Pilot study on impact valuation for UPM

Final report

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Tiina Pursula, Minna Päällysaho, Jonas Alam, Päivi Luoma

Gaia Consulting Oy

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EXECUTIVE SUMMARY

Nowadays stakeholders expect that companies increasingly identify and assess their societal impacts indicating what kind of influence companies' activities have to the surrounding society. In order to understand better societal impacts created by UPM, the pilot study was conducted with the focus on developing and piloting suitable impact valuation methodology.

The pilot study builds on the methodological framework of Social Capital Protocol and Natural Capital Protocol of World Business Council for Sustainable Development (WBCSD). The process of the impact valuation in the pilot study follows the staged approach of these methodologies, and builds on primary data from UPM complemented with external relevant sources for data and reference information.

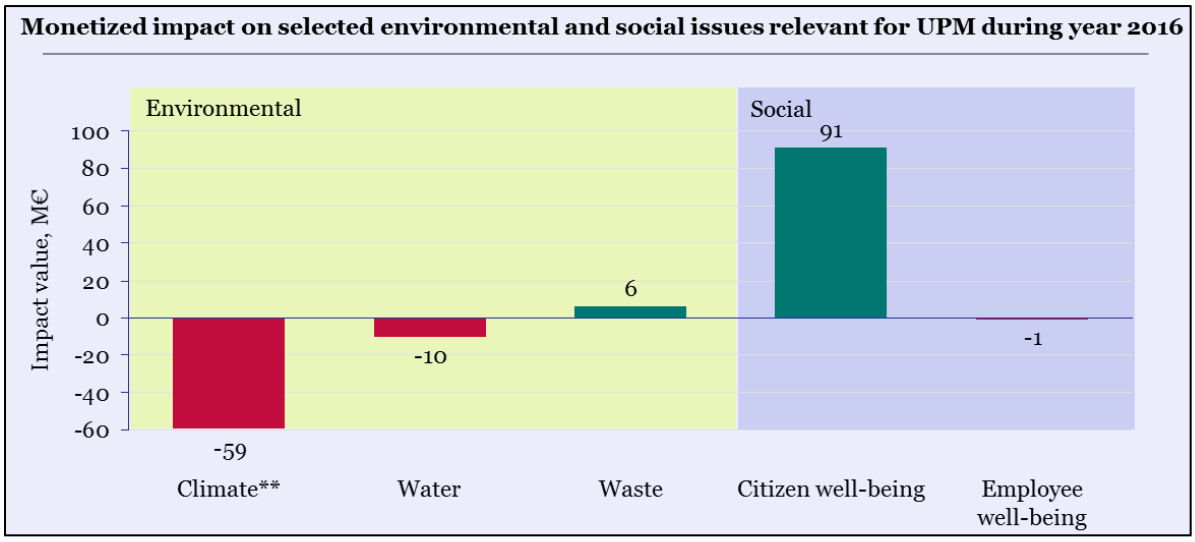
As a result, five impact valuation cases were piloted and calculated. The selected cases represent natural and social capital issues relevant for UPM's stakeholders according to the materiality analysis conducted by the company. The environmental issues included are climate change, generated waste water and waste. From social issues wellbeing of citizens and employees were selected. Monetization of impact was targeted wherever possible and relevant. Monetization was complemented with more comprehensive assessment with impact pathways and qualitative and quantitative indicators. Monetized results of the pilot case studies are shown in the table and figure below.

Table. Summary of monetized impact valuation of environmental and social issues and indicators selected for the pilot study[1].

	Issue	Impact indicators	Quantified output		Monetised impact, M€	
			Global	Finland	Global	Finland
Natural capital	Climate *	• Impact valuation of GHG emissions • Impact valuation of GHG savings from use of surplus electricity sold • Impact valuation of net carbon binding of UPM's forests	-14 Mt CO2 +0.045 Mt CO2 +2.5 Mt	-4,7 Mt CO2 +0.04 Mt CO2 + 1.1 Mt	-73 + 0.24 + 13.6	-25 + 0.21 + 6.1
	Water	• Impact valuation of treated waste water discharged into nature	810 t nutrients	447 t nutrients	- 10	- 6
	Waste	• Impact valuation of landfill waste • Impact valuation for waste and side streams used as raw material (case)	125 000 t 470 000 t	17 000 t 110 000 t	- 19 + 25	- 2.6 + 3.1
Social capital	Citizen well being	• Impact valuation of UPM's forests available for free recreation use	720 000 ha	640 000 ha	+ 91	+ 53
	Employee well being	• Impact valuation of lost time accidents • Impact valuation of OHS activities	58 % reduction in lost time accidents (5 years) 85 % reduction in LTAF (10 years time period)	-	- 1.1 + 0.2	-

** Climate impact monetization is based on emission cost allowance. Monetization based on social cost of carbon (EPA) would give on global level: -480 M€ for GHG emissions, +6.7 M€ for GHG savings from use of surplus electricity sold and + 93 M€ for net carbon binding of UPM's forests.*

[1] Quantified outputs and monetized impacts (in nominal value) of the prioritized issues are based on the indicators chosen for the pilot study. They represent a subset of the actual overall outputs and impacts of UPM's operations and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.
Source: UPM, Gaia analysis



* Quantified and monetized impacts (in nominal value) of the prioritized issues are based on the indicators chosen for the pilot study. They represent a sub set of the actual overall impacts of UPM's operations and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.

** Climate impact monetization is based on the externality value approach used in UPM's Annual Report 2016.

Source: UPM, Gaia analysis

Figure. Summary of monetized impact valuation of environmental and social issues and indicators selected for the pilot study.

The results of the pilot study are a first attempt to valuate the societal impacts of UPM on five prioritized environmental and social issues. While impact valuation in the pilot study was performed in monetarized terms wherever possible, the analysis is not comprehensive due to limitations in availability of data and reference information on monetized impacts in relevant geographical regions. However, impact valuation is more of a continuous process than one-off study. This pilot study is the starting point of the continuous process and provides the methodological framework for further development work. Therefore, the purpose is to develop further the valuation methodology and increase the understanding of societal impacts and also use this information as part of the company's decision-making process. Furthermore, societal impact evaluation provides transparent information for stakeholders, such as local communities.

1 Introduction

1.1 Background

Through its activities and products UPM creates societal impacts. So far, not all of these impacts have been able to be measured and assessed (in monetary terms). To support impact valuation assessment and related decision making UPM started to work on impact valuation with Gaia Consulting in early 2017. First, the focus was on mapping out value creation from responsibility with an integrated approach, including economic, social and environmental aspects and the whole value chain. The key results, including a concise summary of value creation and key impact pathways was published in UPM Annual Report 2016[2]. This pilot study goes one step further in analysis of societal impacts, towards impact valuation and monetization with selected cases.

1.2 Objectives of the pilot study

1. Increase understanding on the societal impacts of UPM
2. Increase understanding on the impact valuation methodologies
3. To select in total five impact valuation cases relevant to UPM's stakeholders and to be calculated
4. To define the methodology and collect the required data for the impact valuations
5. Based on the methodology and the data, produce solid impact valuation calculations for the selected cases
6. Provide a solid basis for continuing impact valuation efforts at UPM

[2] UPM Annual Report 2016, pages 70-71 http://hugin.info/165629/R/2081401/784910.pdf

2 Methodology

Social Capital Protocol and Natural Capital Protocol

There are several potential methodologies for impact valuation. Social Capital Protocol[3], together with Natural Capital Protocol[4] were seen as the most appropriate methodologies to describe and valuate the impacts of UPM.

The guidelines of Social Capital Protocol initiative by World Business Council for Sustainable Development are complemented by Natural Capital Protocol[4] by Natural Capital Coalition (NCC) when detailed valuation information and guidelines for natural capital and environmental indicators were not available in the Social Capital Protocol. Both protocols share the same main process stages, difference is in the detailed impact valuation approaches. Process steps of the Social and Natural Capital Protocol methodologies is shown in Figure 1.

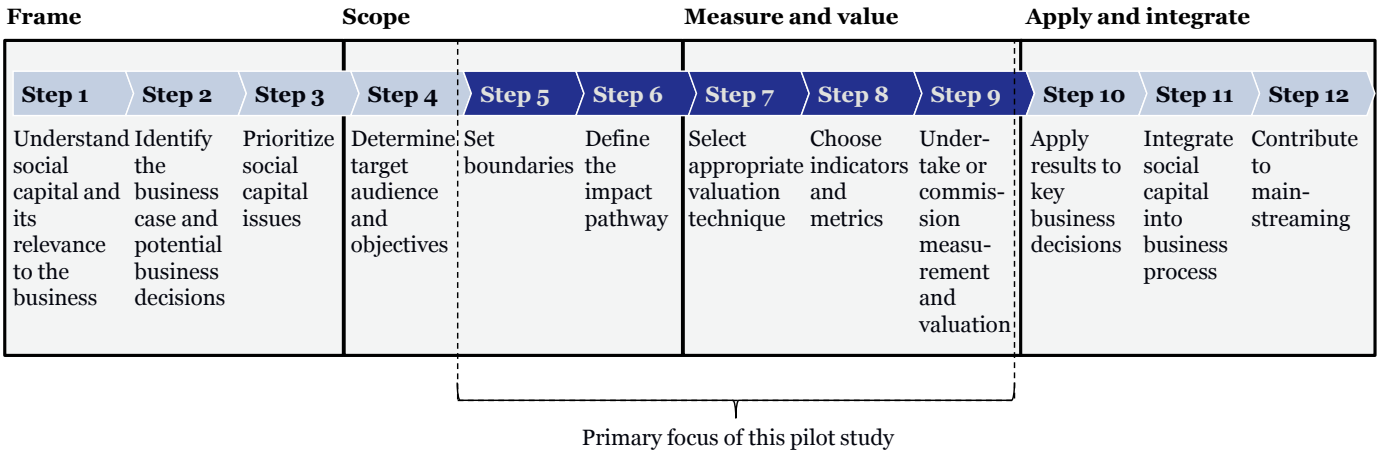


Figure 1. Overarching methodological framework for the pilot case process based on Social Capital Protocol and Natural Capital Protocol.

2.1 Frame

Step 1: Understand social and natural capital and its relevance to the business

Key outputs: relevant social and natural capital issues mapped across the value chain

Social and natural capital issues relevant for UPM are identified and defined in the corporate materiality analysis and corporate strategic goals on social and environmental responsibility. According to the materiality analysis the most significant environmental and social issues are[5]:

- Environmental: Sustainable forest management including biodiversity, product stewardship, resource efficiency and environmental performance and climate change

[3] http://www.wbcsd.org/Clusters/Social-Impact/Social-Capital-Protocol
[4] http://www.wbcsd.org/Clusters/Ecosystems-Landscape-Management/Natural-Capital-Protocol
[5] See Figure 3

- Social: Health and Safety, Employee engagement, Human rights, Diversity

UPM's strategic focus in the area of social responsibility is fulfillment of human rights, occupational health and safety and local stakeholder engagement. Strategic environmental goals cover sustainable products, the climate, the use of forests and water as well as waste reduction. Mapping of these issues across the value chain is also done. The results of mapping was published in Annual report 2016 and is also shown in Appendix 1 of this report. All these materials are published in UPM's sustainability reporting (more information: UPM Annual report 2016[6]).

Step 2: Identify the business case and potential business decisions

Key outputs: business decisions that could be informed by social and natural capital measurement and valuation

As part of UPM's strategy[7], UPM aspires to understand and manage better its societal impacts and communicate this information for its stakeholders. According to UPM's strategical environmental and social goals, this assessment helps to understand better company's societal impacts to surrounding society and impact of different actions. The strategic focus in the area of social responsibility is fulfillment of human rights, occupational health and safety and local stakeholder engagement. Strategic environmental goals cover sustainable products, the climate, the use of forests and water as well as waste reduction.

Selected societal impact assessment indicators support UPM's strategic work and decision making. In addition, the purpose is to communicate UPM's societal impacts to company's stakeholders, such as customers, investors, employees, local communities, suppliers, politicians, authorities, media and NGO's. Social and natural capital assessment helps to communicate better UPM's influence on society and to identify the potential risks as well as benefits caused for local communities. In addition, UPM also works with research organizations to understand and manage better its societal impacts.

Step 3: Prioritize social and natural capital issues

Key Outputs: Prioritized list of social and natural capital issues

UPM's materiality analysis[8] identifies the most relevant social and natural capital issues across the value chain. The results of the materiality analysis are shown in Figure 2.

