

## Estimating the Required Global Warming Offsets to Achieve a Carbon Neutral Synthetic Field Turf System Installation

**GHGs Offset  
Estimation**

**Baseline**

**Project**

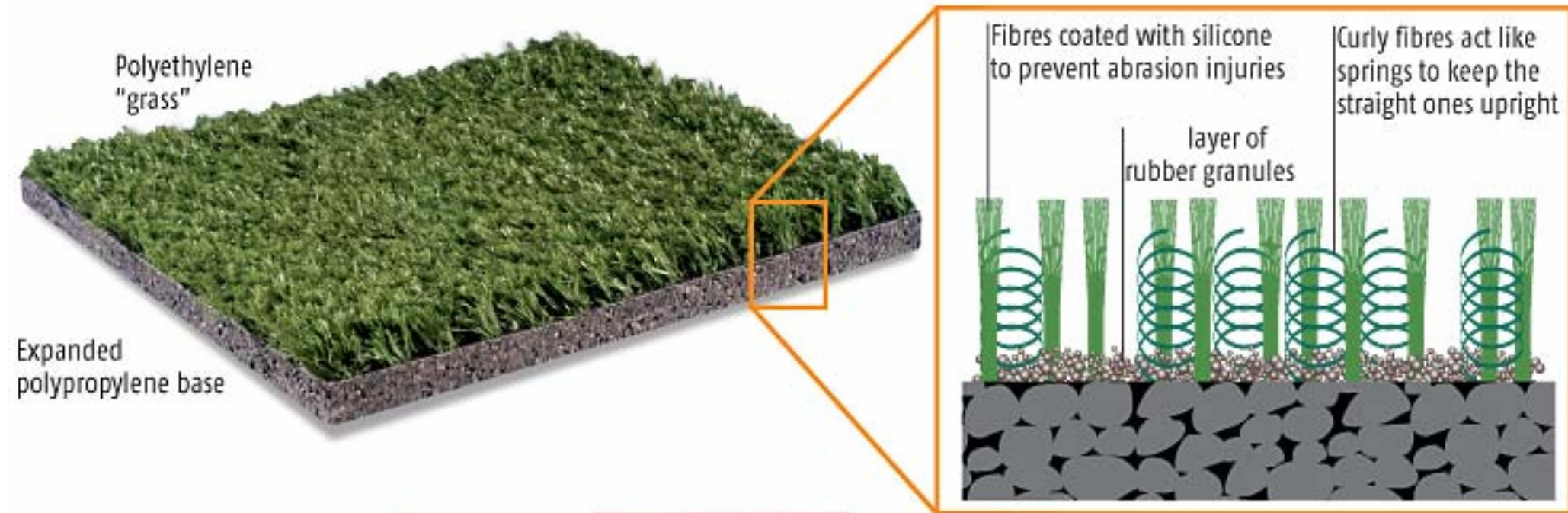


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1. Introduction
2. Scope of Analysis
3. General GHG emissions  
Quantification Procedure
4. Results
5. Uncertainty and Sensitivity Analysis

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# 1. Introduction- Synthetic Turf System



