## Practitioner's Guide
## Make the data speak: Write a Cost-Benefit Analysis

### Calculating the Present Value of future benefits

In the last weeks you outlined all necessary dimensions to conduct a basic cost-benefit analysis for your project. You described the without-project scenario as well as the with-project scenario for your case and you listed all the associated costs and benefits. The only figure missing now to calculate if your project is worth undertaking is the social discount rate. The social discount rate for the specific benefits of your case is set based on theoretical assumptions about how much future benefits are worth in the present. A high discount reflects lower values for benefits in the future. Choosing an appropriate discount rate can be challenging. Please refer to Chapter 3.4 of the UNU-INWEH reading for information on how to set the discount rate for the benefits in your case.

After you set the discount rate for future benefits in your case you can use the table below for you calculations. First, please fill in the benefits associated with each year. Second, please fill in the discount rate and calculate the corresponding discount factor and the present value of your benefits. The two formulas below will help you with your calculation.

**Discount factor = 1 / (1+Discount rate in %)$^{\text{number of years} - 1}$**

**Present Value = Discount factor * Benefit**

| | Year 1 (present) | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| **Benefit** | | | | |
| **Discount rate in %** | | | | |
| **Discount factor** | | | | |
| **Present value** | | | | |

**Economic indicators of a project's worth**

After determining the present value for your projects benefits you can now turn to calculating if your project is ultimately worth undertaking.

Several indicators have been developed to assess whether a project is worth implementing. The main three indicators used for assessment are the net present value (NPV), the internal rate of return (IRR) and the benefit-to-cost ratio (BCR). All three of these are discussed in Chapter 3.5 of the UNU-INWEH Reading. For this weeks Assignment we will focus solely on the net present value as an indicator for whether your project is worth undertaking.

The **net present value (NPV)** or net present worth is computed after all economic values have been obtained and/or estimated. The net benefit for the with-project scenario is computed by subtracting the costs from the benefits for all years. The same is then done for the without-project scenario. The net incremental benefit corresponds to the extra benefit derived from the project and is computed by subtracting the without project net benefit from the with project net benefit. The discounted value of the incremental net benefit is then computed taking year 1 as the year of reference and the discount rate that you set before. The NPV of the project is the sum of the present value of the incremental net benefits across all years.

The project is considered worth undertaking for a NPV greater than 0 (positive) and not worth undertaking for a NPV less than 0 (negative). The NPV can be used in a financial or an economic cost-benefit analysis. This indicator does not allow comparisons across alternative projects, but only to make a decision on whether a given project is worth undertaking or not. For instance, for a project with a NPV of 100 and a project with a NPV of 1, both projects are worth undertaking. However, the project with the lowest NPV might be of more value to society as a whole despite being characterised by this lower value. This is because NPV values are not comparable for projects with different timeframes, scale and scope. To undertake a valid comparison between alternative projects, it is safer to use the next indicator, the Internal Rate of Return.

You can use the table on page 3 to execute your calculation for the NPV of your project.

| **With Project** | **Year 1 (present)** | **Year 2** | **Year 3** | **Year 4** |
|---|---|---|---|---|
| **Benefit** | | | | |
| **Costs** | | | | |
| **Net benefit** | | | | |

**Without Project**

| | | | | |
|---|---|---|---|---|
| **Benefit** | | | | |
| **Costs** | | | | |
| **Net benefit** | | | | |

| | | | | |
|---|---|---|---|---|
| **Incremental net benefit** | | | | |
| **Present value of incremental net benefit (your discount rate)** | | | | |
| **Economic Net present value (your discount rate)** | | | | |

Source: UNU-INWEH Chapter 3.5