This class includes areas seasonally or permanently flooded with freshwater. It excludes coastal mangroves (→07).</td>
</tr>
<tr>
<td>07 Mangroves</td>
<td>This class includes any geographical area dominated by woody vegetation (trees and/or shrubs) with a cover of 10 per cent or more that is permanently or regularly flooded by salt and/or brackish water located in the coastal areas or in the deltas of rivers.</td>
</tr>
<tr>
<td>08 Shrub-covered areas</td>
<td>This class includes any geographical area dominated by natural shrubs having a cover of 10 per cent or more. Trees can be present in scattered form if their cover is less than 10 per cent. Herbaceous plants can also be present at any density. The class includes shrub-covered areas permanently or regularly flooded by inland fresh water. It excludes shrubs flooded by salt or brackish water in coastal areas (→07).</td>
</tr>
<tr>
<td>Class</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>09</td>
<td>Shrubs and/or herbaceous vegetation, aquatic or regularly flooded</td>
</tr>
<tr>
<td>10</td>
<td>Sparsely natural vegetated areas</td>
</tr>
<tr>
<td>11</td>
<td>Terrestrial barren land</td>
</tr>
<tr>
<td>12</td>
<td>Permanent snow and glaciers</td>
</tr>
<tr>
<td>13</td>
<td>Inland water bodies</td>
</tr>
<tr>
<td>14</td>
<td>Coastal water bodies and intertidal areas</td>
</tr>
</tbody>
</table>

**09 Shrubs and/or herbaceous vegetation, aquatic or regularly flooded**
This class includes any geographical area dominated by natural herbaceous vegetation (cover of 10 per cent or more) that is permanently or regularly flooded by fresh or brackish water (swamps, marsh areas, etc.). Flooding must persist for at least two months per year to be considered regular. Woody vegetation (trees and/or shrubs) can be present if their cover is less than 10 per cent.

**10 Sparsely natural vegetated areas**
This class includes any geographical areas were the cover of natural vegetation is between 2 per cent and 10 per cent. This includes permanently or regularly flooded areas.

**11 Terrestrial barren land**
This class includes any geographical area dominated by natural abiotic surfaces (bare soil, sand, rocks, etc.) where the natural vegetation is absent or almost absent (covers less than 2 per cent). The class includes areas regularly flooded by inland water (lake shores, river banks, salt flats, etc.). It excludes coastal areas affected by the tidal movement of saltwater (→14).

**12 Permanent snow and glaciers**
This class includes any geographical area covered by snow or glaciers persistently for 10 months or more.

**13 Inland water bodies**
This class includes any geographical area covered for most of the year by inland water bodies. In some cases, the water can be frozen for part of the year (less than 10 months). Because the geographical extent of water bodies can change, boundaries must be set consistently with those set by class 11, according to the dominant situation during the year and/or across multiple years.

**14 Coastal water bodies and intertidal areas**
The class is defined on the basis of geographical features of the land in relation to the sea (coastal water bodies, i.e., lagoons and estuaries) and abiotic surfaces subject to water persistence (intertidal areas, i.e., coastal flats and coral reefs).
### Classification: Group Exercise 1: Classify Land Cover into SEEA Classes

#### Land Cover Database

<table>
<thead>
<tr>
<th>Land Cover</th>
<th>Area (ha)</th>
<th>SEEA Land Cover Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban residential</td>
<td>32</td>
<td>01 Artificial surfaces (including urban and associated areas)</td>
</tr>
<tr>
<td>Urban commercial</td>
<td>15</td>
<td>02 Herbaceous crops</td>
</tr>
<tr>
<td>Urban park - football fields</td>
<td>8</td>
<td>03 Woody crops</td>
</tr>
<tr>
<td>Roads</td>
<td>4</td>
<td>04 Multiple or layered crops</td>
</tr>
<tr>
<td>Woodland</td>
<td>23</td>
<td>05 Grassland</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>40</td>
<td>06 Tree-covered areas</td>
</tr>
<tr>
<td>Deciduous forest</td>
<td>45</td>
<td>07 Mangroves</td>
</tr>
<tr>
<td>Crops - wheat</td>
<td>30</td>
<td>08 Shrub-covered areas</td>
</tr>
<tr>
<td>Crops - apples</td>
<td>20</td>
<td>09 Shrubs and/or herbaceous vegetation, aquatic or regularly flooded</td>
</tr>
<tr>
<td>Shrubland - dry</td>
<td>12</td>
<td>10 Sparsely natural vegetated areas</td>
</tr>
<tr>
<td>Swamp</td>
<td>5</td>
<td>11 Terrestrial barren land</td>
</tr>
<tr>
<td>Peatland</td>
<td>13</td>
<td>12 Permanent snow and glaciers</td>
</tr>
<tr>
<td>River</td>
<td>23</td>
<td>13 Inland water bodies</td>
</tr>
<tr>
<td>Estuary</td>
<td>30</td>
<td>14 Coastal water bodies and intertidal areas</td>
</tr>
<tr>
<td>Coral reef</td>
<td>20</td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>Crops - apples and hay</td>
<td>12</td>
<td><strong>389</strong></td>
</tr>
<tr>
<td>Mineral excavation area</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Rocky shore</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Desert (sand)</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Lake</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>389</strong></td>
<td></td>
</tr>
</tbody>
</table>