[6] http://www.upm.com/About-us/Newsroom/Releases/Pages/UPM-Annual-Report-2016-published-001-Tue-28-Feb-2017-09-48.aspx
[7] http://www.upm.com/About-us/Newsroom/Releases/Pages/UPM-Annual-Report-2016-published-001-Tue-28-Feb-2017-09-48.aspx
[8] http://www.upm.com/About-us/Newsroom/Releases/Pages/UPM-Annual-Report-2016-published-001-Tue-28-Feb-2017-09-48.aspx

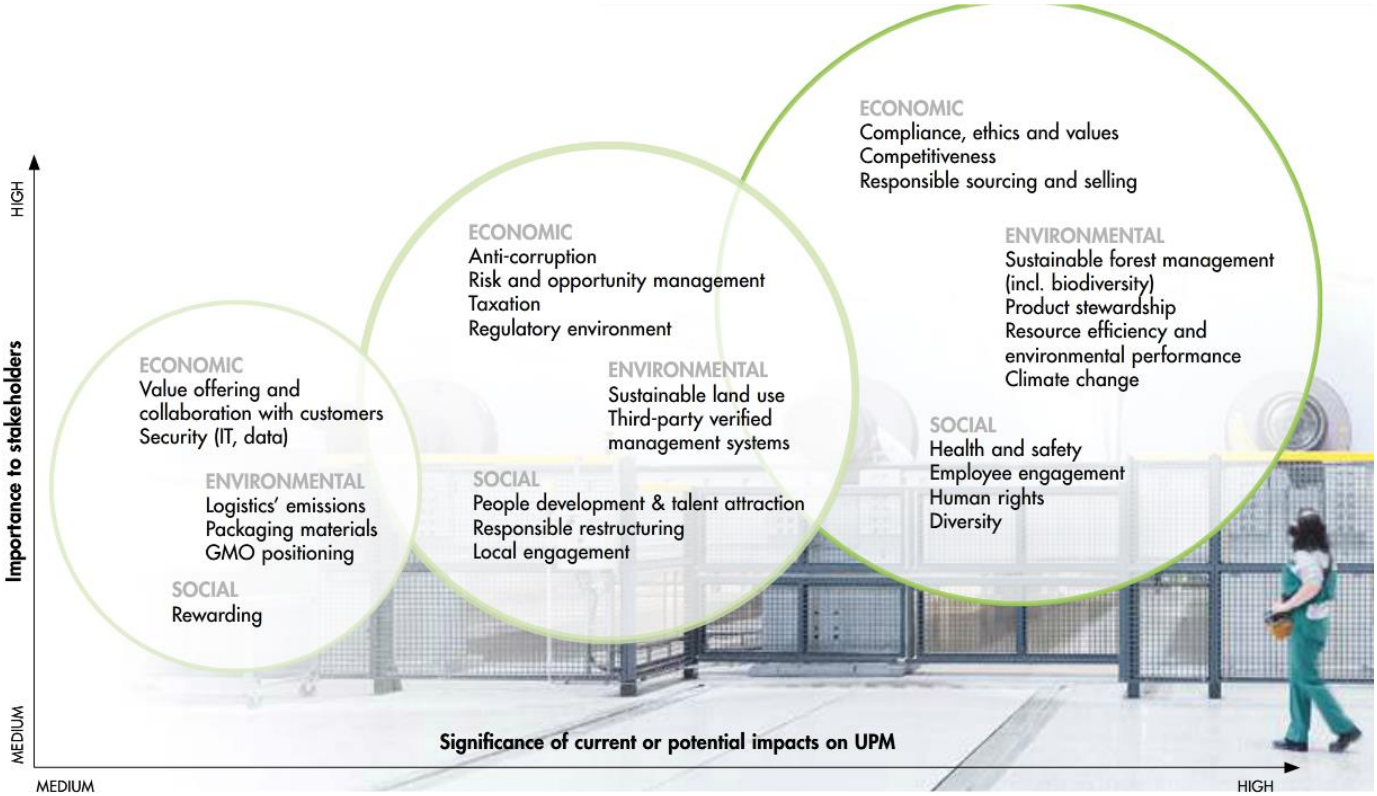


Figure 2. The most relevant social and natural capital issues across the value chain identified in UPM's materiality analysis[9]

For this pilot study the issues identified in the materiality analysis were elaborated further to select five issues for further assessment. The selection was based on UPM's strategic goals and stakeholder's interest as well as measurability and data availability. Not all relevant issues and aspects could be included in this pilot phase, but the purpose is to expand the social and natural capital assessment later on to cover more of the identified and relevant issues. The selected prioritized five social and natural capital issues and justification of selection is presented in the Table below.

9 http://www.upm.com/About-us/Newsroom/Releases/Pages/UPM-Annual-Report-2016-published-001-Tue-28-Feb-2017-09-48.aspx

Table 1. Prioritized issues and indicators chosen for the pilot study[10]

	Issue	Indicators	Justification of relevance	Data availability	
				UPM	Public sources
Natural Capital	Climate	• Impact valuation of GHG emissions • Impact valuation of GHG savings from surplus electricity sold • Impact valuation of net carbon binding of UPM's forests	Climate is one of the material environmental aspects in materiality analysis of UPM and also one of the prioritized areas for UPM's environmental goals.	Good	Good
	Water	• Impact valuation of treated waste water discharged into nature	Water is one of the material environmental aspects in materiality analysis of UPM and also one of the prioritized areas for environmental goals.	Good	Fair
	Waste	• Impact valuation of landfill waste • Impact valuation of waste and side streams used as raw material	Landfilled waste is one of the material environmental aspects in materiality analysis of UPM and also one of the prioritized areas for environmental goals.	Good	Fair
Social capital	Citizen well-being	• Impact valuation of UPM's forests available for free recreation use	Responsible forest management is one of the most significant aspects in UPM's materiality analysis. Forests provide societal benefits to local communities, which were also highlighted in materiality analysis.	Good	Good
	Employee well-being	• Impact valuation of accidents • Impact valuation of OHS activities	Employee well-being is one of the material social aspects in materiality analysis of UPM and also one of the prioritized areas for social goals.	Good	Fair

Prioritized issues were selected as earlier described in the Methodology section (Stage 1 of social capital protocol). Indicators were selected for the issues as earlier described in the Methodology section (Stage 2 of social capital protocol). This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.

2.2 Scope

Step 4: Determine target audience and objectives:

Key outputs: primary and secondary audiences and key objectives

The results of this pilot study will be communicated externally to relevant stakeholders. According to the materiality analysis of UPM the audience is the following: communities, employees, NGOs, customers, suppliers, investors, media, authorities and politicians. All of these are considered primary audience of this pilot study. Secondary audiences for impact valuation will be considered in follow-up work after the pilot study. The objectives are to inform the selected stakeholders on UPM's societal impacts and its value.

Step 5: Set boundaries

Key outputs: organizational, geographic and temporal boundaries

[10] Prioritized issues were selected as earlier described in the Methodology section (Stage 1 of social capital protocol). Indicators were selected for the issues as earlier described in the Methodology section (Stage 2 of social capital protocol). This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.

Following boundaries were seen the most reasonable for the pilot study (based on the objectives of the study as well as the availability and quality of data):

- Organizational boundaries: Corporate
- Geographic boundaries: Global
- Temporal: Year 2016
- When development trends are assessed, they cover 10 years (2007-2016)

The purpose was to include all UPM's activities into the assessment, but for some indicators availability and quality of data set some restrictions. Therefore, for some indicators the narrower organizational and geographical boundaries were used. These are described and justified in detail for each of the relevant indicator in results section of this report.

Step 6: Define the impact pathways

Key outputs: impact and/or dependency pathways for each priority social and natural capital issue

Impact pathways for the prioritized issues were identified and visualized. Visualization model is shown below and utilized for each indicator in the results section. Each impact pathway includes the most relevant inputs, activities, outputs, outcomes and impacts. It needs to be noted that impact pathways are often complicated and the pathways presented in the pilot study are simplifications.

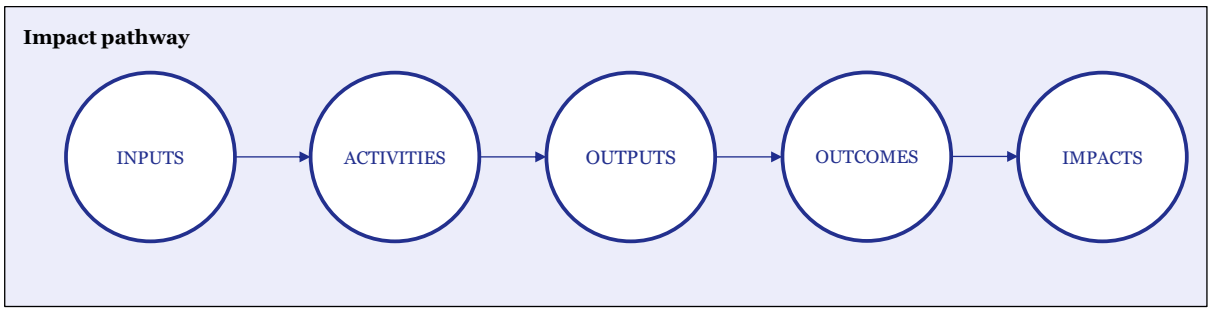


Figure 3. Impact pathway visualization

2.3 Measure and value

Step 7: Select appropriate valuation technique

Key output: selection of valuation technique

Valuation techniques used are described in more detail in the results section. Valuation techniques were selected to best support the assessment of the issue in question as well as the availability of internal and external data. The aim was to use monetary assessment whenever possible so that the results are comparable and can offer meaningful information. In this pilot study, value transfer technique was the most used valuation technique as it provides a good starting point for monetizing of societal impacts. However, also other quantitative techniques were used to evaluate progress over time e.g. in the case of a declining trend in accidents, to complete lack of data for monetary assessment. In addition, qualitative as-

pects were used to provide more comprehensive description of the components of the overall impact, including also impact components that cannot be valuated in monetary terms with currently available information.

Step 8: Choose indicators and metrics

Key output: list of indicators and metrics

Most relevant indicators and metrics were identified to support valuation according to the identified impacts pathways and data requirement of the valuation approach. Company wide information requirements were identified for each selected indicators and metrics. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.

Step 9: Undertake or commission measurement and assessment

Key output: results of measurement and valuation

Results of the measurement and valuation can be seen in the results section. The data was collected according to the chosen indicators. Primary data was collected by the company and for secondary data, existing analysis, peer-reviewed literature and other external data sources were used. Used data sources, assumptions and limitations were documented in transparent manner[11].

2.4 Apply and Integrate

Step 10: Apply results to key business decisions

Results were analyzed and validated prior to external communications. Results are communicated to stakeholders in a transparent manner through UPM's external web pages. Achieved results from the pilot case are used as a basis for the further social and natural capital impact development work.

Step 11: Integrate social and natural capital into business process

The results of the study will be considered in UPM's business processes enabling to better understand the impacts of UPM's business decisions to society. Assessment framework covers UPM's strategic environmental and social goals supporting achieving of strategic goals.

Step 12: Contribute to mainstreaming

The target is to expand the scope of the study in future to cover all UPM's relevant activities influencing on material societal impacts in comprehensive and transparent way. The purpose is to strengthen the company's ability to understand the risks and opportunities related to societal impacts. As a result, this approach enables to include social and natural capital issues better to company's decision making process.

[11] see Appendix

3 Results

The results of the pilot study are a first attempt to valuate the societal impacts of UPM on five prioritized environmental and social issues. While impact valuation in the pilot study was performed in monetarized terms wherever possible, the analysis is not comprehensive due to limitations in availability of data and reference information on monetized impacts in relevant geographical regions.

The knowledge base on monetized value of societal externalities is however evolving and the methodological framework and scope of the analysis can be developed as the available information accumulates. Impact valuation is more of a continuous process than one-off study. This study is the starting point of the continuous process and provides the methodological framework for further development work.

Areas where further development is needed were also identified in this pilot study and are summarized in the steps forward section.

In the following chapters results for impact valuation of the five selected environmental and social issues are described through the indicators selected for the pilot study.

3.1 Climate

3.1.1 Impact valuation of GHG Emissions

Impact pathway and description of scope and methodology for impact valuation of GHG emissions is shown in Figure 4 below, together with justification of relevance for the indicator.

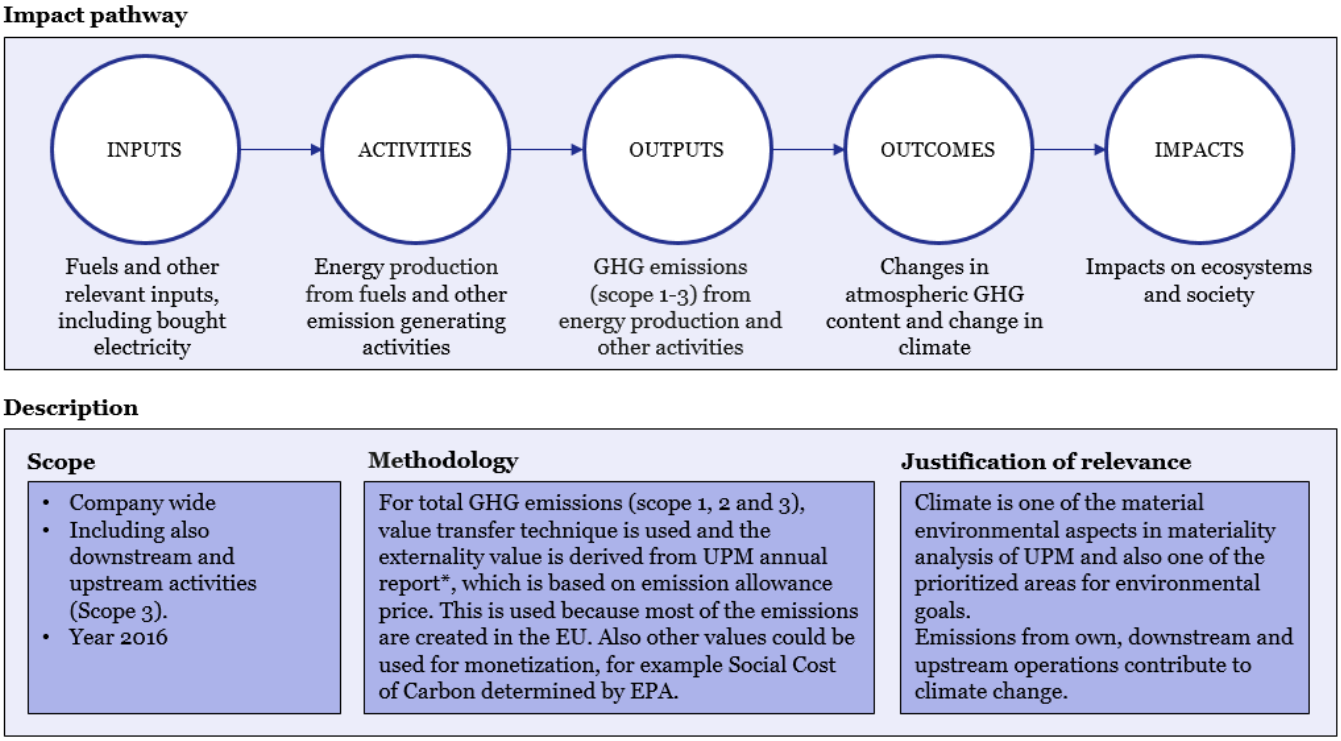


Figure 4. Impact pathway, scope, methodology and justification of relevance for impact valuation of GHG Emissions[12]

Qualitative impacts[13]

Greenhouse gas emissions contribute to climate change and lead to global warming and shifts in precipitation patterns. Climate change also leads to changes in vegetation zones and sea level rise. These consequences have several societal impacts, such as:

- Impacts on health, safety and well-being of citizens as well as associated costs due to extreme weather conditions (storms, draught, heat waves and flooding)
- Direct loss of economic, ecological, cultural, and subsistence values through loss of land, infrastructure, and coastal habitats
- Impacts on food production and food security
- Impacts on natural systems: cryosphere (e.g. glaciers or arctic sea ice), water resources, coastal systems, and ecosystems on land and in the ocean providing ecosystem services such as clean air, water and biodiversity
- Cascading impacts of climate change from physical climate through ecosystems on people (e.g. through forest systems)
- Impacts on vulnerable livelihoods and income for people whose income is dependent on natural resources

[12] EPA – Social cost of carbon, https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html
[13] 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18

- Tradeoff impacts of adaptation to sea-level rise and climate change impacting environmental, economic, social, and cultural values.