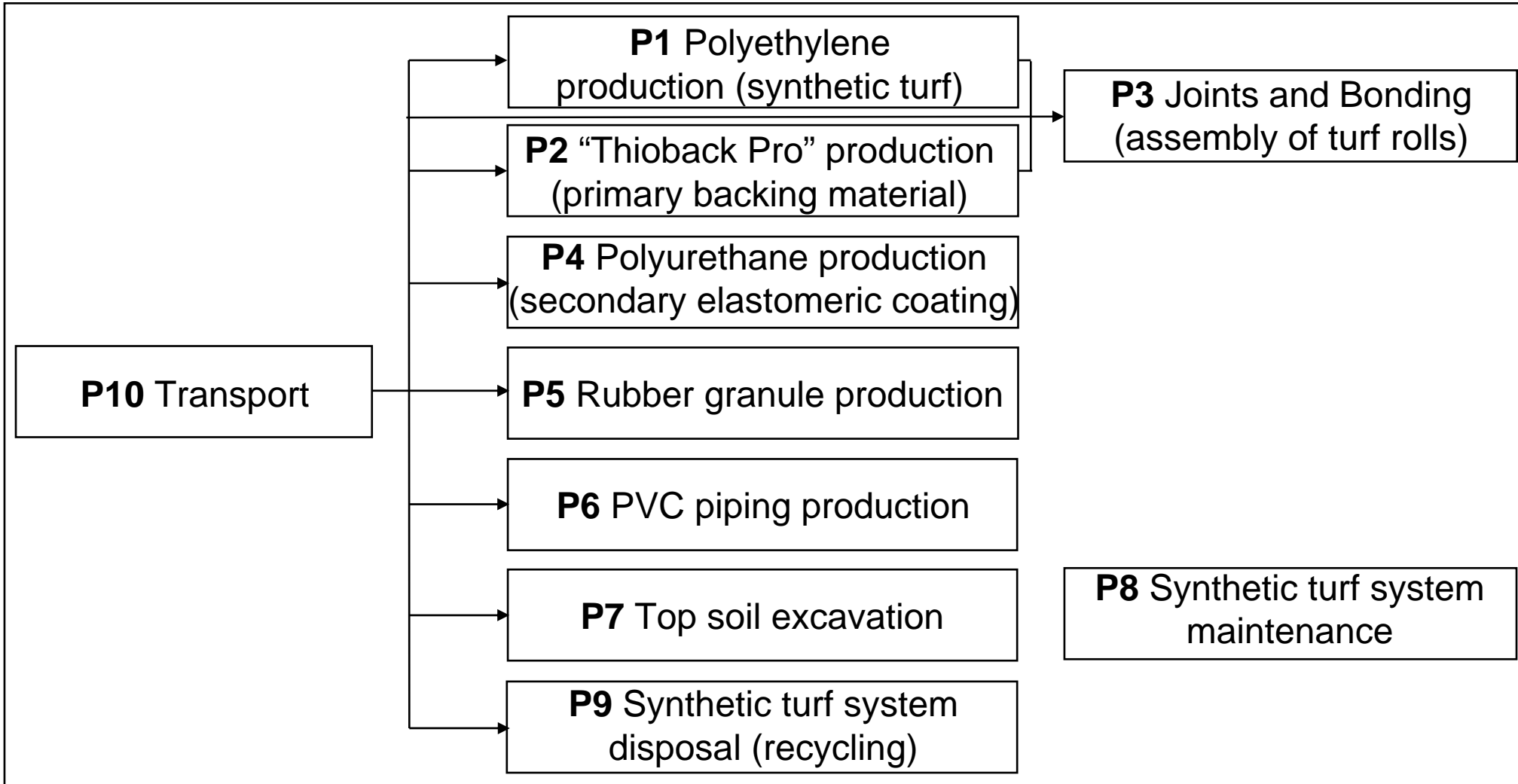
Source: [Lawton, G 2005 modified]

## Main Components of the Synthetic Turf System:

1. **Polyethylene** grass;
2. Expanded **polypropylene** base;
3. Layer of **rubber** granules.

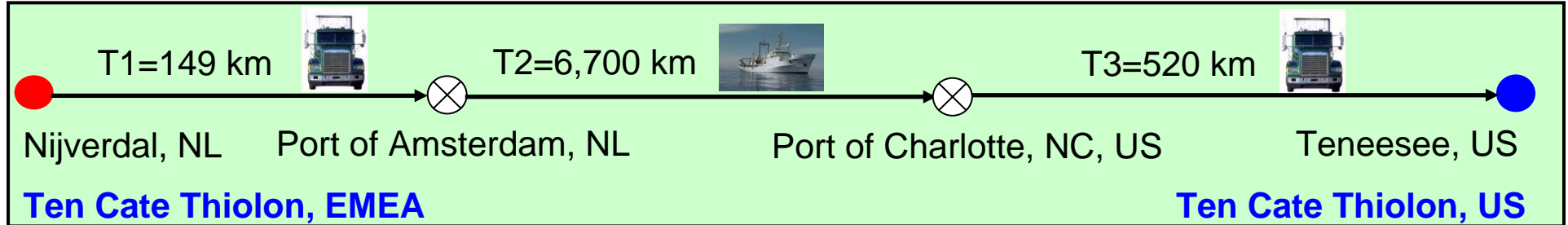
## 2.1 Project System Boundary: Synthetic Turf System