**SEEA Land Cover Class**

01 Artificial surfaces (including urban and associated areas)
02 Herbaceous crops
03 Woody crops
04 Multiple or layered crops
05 Grassland
06 Tree-covered areas
07 Mangroves
08 Shrub-covered areas
09 Shrubs and/or herbaceous vegetation, aquatic or regularly flooded
10 Sparsely natural vegetated areas
11 Terrestrial barren land
12 Permanent snow and glaciers
13 Inland water bodies
14 Coastal water bodies and intertidal areas

**Instructions:**

1. Classify National land cover database items according to SEEA Land Cover Classification. Record SEEA Land Cover Class.
2. Add areas with the same SEEA classes and record totals in SEEA Land Cover Class table.
Extent Account: Step 1 - Calculate Opening and Closing Land Cover (hectares)

Opening Land Cover

<table>
<thead>
<tr>
<th>Code</th>
<th>Count (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>16</td>
</tr>
<tr>
<td>G</td>
<td>7</td>
</tr>
<tr>
<td>T</td>
<td>23</td>
</tr>
<tr>
<td>M</td>
<td>7</td>
</tr>
<tr>
<td>S</td>
<td>19</td>
</tr>
<tr>
<td>T</td>
<td>15</td>
</tr>
<tr>
<td>S</td>
<td>17</td>
</tr>
<tr>
<td>G</td>
<td>13</td>
</tr>
<tr>
<td>P</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
</tr>
<tr>
<td>X</td>
<td>0</td>
</tr>
</tbody>
</table>

Closing Land Cover

<table>
<thead>
<tr>
<th>Code</th>
<th>Count (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>19</td>
</tr>
<tr>
<td>G</td>
<td>18</td>
</tr>
<tr>
<td>T</td>
<td>15</td>
</tr>
<tr>
<td>M</td>
<td>6</td>
</tr>
<tr>
<td>S</td>
<td>17</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
</tr>
<tr>
<td>X</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Each cell represents one hectare.

Instructions: Count the number of cells (hectares) for each land cover type and record in the Land Cover table.
### Extent Account: Step 2 - Calculate Land Cover Change Matrix and Physical Account for Land Cover

#### Table 1: Net Land Cover Change Matrix (hectares)

<table>
<thead>
<tr>
<th>Opening Land Cover</th>
<th>Code</th>
<th>A</th>
<th>C</th>
<th>G</th>
<th>T</th>
<th>M</th>
<th>S</th>
<th>R</th>
<th>P</th>
<th>E</th>
<th>X</th>
<th>Closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial surfaces</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grassland</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree covered area</td>
<td>T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrub covered area</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularly flooded areas</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sparse natural vegetated areas</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrestrial barren land</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent snow, glaciers and inland water bodies</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Rows represent reductions in stock; columns represent deletions in stock

**Instructions:**
1. Transfer the Opening and Closing areas from the Land Cover Tables.
2. Count areas with no change and record on the diagonal.
3. Record changes from Opening to Closing in rows (e.g., 1ha grassland changed to Crop)
4. Check: Rows add to Opening; Columns add to Closing.
## Extent Account: Step 2 - Calculate Land Cover Change Matrix and Physical Account for Land Cover

