VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF BUSINESS MANAGEMENT

DEPARTMENT OF BUSINESS TECHNOLOGIES AND ENTREPRENEURSHIP

Martynas Blažaitis

GREEN BUSINESS MODEL IN THE TOBACCO INDUSTRY

Master‘s degree final work

Business management study programme, state code 6211LX058

International business specialisation

Business study field

Vilnius, 2024

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF BUSINESS MANAGEMENT

DEPARTMENT OF BUSINESS TECHNOLOGIES AND ENTREPRENEURSHIP

Martynas Blažaitis

GREEN BUSINESS MODEL IN THE TOBACCO INDUSTRY

Master‘s degree final work

Business Management study programme, state code 6211LX058

International Business specialization

Business study field

Supervisor Dr. Giedrė Lapinskienė _____ _____
(Title, Name, Surname) (Signature) (Date)

Vilnius, 2024

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY
FACULTY OF BUSINESS MANAGEMENT
DEPARTMENT OF BUSINESS TECHNOLOGIES AND ENTREPRENEURSHIP

Business study field

Business management study programme, state code 6211LX058

International business specialisation

OBJECTIVES FOR MASTER THESIS

2022 10 03 No. .....
Vilnius

For student Martynas Blažaitis

Master Thesis title: GREEN BUSINESS MODEL IN THE TOBACCO INDUSTRY

The Final work has to be completed by 21st December 2023.

THE OBJECTIVES:

1. To discern the difference between a green business model and a sustainable business model, and analyze what such a model should look like.
2. To conduct the literature review and find the policies and objectives that should be included in a green business model in the tobacco industry.
3. To select environmental criteria and their measuring indicators for the tobacco industry.
4. To conduct a survey of experts and use the AHP method to determine the relative weights of each criterion towards the goal of the optimal environmental mix.
5. To establish a green business model using the significant criteria found via the AHP method.

Consultants of the Master Thesis: None.

Academic Supervisor dr. Giedrė Lapinskienė

Objectives accepted as a guidance for my Master Thesis

Martynas Blažaitis

2022 10 03

Vilnius Gediminas Technical University
Faculty of Business Management
Department of Business Technologies and Entrepreneurship

ISBN | ISSN
Copies No. .....
Date .....-.....-.....

Master Degree Studies **Business Management** study programme Master Graduation Thesis

Title	**Green Business Model in the Tobacco Industry**
Author	**Martynas Blažaitis**
Academic supervisor	**Giedrė Lapinskienė**

Thesis language: English

Annotation

The master's thesis explores the tobacco industry, its environmental impact, and a potential green business model. The work emphasizes the need for tobacco companies to focus resources on reducing their industry's environmental impact. After reviewing scientific and other literature, six criteria and 30 sub-criteria for a successful green business model were identified. Eight experts - four working in the tobacco industry, and four external experts - were surveyed using the AHP method and a multi-criteria analysis was performed. It was determined that the most important criterion for a green business model should be the preservation and restoration of biodiversity and ecosystems, although a discrepancy in opinions was noted between tobacco industry experts and external experts. A final green business model was created by eliminating the least significant criteria. Suggestions for further research directions were provided

Keywords: AHP, Big Tobacco, environmental mix, ESG, green business model, life-cycle analysis, supply chain, sustainable, tobacco.

Vilniaus Gedimino technikos universitetas
Verslo vadybos fakultetas
Verslo technologijų ir verslininkystės katedra

ISBN | ISSN
Egz. sk. .....
Data .....-.....-.....

Antrosios pakopos studijų **Verslo vadybos** programos magistro baigiamasis darbas

Pavadinimas	**Žaliojo verslo modelis tabako pramonėje**
Autorius	**Martynas Blažaitis**
Vadovas	**Giedrė Lapinskienė**

Kalba: anglų

Anotacija

Baigiamajame magistro darbe nagrinėjama tabako pramonė, jos poveikis aplinkai bei galimas žalio verslo modelis. Darbe pabrėžiamas poreikis tabako kompanijoms koncentruoti resursus, siekiant sumažinti savo pramonės poveikį aplinkai. Atlikus mokslinės ir kitos literatūros apžvalgą, išskirti šeši kriterijai ir 30 subkriterijų sėkmingam žalio verslo modeliui. AHP metodo pagalba buvo apklausti aštuoni ekspertai – keturi dirbantys tabako pramonėje, ir keturi išorės ekspertai - ir atlikta daugiakriterinė analizė. Nustatyta, kad svarbiausias žalio verlso modelio kriterijus turėtų būti bioįvairovės ir ekosistemų saugojimas bei atkūrimas, nors ir pastebėtas nuomonių nesutapimas tarp tabako pramonės ekspertų ir išorės ekspertų. Sudarytas galutinis žalio verslo modelis iš jo pašalinus mažiausiai reikšmingus kriterijus. Pateikti siūlymai tolimesnėms tyrimų kryptims.