Monetary impacts

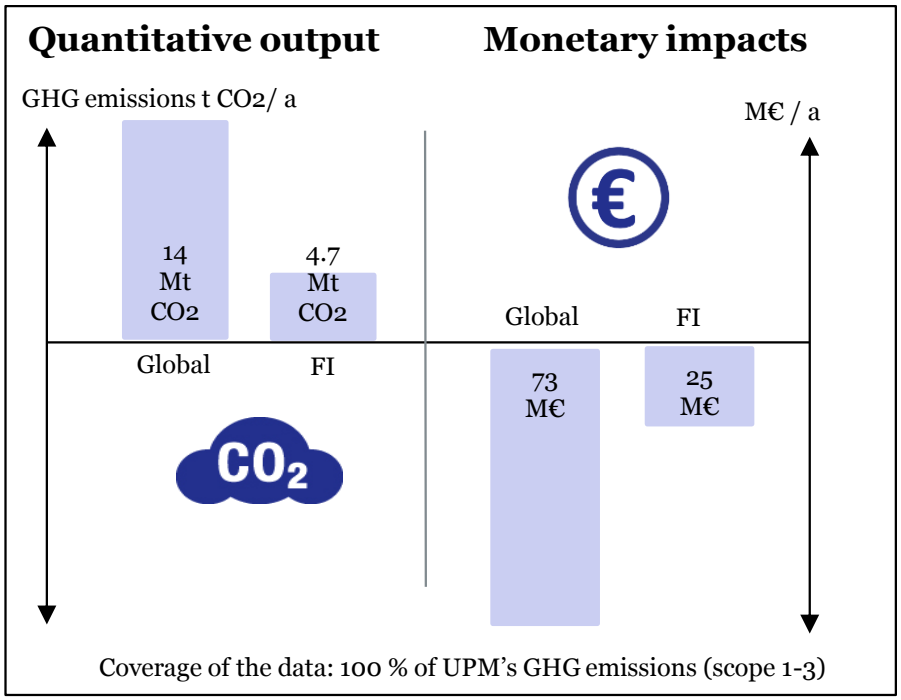


Figure 5. Quantitative output and monetary impacts of GHG emissions for Global level and Finland, respectively. Monetization based on emission allowance price. Social cost of carbon by EPA would give: Global -480M€ and FI -161 M€.

Relevance of results to key stakeholders

Monetized value of impacts of GHG emissions is relevant for all stakeholders, e.g. for investors as one aspect in long term responsible value creation potential.

3.1.2 Impact valuation of GHG savings from use of surplus electricity sold

Impact pathway and description of scope and methodology for impact valuation of GHG savings from use of surplus electricity is shown in Figure 6 below, together with justification of relevance for the indicator.

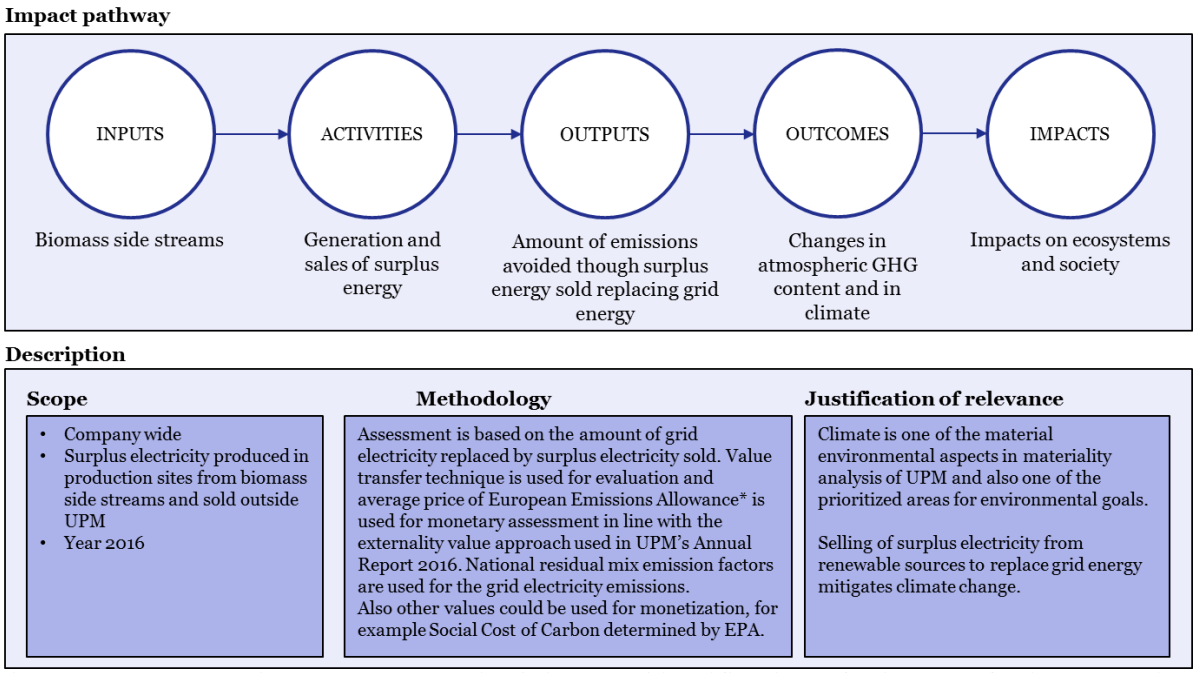


Figure 6. Impact pathway, scope, methodology and justification of relevance for impact valuation of GHG savings from use of surplus electricity sold[14]

Qualitative impacts[15]

Globally, electricity generation plays a significant role in carbon dioxide emission generation. Replacing of grid electricity with surplus electricity from renewable sources mitigates climate change and reduces negative societal impacts from climate change, including:

- Impacts on health, safety and well-being of citizens as well as associated costs due to extreme weather conditions (storms, draught, heat waves and flooding)
- Direct loss of economic, ecological, cultural, and subsistence values through loss of land, infrastructure, and coastal habitats
- Impacts on food production and food security
- Impacts on natural systems: cryosphere, water resources, coastal systems, and ecosystems on land and in the ocean providing ecosystem services such as clean air, water and biodiversity
- Cascading impacts of climate change from physical climate through ecosystems on people (e.g. through forest systems)
- Impacts on vulnerable livelihoods and income for people whose income is dependent on natural resources
- Tradeoff impacts of adaptation to sea-level rise and climate change impacting environmental, economic, social, and cultural values.

[14] https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04; Also other values can be used for monetization, for example Social Cost of Carbon determined by EPA

[15] 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18

Monetary impacts

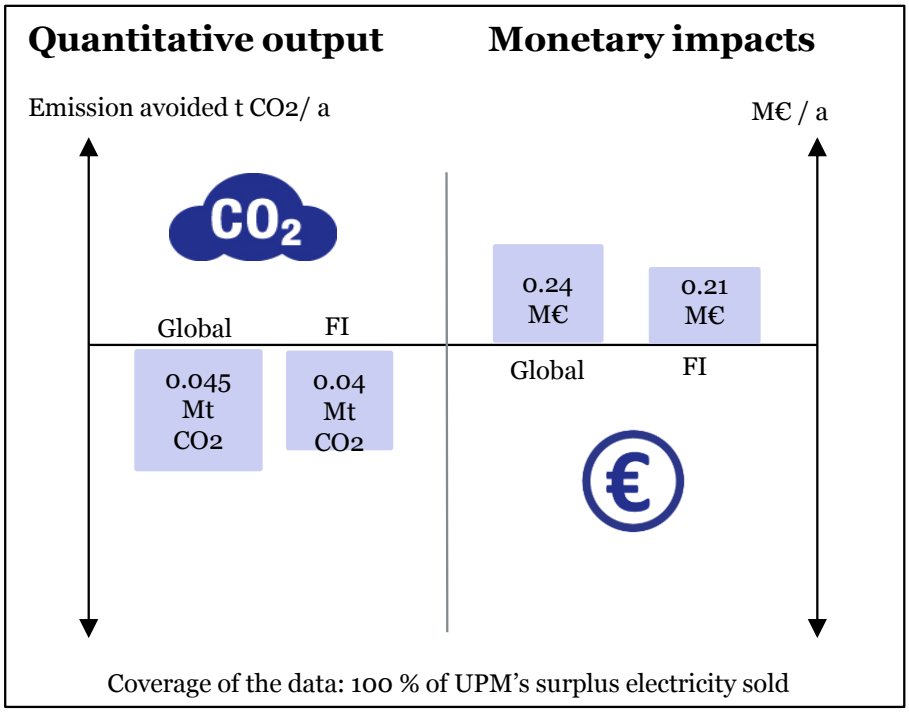


Figure 7: Quantitative output and monetary impacts of surplus electricity sold for Global level and Finland, respectively. Monetization based on emission allowance price. Social cost of carbon by EPA would give: Global +6,7M€, FI +5,9 M€.

Relevance of results to key stakeholders

Monetized value of impacts of emissions avoided through surplus electricity sold is relevant for investors as one aspect in long term responsible value creation potential. It is also relevant for the users of the electricity to balance their carbon load.

3.1.3 Impact valuation of net carbon binding of UPM's forests

Impact pathway and description of scope and methodology for impact valuation of net carbon binding of UPM's forests is shown in Figure 8 below, together with justification of relevance for the indicator.