### Table 2: Physical Account for Land Cover

<table>
<thead>
<tr>
<th></th>
<th>Artificial surfaces</th>
<th>Crops</th>
<th>Grassland</th>
<th>Tree covered area</th>
<th>Mangroves</th>
<th>Shrub covered area</th>
<th>Regularly flooded areas</th>
<th>Sparse natural vegetated areas</th>
<th>Terrestrial barren land</th>
<th>Permanent snow, glaciers and inland water bodies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additions to Stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reductions in Stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing Stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Reductions are sum of row, excluding areas that remained the same

### Instructions:
1. Transfer Opening Land Cover to Opening Stock row
2. Transfer Closing Land Cover to Closing Stock row
3. Add columns (excluding areas that stayed the same) to obtain Additions to Stock
4. Add rows (excluding areas that stayed the same) to obtain Reductions in Stock
5. Check: Total Stock = 100; Additions = Reductions

**Carbon Accounting: Step 3 - Calculate Carbon Stock Account and Carbon Sequestration Services**
**Condition Account: Group Exercise 1: Calculate improvements and reductions in condition**

(Opening Conditions)

**Condition Table**

<table>
<thead>
<tr>
<th>EU</th>
<th>Extent (BSU)</th>
<th>Vegetation</th>
<th>Biodiversity</th>
<th>Water</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU01 = Herbaceous crops</td>
<td>80</td>
<td>4.00</td>
<td>3.00</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>EU02 = Tree covered areas</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU03 = Inland water bodies</td>
<td>11</td>
<td>5.00</td>
<td>6.00</td>
<td>6.00</td>
<td>5.67</td>
</tr>
<tr>
<td>EU04 = Herbaceous crops</td>
<td>45</td>
<td>3.00</td>
<td>2.00</td>
<td>4.00</td>
<td>3.00</td>
</tr>
<tr>
<td>EU05 = Tree covered areas</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU06 = Artificial surfaces (urban)</td>
<td>9</td>
<td>2.00</td>
<td>2.00</td>
<td>4.00</td>
<td>2.67</td>
</tr>
<tr>
<td>EU07 = Artificial surfaces (urban)</td>
<td>11</td>
<td>2.00</td>
<td>1.00</td>
<td>3.00</td>
<td>2.00</td>
</tr>
<tr>
<td>EU08 = Shrubs...regularly flooded (wetland)</td>
<td>6</td>
<td>5.00</td>
<td>7.00</td>
<td>5.00</td>
<td>5.67</td>
</tr>
<tr>
<td>EU09 = Inland water bodies</td>
<td>8</td>
<td>3.00</td>
<td>3.00</td>
<td>4.00</td>
<td>3.33</td>
</tr>
<tr>
<td>EU10 = Tree covered areas</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU11 = Herbaceous crops</td>
<td>28</td>
<td>3.00</td>
<td>2.00</td>
<td>3.00</td>
<td>2.67</td>
</tr>
</tbody>
</table>

Total: 288

Instructions: (1) Transfer the condition measures from the map to the Condition Table for EU02, EU05 and EU10.
(2) Calculate the Index (V+B+W)/3
(3) Calculate the pro-rated condition measure for Forest Tree Cover (multiply measure * BSU Count for each area; add and divide by total BSU Count). Calculate the index.
Instructions: (1) Transfer the values for Opening and Closing Conditions to the appropriate row of the Condition Account.
(2) Calculate difference between Opening and Closing Conditions (Closing - Opening)
(3) Record Improvements (positive values) in the Improvements row
(4) Record reductions (negative values) in the Reductions row
### Services Supply Database