Prasminiai žodžiai: AHP, aplinkosaugos mišinys (angl. Environmental mix), Didysis Tabakas, ESG, gyvenimo ciklo analizė, tabakas, tiekimo grandinė, tvarus, žaliasis verslo modelis.

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

	Martynas Blažaitis, 20220568	
	(Student's given name, family name, certificate number)	
	Faculty of Business Management	
	(Faculty)	
	Business Management, TVfmu-22	
	(Study programme, academic group no.)	

DECLARATION OF AUTHORSHIP
IN THE FINAL DEGREE PAPER

December 6, 2023

I declare that my Final Degree Paper entitled „Green Business Model in the Tobacco Industry“ is entirely my own work. I have clearly signalled the presence of quoted or paraphrased material and referenced all sources.

The academic supervisor of my Final Degree Paper is Doctor Giedrė Lapinskienė.

No contribution of any other person was obtained, nor did I buy my Final Degree Paper.

			Martynas Blažaitis
	(Signature)		(Given name, family name)

CONSENT TO THE USE OF PERSONAL DATA

2023 12 04
(Date)

With this consent I, Martynas Blažaitis (hereinafter referred to as the Data subject) agree to the processing of my personal data for the learning purposes of other students by Vilnius Gediminas Technical University, legal entity code 111950243, address – Saulėtekio al. 11, LT-10223 Vilnius (hereinafter referred to as the Data controller). I agree to the processing of the following personal data (mark the relevant item):

- ☐ name, surname, Bachelor's final thesis;
- ☐ Bachelor's final thesis without name and surname;
- ☒ name, surname, Master's final thesis;
- ☐ Master's final thesis without name and surname.

Personal data processed for this purpose will not be transferred by the Data controller to any third parties, students will be allowed to access the final theses in the internal information system.

The personal data of the Data subject will be used for this purpose for a maximum of 5 years.

By this consent, the Data subject confirms that he / she is aware of the following rights:

- Access to his/her data and how it is processed (right of access);
- Require the rectification or, depending on the purposes of the processing of personal data, the addition of incomplete personal data (right of rectification);
- Destroy his/her data or suspend the processing of data (excluding storage) (right to destroy and right to be "forgotten");
- Require the Data controller to restrict the processing of personal data (right to restrict);
- The right to transfer data (right to transfer);
- Do not consent to the processing of personal data when such data are processed or are intended to be processed for other purposes;
- File a complaint with the State Data Protection Inspectorate.

The Data subject has the right to withdraw his consent at any time.

_____

[Name, surname and signature of Data subject]

Data controller details:
Vilnius Gediminas Technical University
Legal entity code: 111950243
Address: Saulėtekio al. 11, LT-10223 Vilnius, Lithuania
Tel. (+370 5) 274 5030
E-mail: vgtu@vgtu.lt
VAT payer code: LT119502413
Data protection officer tel. (+370 5) 251 2191, e-mail: dap@vgtu.lt

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Relevance of the topic. Although the prevalence of smoking is continuously decreasing globally, the number of smokers is still increasing (Reitsma et al., 2021). This increase, mainly coming from emerging markets, allows the global tobacco industry to remain stable and even experience growth. This has dire effects on societal health. Tobacco product use results in up to half of its users dying prematurely, globally resulting in over 8 million annual deaths. Of these, 1.3 million are not smoking at all – they are second-hand smokers who suffer only because they are exposed to smokers. Besides that, there are many other indirect effects it has on societal health, as smoking is linked to cancer and other diseases that influence people`s well-being. Because of these reasons, governments around the world are acting to try and limit the prevalence of smoking or at least help smokers transition to less harmful alternatives. In parallel, the world has been fighting another threat to global health and well-being – climate change. With temperatures rising, extreme weather events increasing and all kinds of pollution still being prevalent, this has been on most government`s minds resulting in the 2015 Paris Agreement and huge investments recently, most notably the IRA act in the US, to tackle these problems and transition to green economies.

At the intersection of these two globally important topics, we have the tobacco industry. However, while smoking`s effect on individual and public health is well known and understood, understanding of the tobacco industry`s effect on the environment is still lacking and deserves more careful examination. To fully understand the industry`s impact on the environment, the entire life-cycle of cigarettes should be considered – from agricultural cultivation to post-consumer waste (World Health Organization, 2017). The entire sector`s total annual contribution to climate change is about 84Mt CO2 equivalent. This is approximately 0.2 per cent of the world`s total greenhouse emissions, or the same as the contributions by such countries as Israel or Peru, with a disproportionate effect on the developing world (Zafeiridou et al., 2018). Significant improvements are required in all parts of the supply chain to reduce the harmful environmental effects and transition the tobacco industry from a traditional to a green business model.