Reference Unit: 9,000 m<sup>2</sup>; Timeline: 10 years

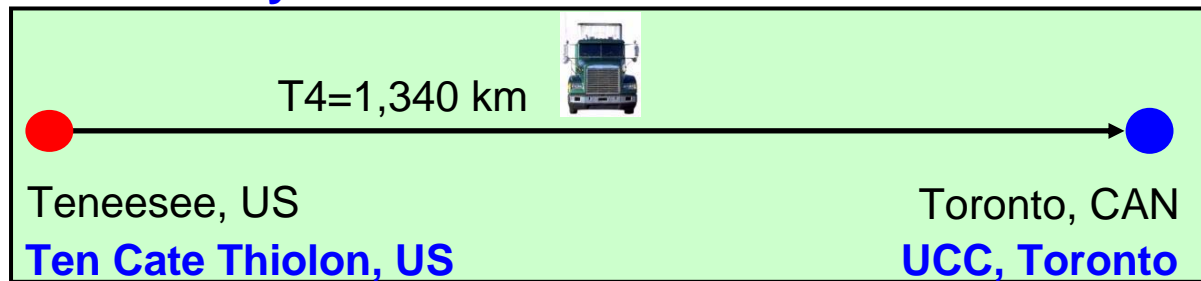


# 2.1 Project System Boundary: Transport

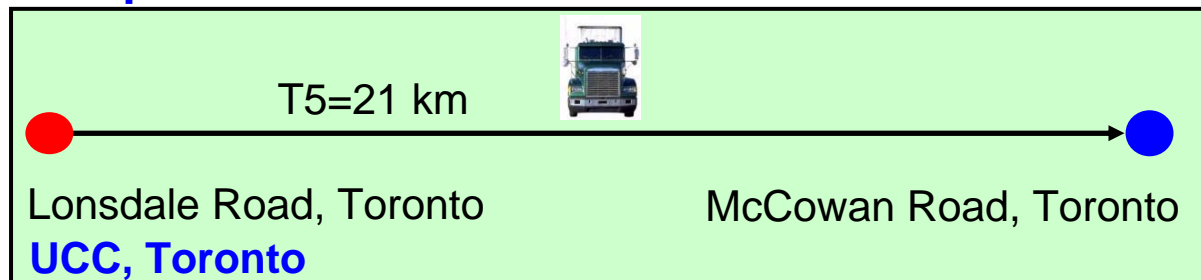
## 1. "Thioback Pro"(primary backing material)