<table>
<thead>
<tr>
<th>EU</th>
<th>Extent (ha)</th>
<th>(C) Crop</th>
<th>(R) Recreation</th>
<th>(W) Water</th>
<th>(S) Carbon Sequestration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>tonnes/year</td>
<td>trips/year</td>
<td>m³/year</td>
<td>tonnes/year</td>
</tr>
<tr>
<td>EU01 = Herbaceous crops</td>
<td>500.0</td>
<td>18,700.0</td>
<td>500.0</td>
<td>600.0</td>
<td>20</td>
</tr>
<tr>
<td>EU02 = Tree covered areas</td>
<td>262.5</td>
<td>0.0</td>
<td>1,500.0</td>
<td>500.0</td>
<td>30</td>
</tr>
<tr>
<td>EU03 = Inland water bodies</td>
<td>68.8</td>
<td>0.0</td>
<td>1,600.0</td>
<td>15,000.0</td>
<td>5</td>
</tr>
<tr>
<td>EU04 = Herbaceous crops</td>
<td>281.3</td>
<td>0.0</td>
<td>1,600.0</td>
<td>15,000.0</td>
<td>5</td>
</tr>
<tr>
<td>EU05 = Tree covered areas</td>
<td>75.0</td>
<td>0.0</td>
<td>1,600.0</td>
<td>15,000.0</td>
<td>5</td>
</tr>
<tr>
<td>EU06 = Artificial surfaces (urban)</td>
<td>56.3</td>
<td>0.0</td>
<td>500.0</td>
<td>500.0</td>
<td>0</td>
</tr>
<tr>
<td>EU07 = Artificial surfaces (urban)</td>
<td>68.8</td>
<td>0.0</td>
<td>700.0</td>
<td>400.0</td>
<td>0</td>
</tr>
<tr>
<td>EU08 = Shrubs..regularly flooded (wetland)</td>
<td>37.5</td>
<td>700.0</td>
<td>5,000.0</td>
<td>10,000.0</td>
<td>40</td>
</tr>
<tr>
<td>EU09 = Inland water bodies</td>
<td>50.0</td>
<td>0.0</td>
<td>500.0</td>
<td>500.0</td>
<td>0</td>
</tr>
<tr>
<td>EU10 = Tree covered areas</td>
<td>225.0</td>
<td>0.0</td>
<td>1,285.7</td>
<td>428.6</td>
<td>30</td>
</tr>
<tr>
<td>EU11 = Herbaceous crops</td>
<td>175.0</td>
<td>0.0</td>
<td>1,285.7</td>
<td>428.6</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>1,800.0</td>
<td>0.0</td>
<td>500.0</td>
<td>500.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Instructions: (1) Calculate unknown services from nearest neighbour for (C), (R), (W); e.g., Crop for EU04 = EU01/500*281
(2) Carbon, calculate from lookup table (S); e.g., Carbon for EU01 = 20*500
(3) Calculate EAU Total for each service
Biodiversity Account: Group Exercise 1, Step 1: Select three key species and reasons for selection

Species prioritization and rationale

<table>
<thead>
<tr>
<th>Species</th>
<th>Species name</th>
<th>Reason for selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Instructions:
1. Write down the three key species you will prioritise and why. When picking your key species, keep in mind the goal of the Biodiversity Account and how including that species will provide information to achieve that goal.
Biodiversity Account: Group Exercise 1, Steps 2-4: Calculate Shannon Index and Evenness for three Forest EUs

Instructions: (1) Transfer the counts of individuals for each species from the map to the Species Table for EU02, EU05 and EU10.
(2) Sum the total number of individuals (A + B + C) for EU02, EU05 and EU10.
(3) Calculate $p_i$ (individuals in species i as a proportion of total number of individuals in the EU)
(4) Calculate $\ln(p_i)$ for each species
(5) Multiply $p_i$ by $\ln(p_i)$ for each species
(6) Calculate Shannon Index (add $p_i \cdot \ln(p_i)$ for each species in EU); Multiply by -1
(7) Calculate Evenness = Shannon Index /$\ln(3)$
Water Accounts: Group Exercise 1: Water asset account (m$^3$)

Stock and Flow Diagram
Water Accounts: Group Exercise 1: Water asset account (m$^3$)

Water Asset Account (m$^3$)

<table>
<thead>
<tr>
<th>Type of water resources</th>
<th>Surface water</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Artificial reservoirs</td>
<td>Rivers and streams</td>
<td>Groundwater</td>
<td>Soil water</td>
</tr>
</tbody>
</table>

**Additions to stock**

- **(A) Opening stock**

- **(B) Returns (from Economy)**

- **(C) Precipitation**

- **(D) Inflows from other territories**

- **(E) Inflows from other inland water**

- **(F) Discoveries of water in aquifers**

- **(G) Total additions to stock**

**Reductions in stock**

- **(H) Abstraction (to Economy)**

- **(I) Evaporation and evapotranspiration**

- **(J) Outflows to other territories**

- **(K) Outflows to the sea**

- **(L) Outflows to other inland water**

- **(M) Total reductions in stock**

**Closing stock**

- **(A) Opening stock**

- **(G) Total additions to stock**

- **(M) Total reductions in stock**

Instructions: (1) Transcribe Opening Stock and flows from Stock and Flow Diagram
(2) Calculate Totals and Closing Stock