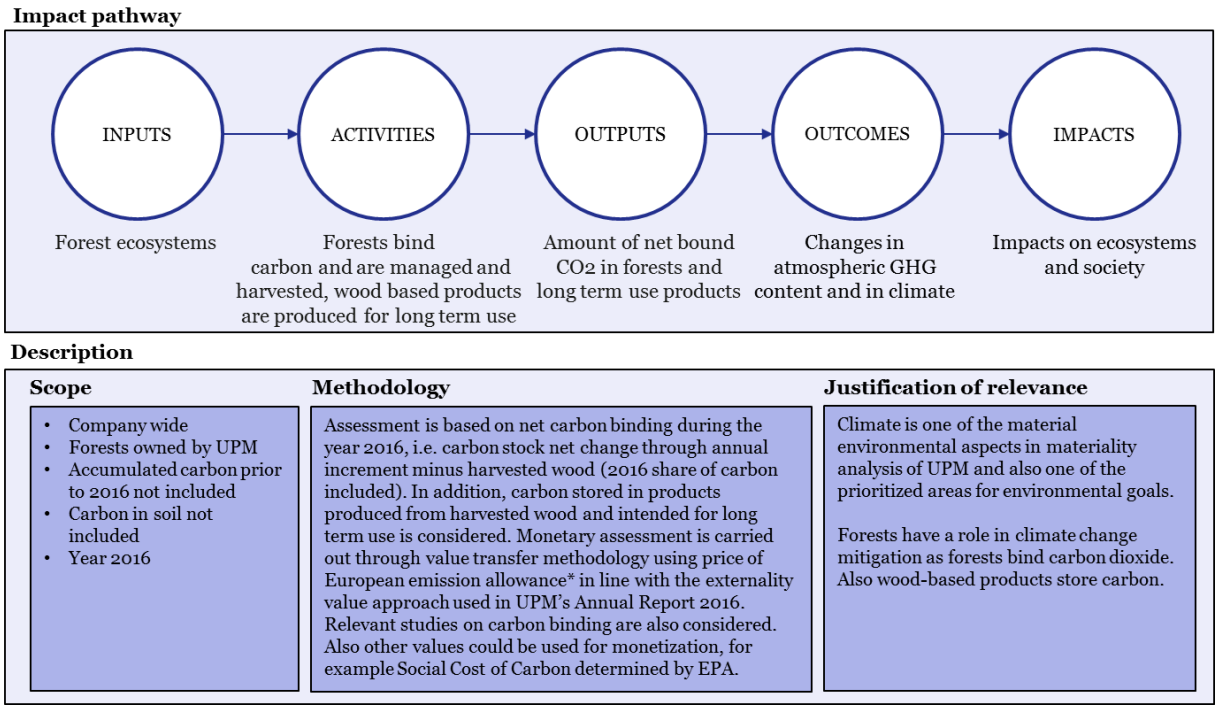
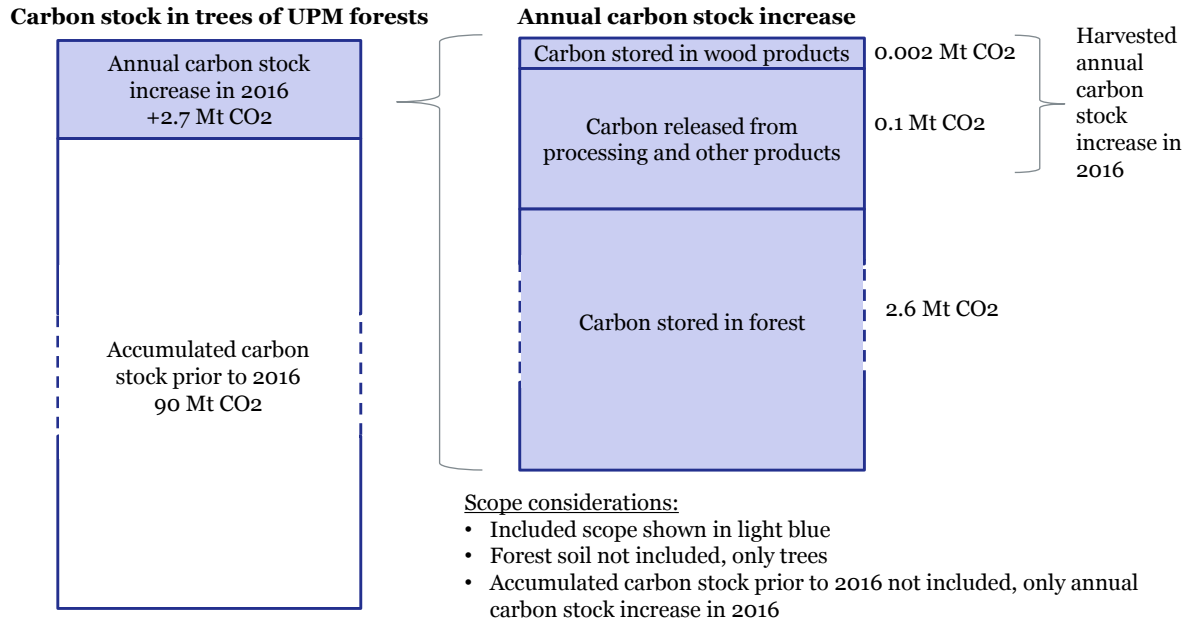


Figure 8. Impact pathway, scope, methodology and justification of relevance for impacts valuation of net carbon binding of UPM's forests[16]

As illustrated in the figure below, the assessment in the pilot study does not cover carbon in forest soil and accumulated carbon stock prior to 2016. UPM is currently working on comprehensive carbon balance assessment which will provide useful information for impact valuation in the future.



[16] https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04

Figure 9. Scope of net carbon binding of UPM forests in the pilot study[17]

As described in the scope, net carbon binding in the assessment of the pilot study is based on annual carbon stock increase in 2016 that stays in the forest (positive), is stored in wood products (positive) and is released from processing and other products (negative). Net carbon binding in UPM's forests is illustrated in the figure below.

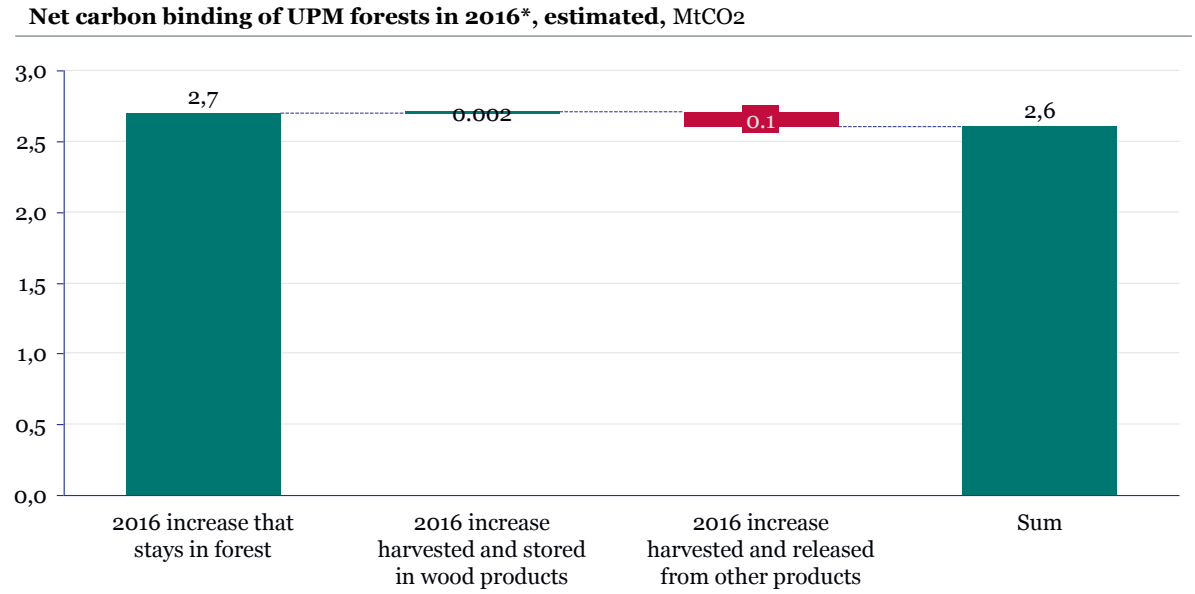


Figure 10. Results of net carbon binding of UPM forests[18]

Qualitative impacts[19]

Trees and forest ecosystems play a role in binding of carbon dioxide and slowing down the global warming. Wood-based products also store carbon the tree has sequestrated during its growth as long as the product is in use. Carbon stored in trees and wood-based products mitigates climate change and reduces negative societal impacts from climate change, including:

- Impacts on health, safety and well-being of citizens as well as associated costs due to extreme weather conditions (storms, draught, heat waves and flooding)
- Direct loss of economic, ecological, cultural, and subsistence values through loss of land, infrastructure, and coastal habitats
- Impacts on food production and food security
- Impacts on natural systems: cryosphere, water resources, coastal systems, and ecosystems on land and in the ocean providing ecosystem services such as clean air, water and biodiversity
- Cascading impacts of climate change from physical climate through ecosystems on people (e.g. through forest systems)

[17] UPM is currently in the process of doing a more detailed carbon inventory
[18] Forest soil not included
[19] 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18

- Impacts on vulnerable livelihoods and income for people whose income is dependent on natural resources
- Tradeoff impacts of adaptation to sea-level rise and climate change impacting environmental, economic, social, and cultural values.

Monetary impacts

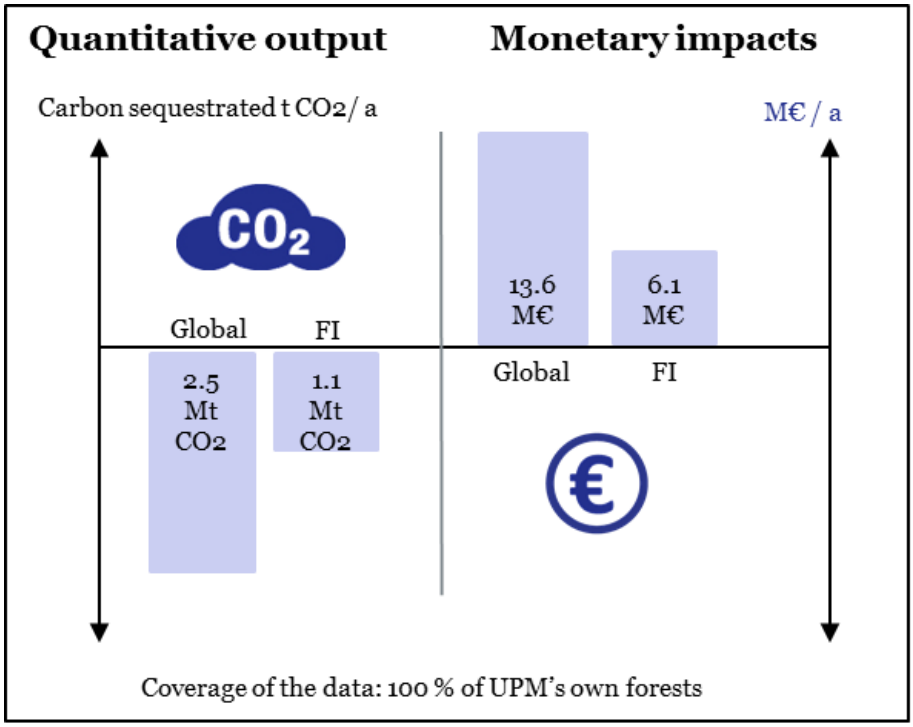


Figure 11. Quantitative output and monetary impacts of net carbon binding for Global level and Finland, respectively. Monetization based on emission allowance price. Social cost of carbon by EPA would give: Global +93 M€, FI +44Me.

Relevance of results to key stakeholders

Monetized value of impacts of carbon sequestrated by trees in forests UPM owns is relevant e.g. for investors as one aspect in long term responsible value creation potential.

3.1.4 Result summary: Climate impact valuation[20]

Climate indicators selected for the pilot study include GHG emissions, GHG savings from surplus electricity sold and net carbon binding of UPM's forests. All these indicators were monetized and are shown in the figure below.

[20] Source: UPM, Gaia analysis

Impact value on climate during year 2016

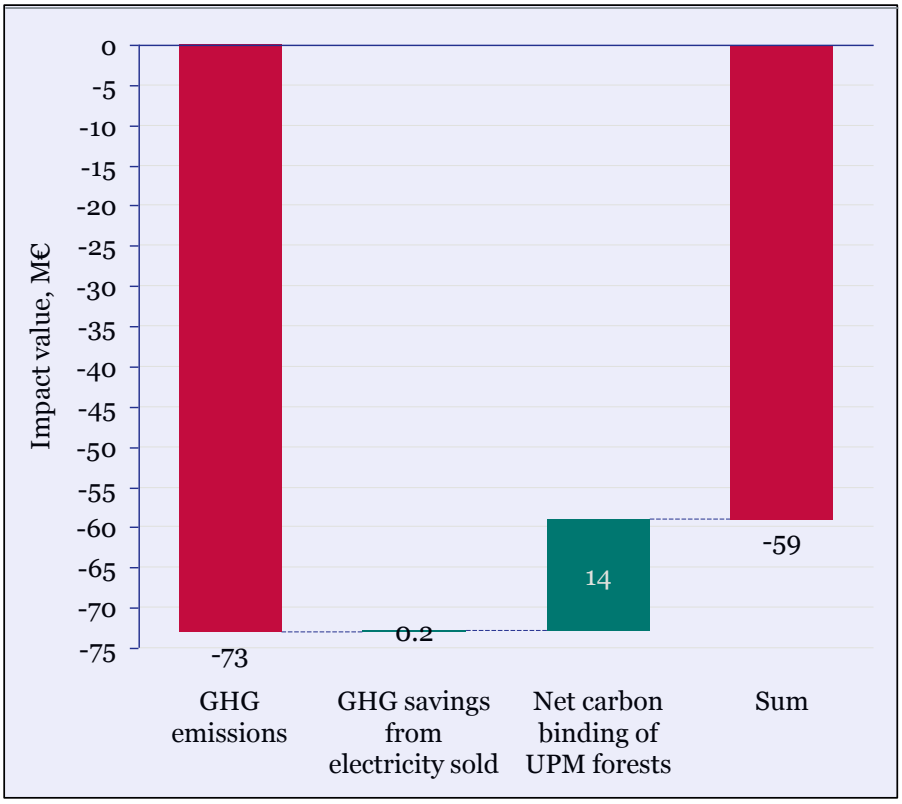
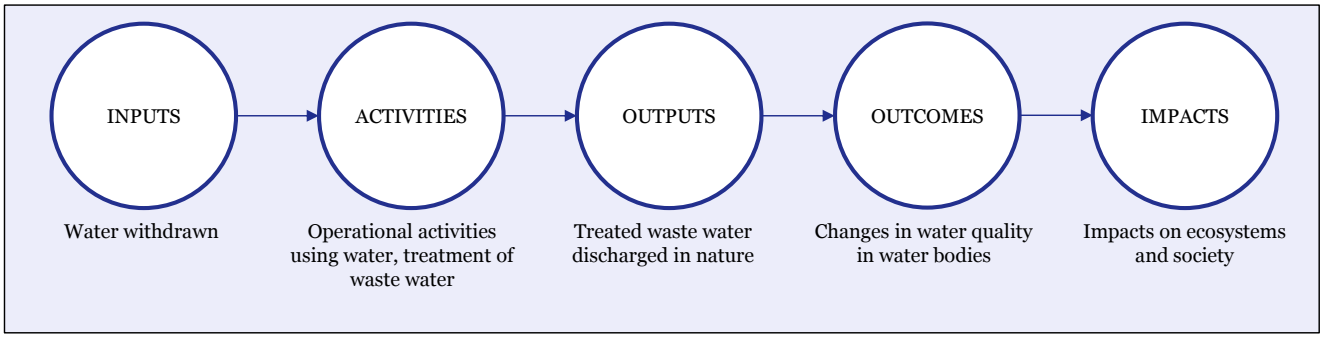


Figure 12. Monetized impact valuation of selected climate indicators during year 2016. Quantified and monetized impacts (in nominal value) are based on the indicators chosen for the pilot study. They represent a sub set of the actual overall impacts of UPM's operations on climate and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the indicators will be complemented with more comprehensive indicators in the follow-up work. Climate impact monetization is based on the externality value approach used in UPM's Annual Report 2016.