## 2. Assembly of turf roll

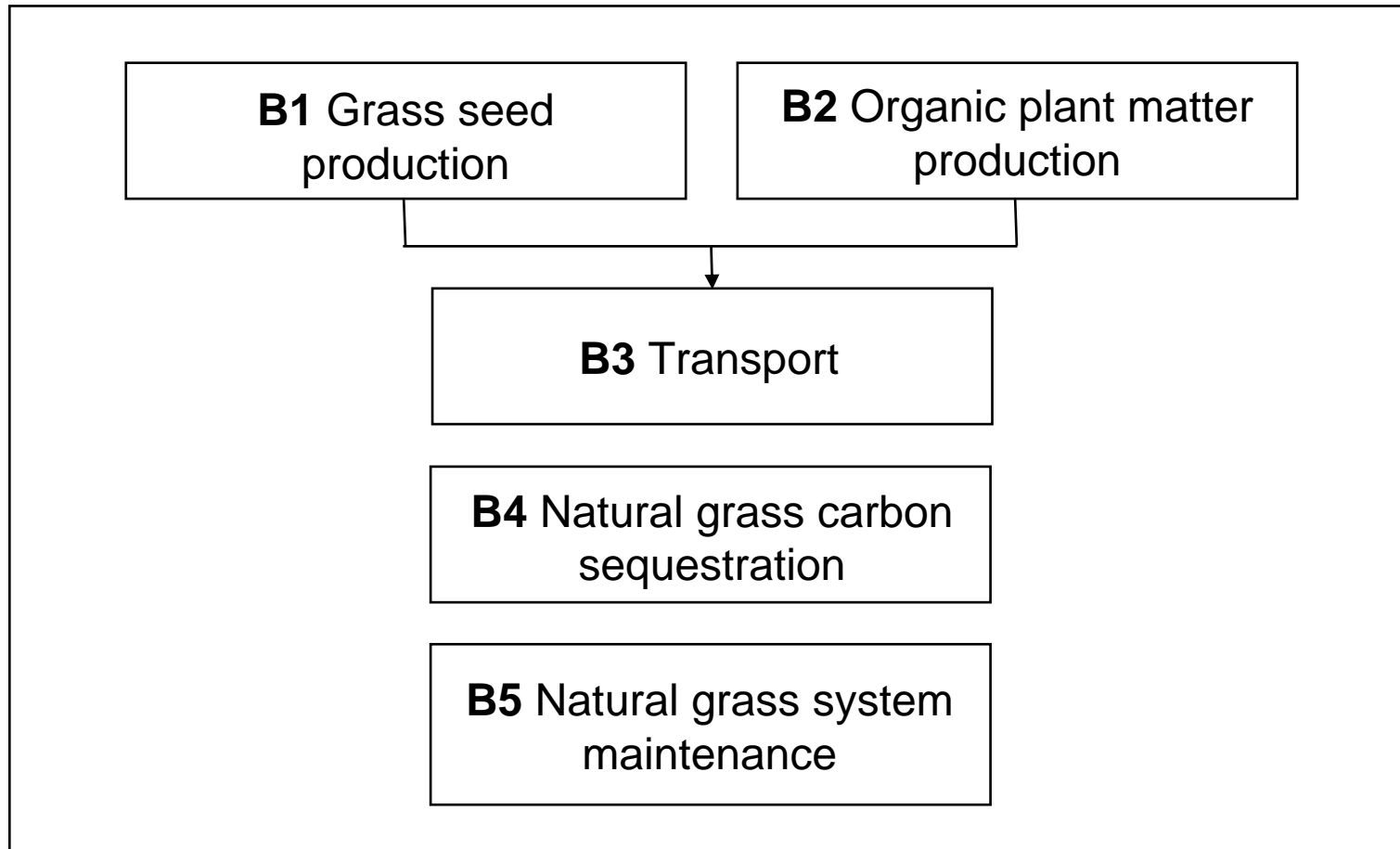


## 3. Topsoil



## 2.2 Baseline System Boundary: Natural Grass System

Reference Unit: 9,000 m<sup>2</sup>; Timeline: 10 years



### 3. General GHG Emissions Quantification Procedure

Equation for Estimating the CO<sub>2</sub> equivalent Emissions:

$$\text{CO}_2\text{e} = \sum_{i=1}^n E_i \times \text{GWP}_i$$

Where: CO<sub>2</sub>e = Emissions of CO<sub>2</sub> equivalent in kg

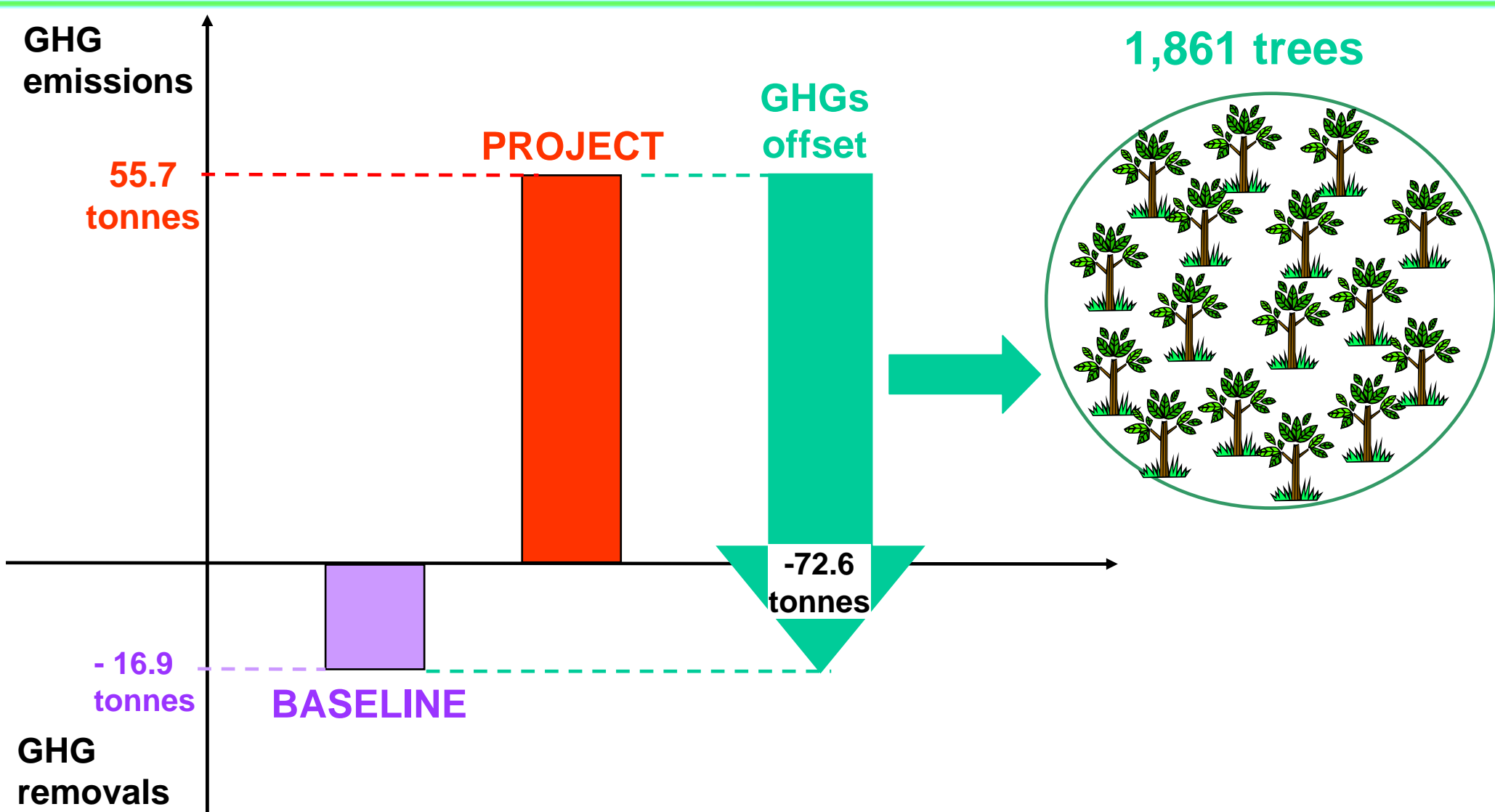
i = Greenhouse gas type

n = Total number of greenhouse gases emitted by the element

E<sub>i</sub> = Emissions of greenhouse gas i in kg

GWP<sub>i</sub> = Global Warming Potential of greenhouse gas i

# 4 Project Results and GHGs Offset



# 5.1 Uncertainty Analysis

## Uncertainty Analysis [IPCC 2000] ...

...of a model aims to provide quantitative measures of the uncertainty output values caused by uncertainties in the model itself and in its input values, and to examine the relative importance of these factors.

### Sources of Uncertainty in the Quantification of GHG Emissions:

1. Scientific uncertainty;
2. Parameter uncertainty;
3. Model uncertainty;
4. Uncertainty propagation.

### IPCC 2000 method for combining uncertainties (e.g. by addition):

$$U_{\text{total}} = \frac{\sqrt{(U_1 \cdot x_1)^2 + (U_2 \cdot x_2)^2 + \dots + (U_n \cdot x_n)^2}}{x_1 + x_2 + \dots + x_n}$$

IPCC- Intergovernmental Panel on Climate Change;  $x_i$  and  $U_i$ : the uncertain quantities and the percentage uncertainties associated with them, respectively.

## 5.2 Sensitivity Analysis

### Sensitivity Analysis [ISO/FDIS 14044:2006] ...

...is a systematic procedure for estimating the effects of the choices made regarding methods and data on the outcome of a study.

Scenario 1. Change the GHGs factor of the B4 to 3.3 tonne CO <sub>2</sub> e/ha/yr									
Element identifier Element name		B1 Grass seed production	B2 Organic plant matter production	B3 Transport	B4 Natural grass carbon sequestration	B5 Natural grass system maintenance	TOTAL BASELINE	GHGs Offset BASELINE PROJECT	Number of trees
Base case	t CO <sub>2</sub> e	0.003	0.11	0.83	<b>-31.3</b>	13.4	-16.9	-72.6	<b>1861</b>
Altered assumption	t CO <sub>2</sub> e	0.003	0.11	0.83	<b>-29.7</b>	13.4	-15.3	-71	<b>1820</b>
Deviation	t CO <sub>2</sub> e	0.0	0.0	0.0	<b>1.6</b>	0.0	1.6	1.6	<b>-41.3</b>
Deviation	%	0%	0%	0%	<b>-5%</b>	0%	-10%	-2%	<b>-2%</b>
Sensitivity	%	0%	0%	0%	<b>5%</b>	0%	-10%	2%	<b>2%</b>

Thank you for your attention!