Note: (E ) and (L) are transfers among Rivers & Streams, Artificial Reservoirs, Groundwater and Soil Water
Water Accounts: Group Exercise 2: Water Use Table (m³)

Water Use Diagram (m³)

- Produced water
- Water provisioning service

1. Agriculture: 300 m³
2. Households: 100 m³
3. Other industries: 25 m³
4. Electricity: 75 m³
5. Water supply: 100 m³

6. Soil water: 10,000 m³
7. Groundwater: 250 m³
8. Lakes: 10 m³
9. Rivers and streams: 5 m³
10. Artificial Reservoirs: 575 m³

Other territories
Precipitation
The Sea
### Water Accounts: Group Exercise 2: Water Use Table (m$^3$)

#### Water Use Table (m$^3$)

<table>
<thead>
<tr>
<th>Sources of abstracted water</th>
<th>Agriculture, forestry and fishing</th>
<th>Electricity, gas, steam and air conditioning supply</th>
<th>Water collection, treatment and supply</th>
<th>Other industries</th>
<th>Households</th>
<th>Total use</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Surface water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(B) Groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C) Soil water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(D) Sea water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(E) Total abstracted water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>=A+B+C+D</td>
</tr>
</tbody>
</table>

#### Abstracted water

| (G) Distributed water (to other economic units) |                                  |                                                   |                                       |                 |           |           |
| (H) Use of water (from other economic units)  |                                  |                                                   |                                       |                 |           |           |
| (I) Own use                                 |                                  |                                                   |                                       |                 |           |           |

**Total use of water (abstracted and distributed water)** =H+I

**Note:** Surface water = (Lakes + Rivers and Streams + Artificial Reservoirs)

**Note:** Own use for Water collection, treatment and supply = Abstracted - (total distributed)

**Instructions:**
1. Transcribe values for Distribution and Abstraction from Water Use diagram
2. Calculate Total Use (column and row)
## Carbon Accounting: Group Exercise - Calculate Simplified Carbon Stock Account from Physical Account for Land Cover

### Table 1: Physical Account for Land Cover

<table>
<thead>
<tr>
<th></th>
<th>Artificial surfaces</th>
<th>Crops</th>
<th>Grassland</th>
<th>Tree covered area</th>
<th>Mangroves</th>
<th>Shrub covered area</th>
<th>Regularly flooded areas</th>
<th>Sparse natural vegetated areas</th>
<th>Terrestrial barren land</th>
<th>Permanent snow, glaciers and inland water bodies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opening Stock</strong></td>
<td>16</td>
<td>7</td>
<td>14</td>
<td>23</td>
<td>7</td>
<td>19</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td><strong>Additions to Stock</strong></td>
<td>3</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td><strong>Reductions in Stock</strong></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td><strong>Closing Stock</strong></td>
<td>19</td>
<td>18</td>
<td>13</td>
<td>15</td>
<td>6</td>
<td>17</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
Carbon Accounting: Group Exercise - Calculate Simplified Carbon Stock Account from Physical Account for Land Cover

**Table 2: Simplified Carbon Stock Account**

<table>
<thead>
<tr>
<th>Artificial surfaces</th>
<th>Crops</th>
<th>Grassland</th>
<th>Tree covered area</th>
<th>Mangroves</th>
<th>Shrub covered area</th>
<th>Regularly flooded areas</th>
<th>Sparse natural vegetated areas</th>
<th>Terrestrial barren land</th>
<th>Permanent snow, glaciers and inland water bodies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Stored (tonnes/ha)</td>
<td>5</td>
<td>40</td>
<td>10</td>
<td>200</td>
<td>800</td>
<td>80</td>
<td>300</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carbon Stock (tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Opening</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Closing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Opening = Opening Land Stock * Carbon Stored  
Net change = Increases - Decreases