3.2 Water

3.2.1 Impact valuation of treated waste water discharged into nature

Impact pathway and description of scope and methodology for impact valuation of treated waste water discharged into nature is shown in Figure 13 below, together with justification of relevance for the indicator.



Description

Scope

- Company wide for quantitative output and qualitative assessment of impact.
- For monetary impact assessment UPM's sites in Europe are included (covers 83% of generated treated waste waters in group level).
- Nutrient emissions released (nitrogen and phosphorus) in treated waste water discharged to nature from UPM's sites.
- Year 2016

Methodology

Assessment is based on the amount of released nutrients (P and N) in discharged treated waste waters to types of water bodies: seas, lakes and rivers (outputs). Monetary assessment is done through value transfer studies based on the earlier published studies*.

Justification of relevance

Water pollution is one of the material environmental aspects in materiality analysis of UPM and also one of the prioritized areas for environmental goals.

Nutrients discharged to water bodies cause eutrophication, which may have several local and regional environmental and societal impacts.

Figure 13. Impact pathway, scope, methodology and justification of relevance for impacts valuation of treated waste water discharged into nature[21]

Qualitative impacts[22]

Excess nutrients (nitrogen and phosphorus) in water bodies accelerate eutrophication, which has several environmental and societal impacts:

- Due to increased amount of biomass, oxygen is consumed faster which can lead to changes and damage in aquatic ecosystems
- Increasing algae growth and toxic substances may cause health problems for people and animals as well as have negative impacts on recreational use of water bodies.
- Poor water quality has negative impacts on recreational use of water bodies as well as tourism.
- Eutrophication has also an impact on existing fish species, which might have an impact on incomes and business opportunities of commercial fisheries.
- Water courses provide ecosystem services, such as regulation of environmental toxins, biological diversity, cultural heritage and resources, which all can be damaged by excessive nutrient pollution.

[21] Baltic Stern, 2013. The Baltic Sea – Our Common Treasure. Economics of Saving the Sea; Hernandez-Sancho et al., 2010. Economic valuation of environmental benefits from waste water treatment processes.
[22] Baltic Stern, 2013. The Baltic Sea – Our Common Treasure. Economics of Saving the Sea; UNEP, Water Quality: The Impact of Eutrophication. Lakes and reservoirs vol. 3, http://www.unep.or.jp/ietc/publications/short_series/lakereservoirs-3/index.asp.

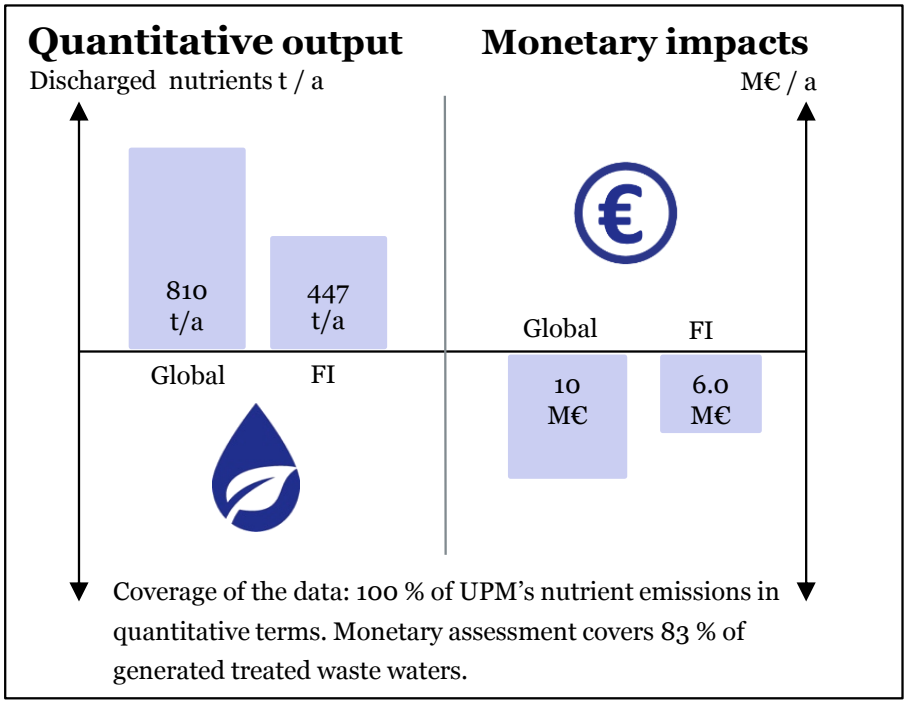


Figure 14. Quantitative output and monetary impacts of discharged waste water for Global level and Finland, respectively.

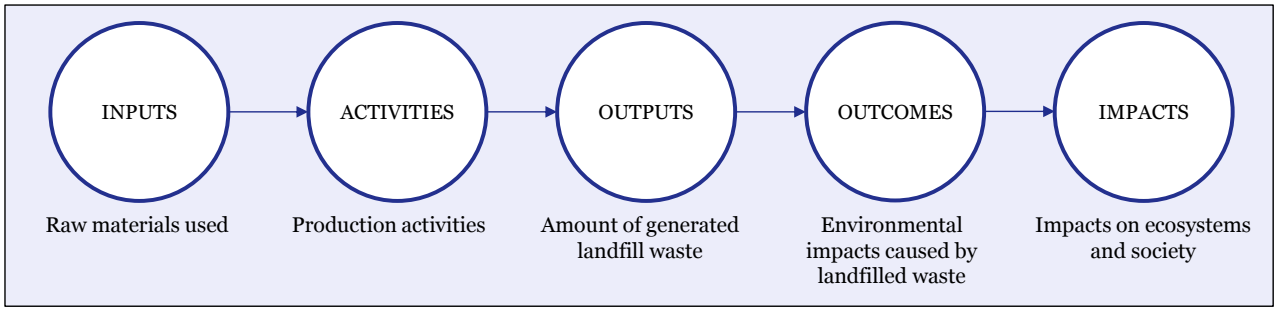
Relevance of results to key stakeholders

Monetized value of impacts of nutrient pollution is relevant for investors as one aspect in long term responsible value creation potential. Information in site level is relevant for local communities.

3.3 Waste

3.3.1 Impact valuation of landfill waste

Impact pathway and description of scope and methodology for impact valuation of landfill waste is shown in Figure 15 below, together with justification of relevance for the indicator.



Description

Scope	Methodology	Justification of relevance
• Company wide • Generated landfilled waste from UPM's sites. • Year 2016	Assessment is based on the amount of generated landfilled waste. Monetary assessment is based on the actualized cost of state of the art landfill waste handling as a proxy for the value of the impact avoided i.e. potential environmental damages caused by the landfilled waste.	Landfilled waste is one of the material environmental aspects in materiality analysis of UPM and also one of the prioritized areas for environmental goals. Landfilled waste has also local societal impacts.

Figure 15. Impact pathway, scope, methodology and justification of relevance for impacts valuation of landfill waste

Qualitative impacts[23]

Landfills and landfilled waste have direct and indirect environmental and societal impacts, which affect local communities and citizens, such as:

- Leachate emissions have a potential to migrate to groundwater and therefore have a potential to have an impact on human health
- Descreasing value of properties near landfills
- Decreasing quality of life for population located near landfills. Landfills might cause odor and noise and noise may have many undesirable health effects.
- Increasing traffic nearby landfill site creates noise and increase possibility for traffic accidents.
- Limited land use. Land occupied by landfills cannot be used for recreational use for local populations.
- Impact of released greenhouse gases from the decomposition of organic matter influencing on the global warming and societal impacts caused by it.

Monetary impacts

[23] BDA Group, The full cost of landfill disposal in Australia

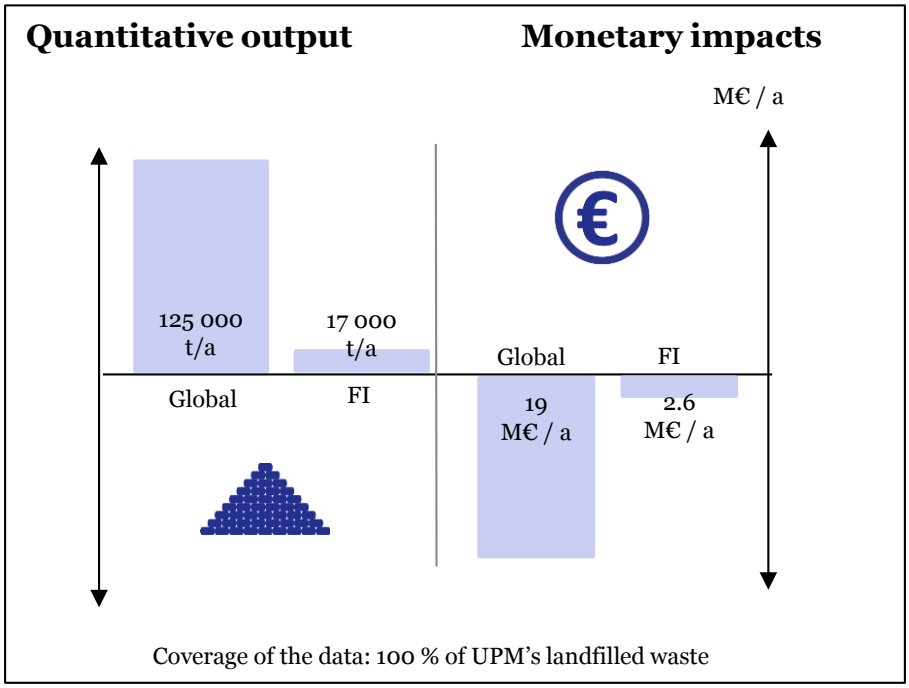


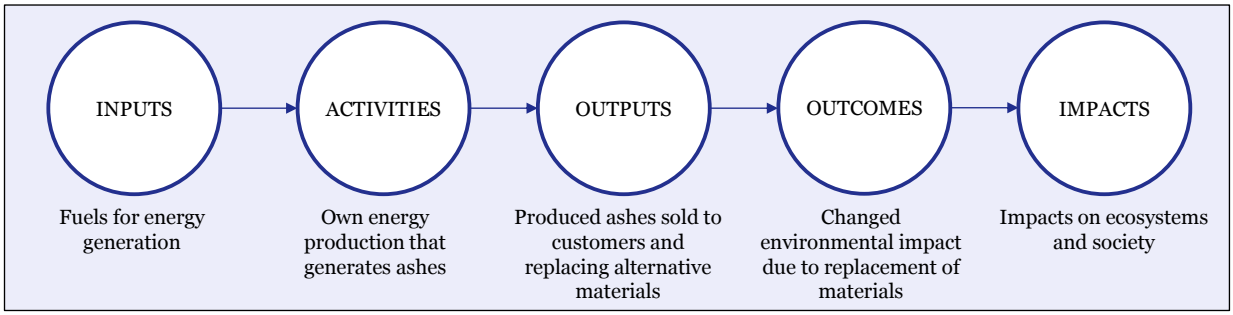
Figure 16. Quantitative output and monetary impacts of landfilled waste for Global level and Finland, respectively.

Relevance of results to key stakeholders

Monetized value of impacts of waste generation is relevant for investors as one aspect in long term responsible value creation potential. Information in site level is relevant for local communities.

3.3.2 Impact valuation for waste and side streams used as raw material

Impact pathway and description of scope and methodology for impact valuation for waste and side streams used as raw material are shown in Figure 17 below, together with justification of relevance for the indicator.



Description

Scope	Methodology	Justification of relevance
• Company wide case study • Generated ashes for utilization • Year 2016	Assessment is based on utilized ashes generated from UPM's operations. Monetary assessment is based on the cost of virgin materials replaced by ashes generated as side products. The price of alternative virgin raw materials is used as a proxy value for the monetized impacts*. It is assumed to give an indicative proxy on resource value and associated processing and logistics costs saved when replacing virgin materials.	Utilization of produced by-products enhances utilization rate of raw materials and thereby resource efficiency. It also contributes positively to circular economy and reduces negative impacts of virgin materials being replaced.

Figure 17. Impact pathway, scope, methodology and justification of relevance for impacts valuation of waste and side streams used as raw material[24]

Qualitative impacts[25]

Solution that enables utilization of by-products and waste streams instead of landfilling or incineration has several environmental and societal impacts:

- Replacement of alternative virgin products and materials enables avoiding environmental impacts caused by production of virgin products (eg. extraction of raw materials, utilization of energy resources). For example, utilization ashes as fertilizers reduces the need of virgin nitrogen and phosphorus fertilizers.
- By utilization of side streams environmental and societal impacts caused by waste disposal can be avoided, such as leachate emissions from landfills and societal impacts of landfilling.
- Transition towards circular economy may have a great impact on economic growth, which may have wider societal impacts in terms of increased income and related benefits.
- It is estimated that two thirds of added value of circular economy is generated through externality benefits.

Monetary impacts

[24] For those sites where alternative virgin raw material price is not available, weighted average price for other sites is used
[25] EllenMcArthur Foundation & McKinsey, 2015. Growth within: A circular economy vision for competitive Europe.

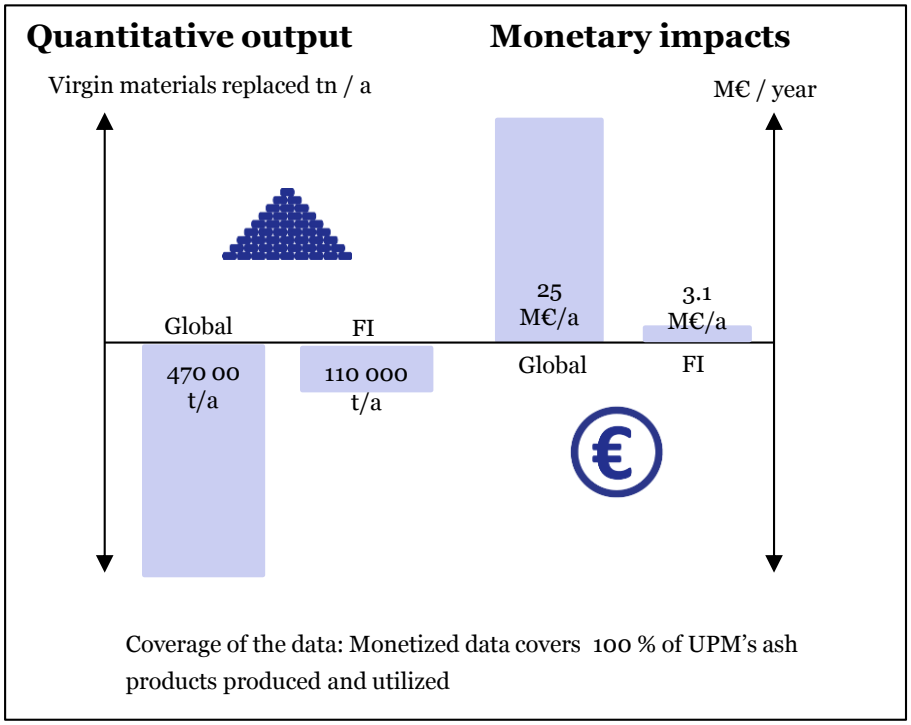


Figure 18. Quantitative output and monetary impacts of waste and side streams used as raw material for Global level and Finland, respectively.

Relevance of results to key stakeholders

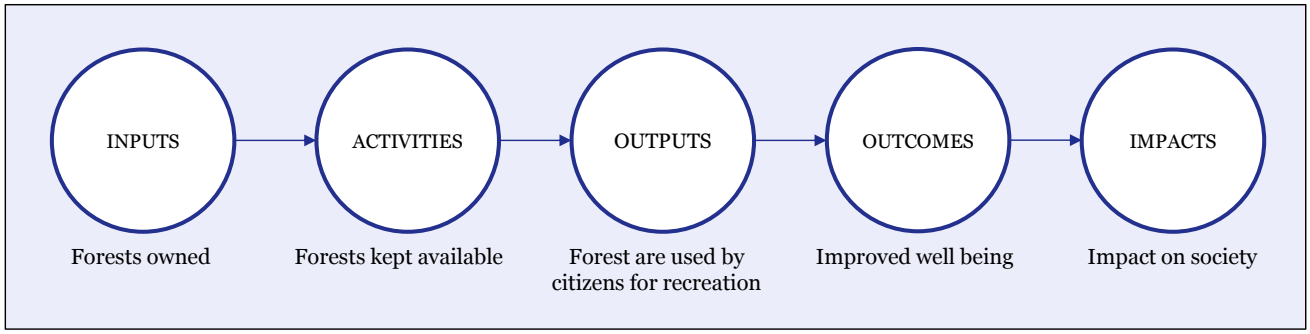
Monetized value of impacts of side stream utilization is relevant for investors as one aspect in long term responsible value creation potential.

3.4 Citizen well-being

3.4.1 Impact valuation of UPM's forests available for free recreation use

Impact pathway and description of scope and methodology for impact valuation of UPM's forests available for free recreation use are shown in Figure 19 below, together with justification of relevance for the indicator.

Impact pathway



Description

Scope	Methodology	Justification of relevance
• Company wide • Forests owned by UPM • Year 2016	Assessment is based on the area of forests that can be used for recreational purposes owned by UPM. Monetary assessment is based on the value transfer technique and the study on the value (travel cost method) of recreational use of Finnish forests*. To estimate recreational value of USA forests, the conservation easement cost is used.	Forests have a central role in UPM's business. Responsible forest management is one of the most significant aspects in UPM's materiality analysis. Forests provide societal benefits to local communities.

Figure 19. Impact pathway, scope, methodology and justification of relevance for impacts valuation of UPM's forests available for free recreation use[26]

Qualitative impacts[27]

In addition to provision of wood based raw materials, forests provide also other material and immaterial benefits, which have diverse societal impacts:

- Forest ecosystems provide positive impacts on health and well-being. For example, forests control pollution and provide clean water and air, which are crucial for human life and well-being.
- Poor health of citizens has increased in urban areas and it is estimated that current health care system cannot cope with these problems alone. However, forests can have a great impact on human well-being and health. Forest visits enhance humans' mental and physical health in many ways, such as by reducing stress and strengthening human immune system. Visits may also have preventive effect on cancer generation and they reduce concentration of stress hormone.
- Forests provides also a place for recreational activities, such as camping and hiking.

Monetary impacts

[26] http://www.metsatieteellinenseura.fi/files/sms/MTP2014/mtp2014_kp_juutinen.pdf
[27] Karjalainen et al.(2010). Promoting human health through forests: overview and major challenges; JRC – Forest ecosystem services

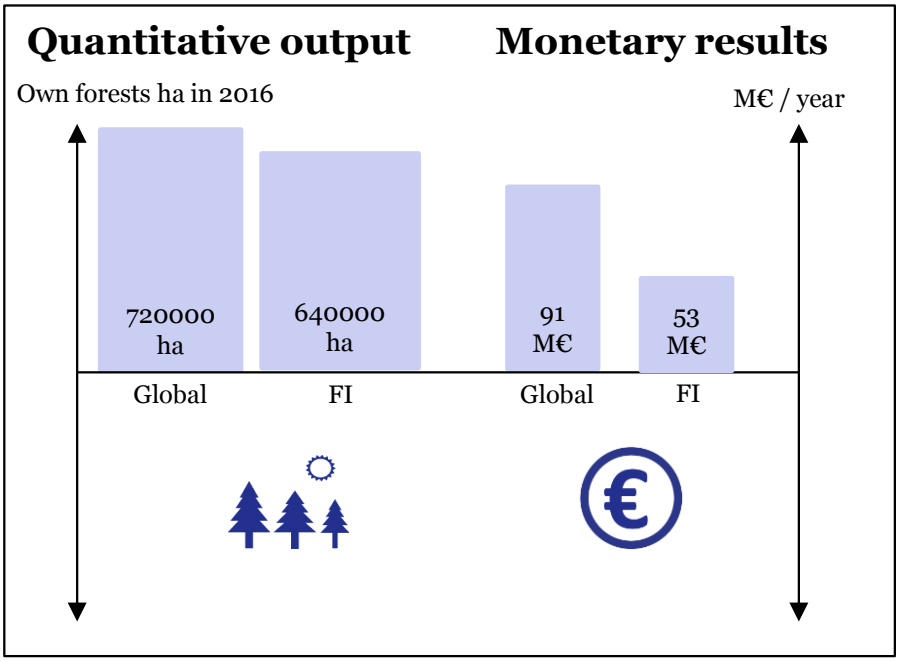


Figure 20. Quantitative output and monetary impacts of UPM's forests available for recreational use for Global level and Finland, respectively.

Relevance of results to key stakeholders

Monetized value of societal impacts of forests is relevant for investors as one aspect in long term responsible value creation potential. It is relevant for other key stakeholders as well to understand the value of forests in different uses.

3.5 Employee well-being

3.5.1 Impact valuation of accidents

Impact pathway and description of scope and methodology for impact valuation of accidents are shown in Figure 21 below, together with justification of relevance for the indicator.

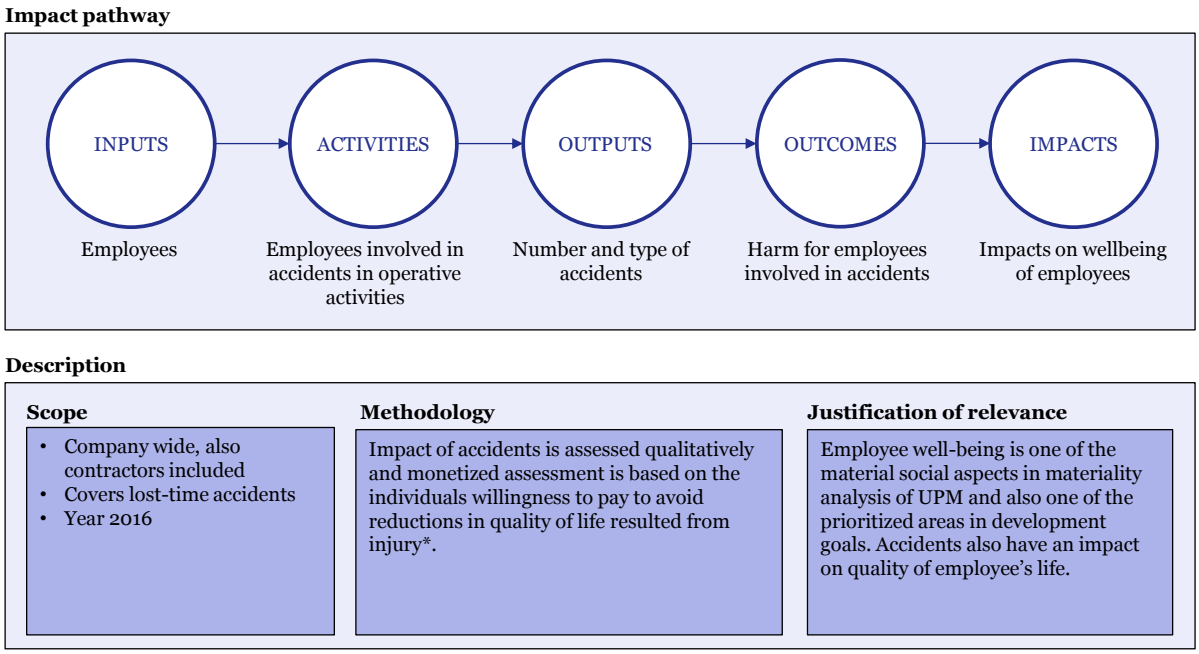


Figure 21. Impact pathway, scope, methodology and justification of relevance for impacts valuation of accidents[28]

Qualitative impacts[29]

According to the ILO's mandate on occupational safety and health, all the employees should have an adequate protection for the life and health in all occupations. Accidents cause cost and burden for employer and society, but they also have an impact on the well-being of employees:

- According to the study by Argh et al., there is some significant difference how injured and uninjured individuals perceive quality of life.
- For example, pain caused by accidents and illness has an impact on the quality of life. Pain may also cause depression, which has wider impact on the perceived quality of life.
- Also role limitation due the physical problems may reduce the perceived quality of life.
- In case of loss of life due to accidents, there can be a significant loss of quality of life for other people as well, which cannot be measured or monetized.

Monetary impacts

[28] http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf
[29] ILO, 2008. Fundamental principles of occupational health and safety. 2nd edition. http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_093550.pdf and Agh et al. Study on Relationship between Life Quality and Occupational Accident in Wood industry. http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf

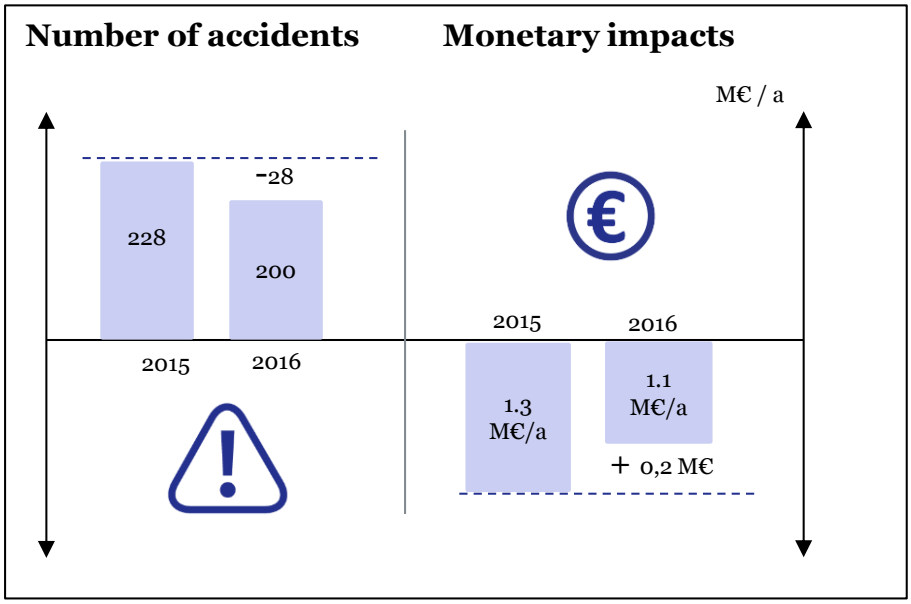


Figure 22. Quantitative output and monetary impacts accidents for Global level and Finland, respectively.

Relevance of results to key stakeholders

Monetary assessment is based on willingness to pay to avoid reductions quality of life resulted from injury, based on the study by UK's Health and Safety Executives.

The impacts are relevant for employees and for investors as a measure of operational performance and risk for development of responsible value creation.

3.5.2 Impact valuation of OHS activities

Impact pathway and description of scope and methodology for impact valuation of OHS activities are shown in Figure 23 below, together with justification of relevance for the indicator.