**Instructions:**
1. Multiply each value in the Physical Account for Land Cover by the corresponding value for Carbon Stored.  
2. Calculate net change  
3. Calculate totals for Opening, Increases, Decreases, Net change and Closing
<table>
<thead>
<tr>
<th>Artificial surfaces</th>
<th>Crops</th>
<th>Grassland</th>
<th>Tree covered area</th>
<th>Mangroves</th>
<th>Shrub covered area</th>
<th>Regularly flooded areas</th>
<th>Sparse natural vegetated areas</th>
<th>Terrestrial barren land and inland water bodies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Sequestration (tonnes/ha/year)</td>
<td>1</td>
<td>20</td>
<td>2</td>
<td>30</td>
<td>100</td>
<td>5</td>
<td>40</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Opening: Carbon Sequestration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing: Carbon Sequestration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Opening = Opening land area * Carbon Sequestration
Net change = Closing - Opening

Instructions: (1) Multiply Opening and Closing stock in the Physical Account for Land Cover by the corresponding value for Carbon Sequestration.
(2) Calculate Net change
(3) Calculate totals for Opening, Closing and Net Change
### Biophysical Modelling: Group Exercise - Timber stock account

#### Timber stock account

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opening stock</strong></td>
<td>1,000.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reductions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest</td>
<td>50.0</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Fire and storm damage</td>
<td>20.0</td>
<td>15.0</td>
<td>25.0</td>
<td>18.0</td>
<td>10.0</td>
</tr>
<tr>
<td><strong>Total reductions</strong></td>
<td>70.0</td>
<td>55.0</td>
<td>85.0</td>
<td>58.0</td>
<td>60.0</td>
</tr>
<tr>
<td><strong>Additions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regrowth</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Additions</strong></td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing stock</td>
<td>980.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Instructions:** Calculate Opening Balances, Closing Balances, Regrowth, and Total Additions for Years 2 to 5.

- Opening Stock for Year 2 is Closing Stock for Year 1
- Regrowth is 5% of Opening Stock

**At year 5:**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>m³ timber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average harvest</td>
<td></td>
</tr>
<tr>
<td>(B) Average fire and storm damage</td>
<td></td>
</tr>
<tr>
<td>(A) Expected &quot;Year 6&quot; additions</td>
<td>= 5% of Year 5 closing stock</td>
</tr>
<tr>
<td>Recommended &quot;sustainable&quot; harvest</td>
<td>= (A) - (B)</td>
</tr>
</tbody>
</table>

**Instructions:** Calculate

- Average Harvest for Years 1 to 5
- (B) Average fire and storm damage for Years 1 to 6
- (A) Expected "Year 6" Additions (= 5% of Year 5 Closing Stock)
- Recommended "sustainable" harvest (= (A) - (B))
## Services Use: Group Exercise 1: Allocate Services Supplied to Beneficiaries

### Services Supply Account

<table>
<thead>
<tr>
<th>EU Type</th>
<th>(C) Crop</th>
<th>(R) Recreation</th>
<th>(W) Water</th>
<th>(S) Carbon Sequestration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial surfaces (urban)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herbaceous crops</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree covered areas</td>
<td>35,764</td>
<td>956</td>
<td>1,148</td>
<td>19,125</td>
</tr>
<tr>
<td>Inland water bodies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrubs..regularly flooded (wetland)</td>
<td>700</td>
<td>5,000</td>
<td>10,000</td>
<td>1,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36,464</td>
<td>11,534</td>
<td>39,028</td>
<td>38,094</td>
</tr>
</tbody>
</table>

### Beneficiary allocation table

<table>
<thead>
<tr>
<th>Beneficiaries (based on survey)</th>
<th>(C) Crop</th>
<th>(R) Recreation</th>
<th>(W) Water</th>
<th>(S) Carbon Sequestration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>30</td>
<td>80</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Enterprises</td>
<td>60</td>
<td></td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Rest of the world</td>
<td>10</td>
<td>20</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Services Use Account

<table>
<thead>
<tr>
<th>Beneficiaries (based on survey)</th>
<th>(C) Crop</th>
<th>(R) Recreation</th>
<th>(W) Water</th>
<th>(S) Carbon Sequestration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>30</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Enterprises</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest of the world</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36,464</td>
<td>11,534</td>
<td>39,028</td>
<td>38,094</td>
</tr>
</tbody>
</table>

### Instructions:

1. **Step 1:** Apply percentages provided in Beneficiary Allocation Table to totals in Services Supply Account.
2. **Step 2:** Calculate proportion of each service used by each beneficiary type.