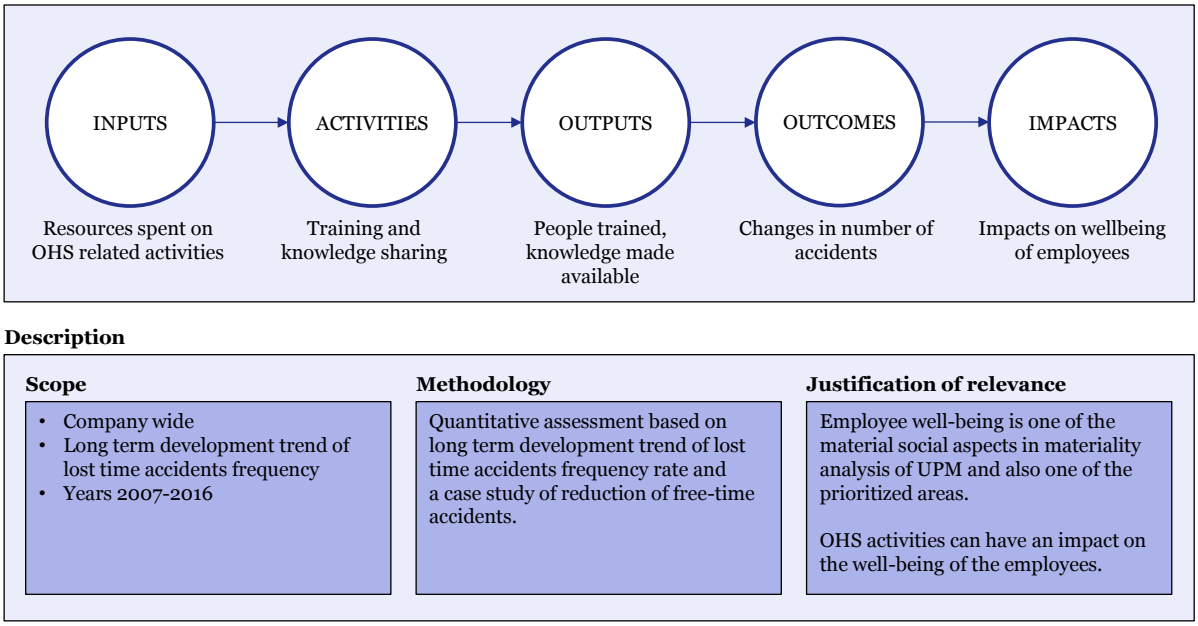


Figure 23. Impact pathway, scope, methodology and justification of relevance for impacts valuation of OHS activities

Qualitative impacts[30]

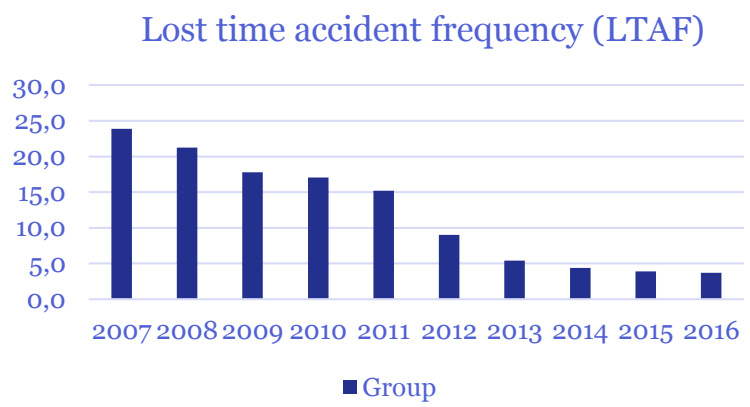
With OHS activities negative impacts of accidents in work place and free time to employee well being can be reduced:

- According to the study by Argh et al., there is a significant difference how injured and uninjured individuals perceive quality of life.
- For example, pain caused by accidents and illness has an impact on the quality of life. Pain may also cause depression, which has wider impact on the perceived quality of life.

Quantitative impacts

[30] ILO, 2008. Fundamental principles of occupational health and safety. 2nd edition. http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_093550.pdf and Agh et al., Study on Relationship between Life Quality and Occupational Accident in Wood industry.

Quantitative impacts



Due to OHS activities, the lost time accident frequency rate has decreased **85 %** (2007-2016)

Figure 24. Lost time accident frequency (LATF)

Relevance of results to key stakeholders

Positive development trend in LTA and the case study show the impact in reduction of occurrence of accidents due to OHS activities. The impacts are relevant for employees by increasing their quality of life and for investors as a measure of operational performance and responsible value creation potential.

CASE STUDY

During the 2016, UPM supported employee's health and safety by free-time accidents prevention at the UPM plywood mills in Finland. As the accidents have an impact on the perceived quality of life, it is important to reduce accidents also during free time.

Quantitative impacts:

*During the health and safety campaign, absences due to free time accidents were reduced by **44 %**.*

4 Summary

The pilot study focused on impact valuation of five selected prioritized social and environmental issues in line with the Social Capital Protocol and the Natural Capital Protocol. Monetized impact valuation was targeted wherever feasible and relevant to implement within the context and scope of the pilot study. In table and figure below the monetized impacts are summarized for the selected prioritized issues and indicators of the pilot study.

Table 2. Summary of monetized impact valuation of environmental and social issues and indicators selected for the pilot study[31]

	Issue	Impact indicators	Quantified output		Monetised impact, M€	
			Global	Finland	Global	Finland
Natural capital	Climate *	• Impact valuation of GHG emissions • Impact valuation of GHG savings from use of surplus electricity sold • Impact valuation of net carbon binding of UPM's forests	-14 Mt CO2 +0.045 Mt CO2 +2.5 Mt	-4,7 Mt CO2 +0.04 Mt CO2 + 1.1 Mt	-73 + 0.24 + 13.6	-25 + 0.21 + 6.1
Natural capital	Water	• Impact valuation of treated waste water discharged into nature	810 t nutrients	447 t nutrients	- 10	- 6
Natural capital	Waste	• Impact valuation of landfill waste • Impact valuation for waste and side streams used as raw material (case)	125 000 t 470 000 t	17 000 t 110 000 t	- 19 + 25	- 2.6 + 3.1
Social capital	Citizen well being	• Impact valuation of UPM's forests available for free recreation use	720 000 ha	640 000 ha	+ 91	+ 53
Social capital	Employee well being	• Impact valuation of lost time accidents • Impact valuation of OHS activities	58 % reduction in lost time accidents (5 years) 85 % reduction in LTAF (10 years time period)	-	- 1.1 + 0.2	-

** Climate impact monetization is based on emission cost allowance. Monetization based on social cost of carbon (EPA) would give on global level: -480 M€ for GHG emissions, +6.7 M€ for GHG savings from use of surplus electricity sold and + 93 M€ for net carbon binding of UPM's forests.*

[31] Quantified outputs and monetized impacts (in nominal value) of the prioritized issues are based on the indicators chosen for the pilot study. They represent a subset of the actual overall outputs and impacts of UPM's operations and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.
Source: UPM, Gaia analysis

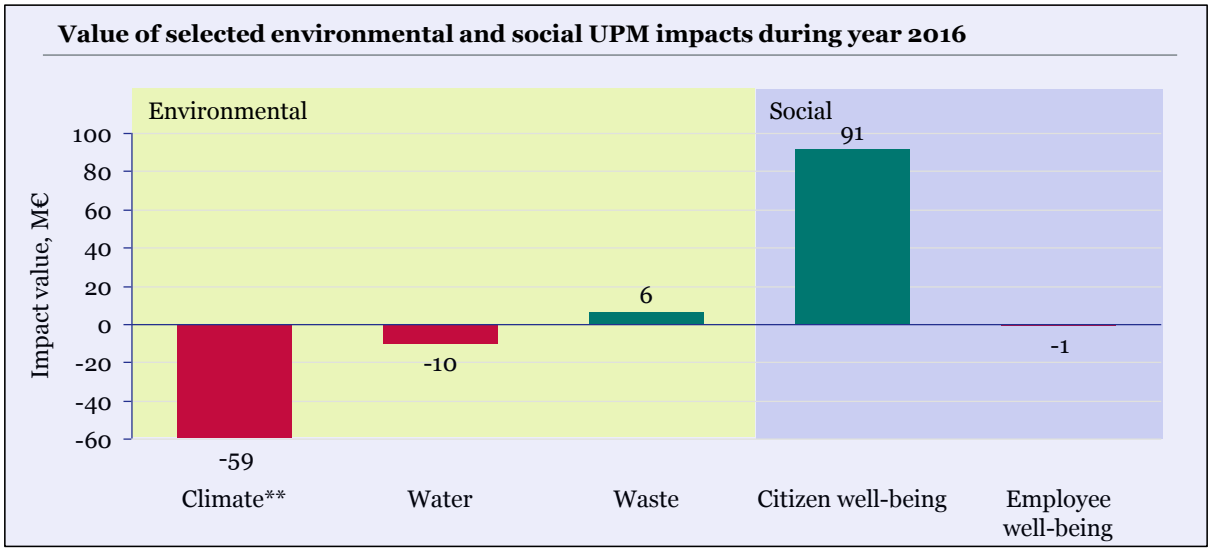


Figure 25. Summary of monetized impacts of selected environmental and social issues of the pilot study[32] [33]

The selected environmental and social issues monetized within the scope of the pilot study are put to interesting context when compared with the economic value created through operating profit. Although economic impact valuation was not in the scope of this study, it can be concluded that further assessment of economic impact valuation together with further assessment of the environmental and social impact valuation would provide interesting, more comprehensive and integrated impact valuation in the future.

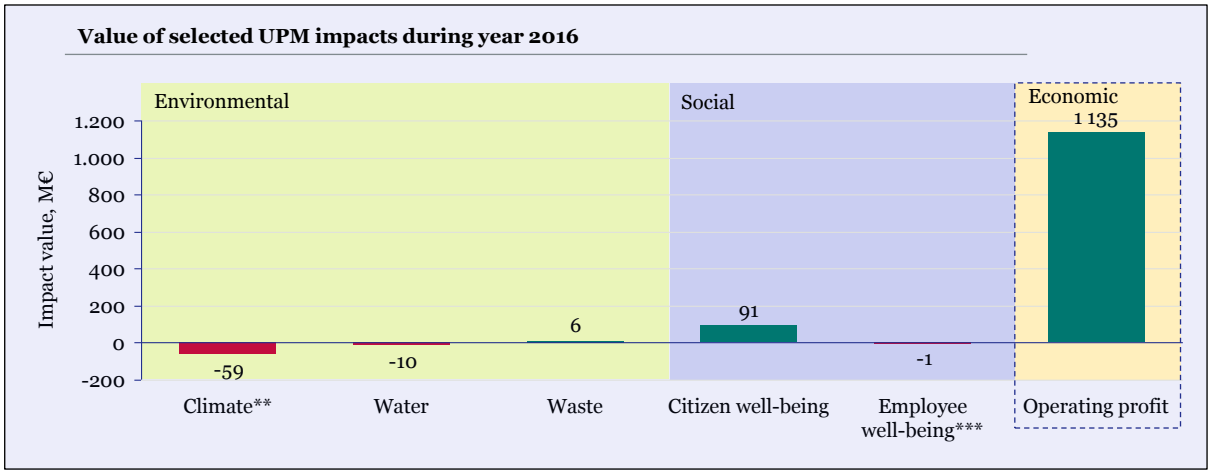


Figure 26. Summary of monetized impact valuation of environmental and social issues and indicators selected for the pilot study[34] [35]

[32] Quantified and monetized impacts (in nominal value) of the prioritized issues are based on the indicators chosen for the pilot study. They represent a sub set of the actual overall impacts of UPM's operations and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.

[33] Climate impact monetization is based on the externality value approach used in UPM's Annual Report 2016. Source: UPM, Gaia analysis

5 Steps forward

Further development of the impacts valuation methodology

This pilot study focused on five prioritized issues and selected impact valuation indicators for the prioritized environmental and social issues. The study was conducted in line with UPM's materiality analysis, corporate environmental and social target setting and the Social capital protocol and Natural Capital protocol of World Business Council of Sustainable Development (WBCSD). The knowledge base on monetized value of societal and environmental externalities is evolving and the methodological framework of this analysis can be developed as the available information accumulates. Impact valuation is more of a continuous process than a one-off study. This study is the starting point of the continuous process and provides the methodological framework for further development work.

In the follow-up work the following development topics are recommended to be addressed:

- Consideration of other important and material issues in addition to the five issues prioritized for the pilot study, including also economic aspects in addition to social and environmental.
- Consideration of secondary audiences for impact valuation
- Assessing the need for primary approach development for monetarization (in indicator level)
- Extension of the scopes of the individual indicators and inclusion of new indicators to better cover the prioritized issues in a more comprehensive manner, as more information comes available
- Development needs identified for the individual indicators are described in Table below.

[34] Quantified and monetized impacts (in nominal value) of the prioritized issues are based on the indicators chosen for the pilot study. They represent a sub set of the actual overall impacts of UPM's operations and do not show the overall net impact UPM operations have. This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work.
[35] Climate impact monetization is based on the externality value approach used in UPM's Annual Report 2016. Source: UPM, Gaia analysis

Table 3. Indicator specific development needs identified[36]

	Issue	Development needs *(in italic)* of current indicators	Possible new indicators

Natural capital	Climate	• All impact valuation of climate change indicators
		  • *Monetization: further research on suitable valuation methods for societal cost of carbon*
		• Impact valuation of GHG savings from use of surplus electricity sold
		  • *Scope extension: Emissions avoided through green certificates sold other than surplus electricity from sites*
		• Impact valuation of net carbon binding
		  • *Scope extension: Forest soil in own forests*
		  • *Scope extension: Wood sourced from outside own forests*
		  • *Scope extension: Accumulated carbon stock*
			• *Externality value of emissions avoided through product substitution*

	Water	• Impact valuation of treated waste water discharged into nature • *Monetization: COD of discharged waste water*	• *Externality value of withdrawn water*

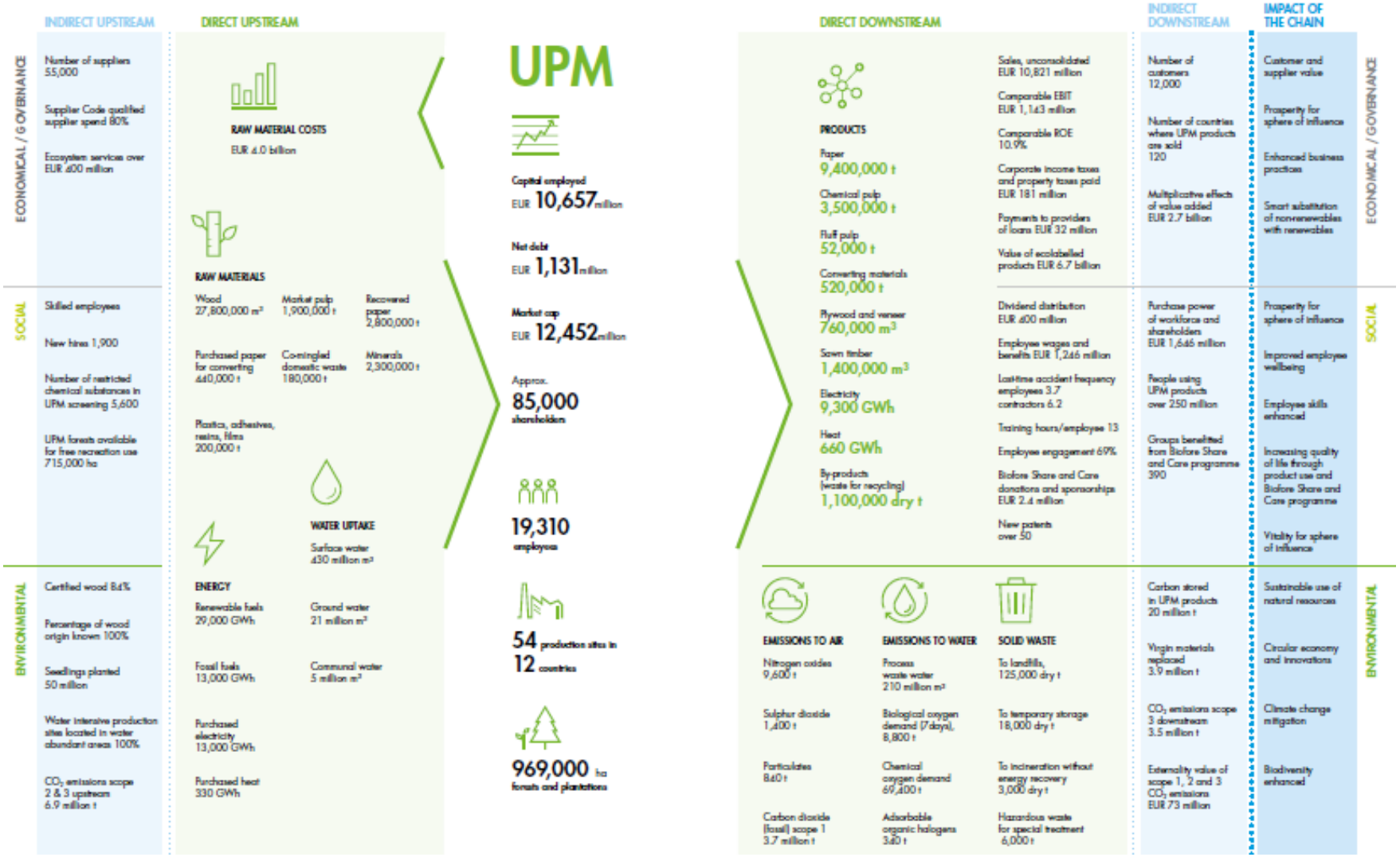
	Waste	• Impact valuation of landfill waste
		  • *Monetization based on valuation of impacts for waste specific characteristics*
		• Impact valuation of waste and side streams used as raw material
		  • *Scope extension: All waste and side streams*
			• *Virgin resources saved through recycled raw materials used*

Social capital	Citizen well-being	• Value of UPM's forests available for free recreation use	• *Externality value for local communities*

	Employee well-being	• All impact valuation indicators of employee well-being
		  • Possible survey to employees to assess perceived value
		• Impact valuation of accidents
		  • *Monetization: development of applicable method*
		• Impact valuation of OHS activities
		  • *Monetization: development of applicable method*
		  • *Possible survey on how employees value OHS activities*
			• *Impact of well-being and health care activities*

[36] This pilot study is the starting point for the impact valuation efforts of UPM, and the prioritized issues will be complemented with more comprehensive indicators in the follow-up work. This listing of relevant indicators is a starting point for widening the coverage of impact valuation to be more comprehensive in the future.

APPENDIX 1: IMPACTS ACROSS VALUE CHAIN



APPENDIX 2: ASSUMPTIONS AND SOURCES

Table 1. Calculation assumptions and information sources

CLIMATE	
1.1 Impact valuation of GHG emissions	
Information used for calculation and calculation assumptions	**Used Sources**
• Scope 1, 2 and 3 greenhouse gas emission data was received from UPM • Value of GHG emissions is monetized through value transfer method using average settlement price (2016) of European Emission Allowance	• Settlement price of European Emission Allowance: https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04 • 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18: http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap18_FINAL.pdf • https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04 • UPM annual report: http://hugin.info/165629/R/2081401/784910.pdf
1.2 Impact valuation of GHG savings from use of surplus electricity sold	
Information used for calculation and calculation assumptions	**Used Sources**
• Information of surplus electricity sold outside company was received from UPM • Emission factor for Uruguay's electricity was received from UPM • For Finland, emission factor of Finnish electricity residual mix for 2015 was used (emission factor for residual mix for 2016 will be published on June 2017) • Value of saved GHG emissions is monetized through value transfer method using average settlement price (2016) of European Emission Allowance	• Emission factor for Finnish electricity residual mix: Suomen energiavirasto, emission factor for Finnish residual mix for the year 2015 https://www.energiavirasto.fi/documents/10179/0/J%C3%A4%C3%A4nn%C3%B6sjakauma_2015_julkaisu_23_6_2016_Allekirjoitettu+versio.pdf/ed235900-af00-47c6-8e4a-af943ca5b5a1 • Settlement price of European Emission Allowance: https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04 • 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18: http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap18_FINAL.pdf and https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04

CLIMATE	
1.3 Impact valuation of net carbon binding of UPM' forests	
Information used for calculation and calculation assumptions	**Used Sources**
• Forest areas owned by UPM and amount of produced plywood and sawn goods was received from UPM • It was assumed that carbon is bound for longer period of time to plywood and sawn wood and from other products it is released during the year 2016. • It was assumed that plywood and sawn wood is not produced from USA's and Uruguay's forests. • Share of harvested wood from own forests and total harvested wood was used for evaluation for the amount of products produced from own forests • Annual carbon binding of forests and forest stock was evaluated according literature • Carbon stock of USA's forest were assumed to be same as in Finnish forest • Carbon content of biomass was assumed to be 50 % • Average density of harvested wood was assumed to be 500 kg/ m3 • Moisture content of harvested for harvested wood (air dried) was assumed to be 20 %. • Moisture content of plywood was assumed to be 10 % and for sawn wood 20 %.	• Carbon binding and carbon stock of Finnish forests: SYKE: Framework for assessing the state of environment in boreal forest used for pulp production and emissions from logistics and pulp production, report 3.7.2015 • For carbon binding and carbon stock of Uruguay's forests: Juntheikki, J., 2014. Estimation of eucalyptus forest plantation carbon sequestration potential in Uruguay with the CO2 fix model • Information of carbon bound to USA's forest during 2016: Summary of Blandin Improved Forest Management Project • Carbon content of biomass: SYKE: Framework for assessing the state of environment in boreal forest used for pulp production and emissions from logistics and pulp production, report 3.7.2015 • 5th Assessment Report of Intergovernmental Panel on Climate Change, Ch 18: http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap18_FINAL.pdf and https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2017/05/04

WATER	
2.1 Impact valuation of treated waste water discharged into nature	
Information used for calculation and calculation assumptions	**Used Sources**
• Information regarding discharged treated waste water and nutrients (N and P) data was received from UPM • Assessment if based on the amount of released nutrients (P and N) in discharged treated waste waters to types of water bodies (outputs)	• Monetary valuation of nutrients discharged to Baltic Sea: Baltic stern, 2013. The Baltic Sea – Our Common Treasure. Economics of Saving the Seas • Monetary valuation of nutrients discharged to European water bodies: Hernandez-Sancho et al., 2010. Economic valuation of environmental benefits from waste water treatment processes
WASTE	
3.1 Impact valuation of landfill waste	
Information used for calculation and calculation assumptions	**Used Sources**
• Information about generated landfilled waste was received from UPM • Monetary assessment is based on the actualized cost of state of the art landfill waste handling as a proxy for the external value, information was received from UPM	• BDA Group, The full cost of landfill disposal in Australiahttps://www.environment.gov.au/system/files/resources/2e935b70-a32c-48ca-a0ee-2aa1a19286f5/files/landfill-cost.pdf

WASTE	
3.2 Impact valuation for waste and side streams used as raw material	
Information used for calculation and calculation assumptions	**Used Sources**
• Information about amount of re-used ashes produced and their end uses was received form UPM • If the information regarding the end use was missing, the price was estimated according to the weighted average price of the known ash streams • For the price estimation, different information sources were used • Average exchange rate of 2016 was used for currency change form USD to € (www.oanda.com)	• Price of agricultural lime: average price for virgin agricultural lime was used (source: http://kaytannonmaamiesfi.virtualserver27.hosting.fi/wp-content/uploads/2013/12/nopeavaikutteinen_2012.pdf • Fertilizer: price of Yara's forest fertilizer was used (https://kauppa.raisioagro.com/raisio_b2c/init.do?scenario.xcm=raisio_b2c&shop=raisio_b2c&language=fi&areaID=0000000016) • NaOH: http://asia.nikkei.com/Markets/Commodities/Caustic-soda-prices-on-upward-trend-in-Asian-markets • For clay used: price data was derived from USGS information: https://minerals.usgs.gov/minerals/pubs/commodity/clays/myb1-2014-clays.pdf • For lime products (other than agricultural use), price data was estimated according the study on North America calcium carbonate market (https://roskill.com/wp/wp-content/uploads/2014/11/download-roskills-paper-on-the-north-american-calcium-carbonate-market.attachment1.pdf) • Finnish price for ground material used as an estimate: http://www.pohjatyöt.fi/maa-ainekset

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4.1 Impact valuation of UPM's forests available for free recreation use	
Information used for calculation and calculation assumptions	**Used Sources**
• Information about the are of the forest area owned by UPM was received from UPM • For estimation of monetary value of Finnish forest the study of value of Finnish forest was used. The monetary value of UPM's forest was calculated according their share of Finnish forest area. • For USA's forests, the conversation easement cost was used, information received from UPM • Average exchange rate of 2016 was used for currency change form USD to € (www.oanda.com)	• Monetary valuation of Finnish forest's recreational value: http://www.metsatieteellinenseura.fi/files/sms/MTP2014/mtp2014_kp_juutinen.pdf • Total forest area of Finland: Information form Natural Research Institute Finland (https://www.luke.fi/tietoa-luonnonvaroista/metsa/metsavarat-ja-metsasuunnittelu/suomen-metsat-euroopassa-vuonna-2015/euroopan-metsaala/) • Karjalainen et al.(2010). Promoting human health through forests: overview and major challenges https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2793342/#CR26 • JRC – Forest ecosystem services

CITIZEN WELL-BEING	
4.2 Impact valuation of accidents	
Information used for calculation and calculation assumptions	**Used Sources**
• Information about number of lost time accidents was received from UPM • For monetization, information derived from UK's Health and Safety Executives • Average exchange rate of 2016 was used for currency change form £ to € (www.oanda.com)	• UK's Health and Safety Executives, http://www.hse.gov.uk/index.htm and http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf

For any inquiries, please contact

Tiina Pursula

Tiina.pursula@gaia.fi

tel. +358 40 514 9507

The report shall be provided based on the facts and instructions in the specific assignment considering the circumstances at the time of the assignment in accordance with the respective scope of work. We assume that all the information provided to us is accurate and complete and that you have verified the correctness of the disclosed information. We assume no responsibility and make no representations with respect to the accuracy or completeness of the information in this report unless otherwise stated. The report should not be regarded, or be relied upon, as a recommendation in decision making concerning any matter referred to in it. It should be understood that we do not asset that we have identified all matters included in these documents that may be relevant if these documents are included as disclosures against the warranties of the future agreements. Our review of the documents has only been what we consider appropriate in the context of the scope of our work as set out in our offer.

Gaia Group Oy
Bulevardi 6 A,
FI-00120
HELSINKI, Finland
Tel +358 9686 6620
Fax +358 9686 66210

ADDIS ABABA | BEIJING |
BUENOS AIRES | GOTHENBURG |
HELSINKI | SAN FRANCISCO |
TURKU | ZÜRICH

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