Problem. The green transition requires enormous amounts of resources to be implemented and the same is true for the tobacco industry. Its supply chain spans the entire globe as it includes agricultural processes of growing tobacco, processing tobacco leaves, manufacturing tobacco products, and distributing them worldwide. No company in the world has enough resources to fully commit to every issue facing the industry. This then requires making choices and distributing

attention to those areas where the most impact can be achieved. Thus there is a need to develop a green business model that is tailored to the specifics of the tobacco industry so that it could be truly successful. Additionally, there are a lot of articles analyzing the environmental assessment of the tobacco industry (Cao et al., 2017; Hendlin & Bialous, 2019; Nara et al., 2019; Zafeiridou et al., 2018; Zhang et al., 2016), but the discussions of having the most proper criteria of assessment of tobacco industry are now very relevant because of increasing "greenwashing"(Houghton et al., 2018, 2019; Momas, 2023) allegations against the industry.

Research object – the tobacco industry and its impacts on the environment, especially of big multinational companies that comprise most of the global tobacco market.

Aim – to select the most relevant environmental criteria for the tobacco industry life assessment and to propose a green model for this industry.

Tasks:

1. To discern the difference between a green business model and a sustainable business model, and analyse how such a model should look like.
2. To conduct the literature review and find the policies and objectives that should be included in a green business model in the tobacco industry.
3. To select environmental criteria and their measuring indicators for the tobacco industry.
4. To conduct a survey of experts and use the AHP method to determine the relative weights of each criterion towards the goal of the optimal environmental mix.
5. To establish a green business model using the significant criteria found via the AHP method.

Research methods. The thesis will use Analytical Hierarchy Process (AHP) methods to create a hierarchical structure of criteria and subcriteria necessary for a green business model and establish relative weights of each subcriteria to find areas where most attention and resources are required. Euromonitor`s Passport database is used among other sources to analyse the tobacco industry.

This Master`s thesis will consist of three parts. First will be the theoretical part consisting of an overview of terminology, methodology and literature review of scientific articles as well as official documents. Second, will be the analysis of the tobacco industry, both from a general perspective and the environmental perspective. Last will be the practical part containing the survey results and the construction of the green business model.

1. Green Assessment of the Tobacco Industry: Theoretical Observations

1.1. ESG Theory

In recent years, the term ESG has proliferated in business and investing circles. ESG is an abbreviation for 3 elements in a sustainable business – E for environment, S for society and G for governance. ESG theory states that traditional investment strategies are not prudent and viable in the long term, so environmental protection, social responsibility and corporate governance standards need to be the basis of the investment decision-making process (C. Wang et al., 2021). The popularity of ESG, evidenced by the exponential growth of various ESG-focused mutual funds, exchange-traded funds (ETFs), bonds, etc., has, among other reasons, led many businesses to adopt more and more measures to tackle sustainability-related issues.

This sustainability craze was spurred by governmental, inter-governmental and private initiatives, seeking to make sustainable policies the modus operandi of all businesses. For that purpose, common and universally applicable standards, principles, and criteria were established for sustainable business. United Nations Global Compact (UN GC) set out 10 principles that should be incorporated into the business strategies of responsible companies. These tackle complex and different topics: Human rights, labour, environment, and anti-corruption. Similarly, the Global Reporting Initiative (GRI) created standards for reporting the impact of companies on topics ranging from emissions to diversity and equal opportunity. These and similar initiatives provide strong general principles to guide a business strategy (as in UN GC) (Rasche & Waddock, 2014) or specific impacts a company should focus on to review and lessen their effect on the environment (as in GRI). These are a fine basis for a general business strategy, but the problem is exactly that – they are not specific enough as they do not account for contextual differences in local, regional or sectoral factors (Hill, 2020).

The same applies to ESG theory itself. While it is a worthy goal to seek to address both socio-economic and environmental issues, the fact is it is difficult to do. ESG considerations are multi-dimensional as many variables need to be measured and weighed against each other: emissions, water waste, minority representation, anti-corruption, recyclability, etc (Hill, 2020). This challenge is at the core of the green vs. sustainable divide. A sustainable business, following the logic of ESG, is mission-driven, seeking not only environmental but societal and economic goals (Mondal et al., 2022) like the sustainable goals of UN GC, which include poverty reduction, improving education quality, promoting peace and so on. On the other hand, a green business seeks firstly and foremost ecological mitigation and makes solutions to environmental challenges the core of its business strategy. In effect,

this means that green entrepreneurship is a subset of sustainable entrepreneurship (Sun et al., 2020). There have been calls for businesses, regulators and investors to disregard the S and G parts of ESG as they distract from the most urgent need to save the environment such as the newspaper The Economist, which even promoted the view to disregard the environment overall and focus only on emissions (The Economist, 2022). While focusing on emissions might be too narrow, this thesis will focus only on the environmental part of sustainability. Firstly, because of the difficulty in balancing the differing demands of environmental, social and governance goals. Secondly, it is difficult to convince the general public that tobacco companies can be socially responsible when their products` impact on society's health is so well documented. It makes more sense to concentrate those CSR investments on improving their effects on the environment, while at the same time increasing their efficiency, and productivity and being better prepared for future regulations on the industry.

1.2. Green Business Model and Life-Cycle Analysis

Although the effects of climate change have been known for decades, serious and sizeable research into environmentally friendly (or friendlier) businesses has only started in the last couple of decades. Part of that is growing awareness of the public of the issues facing the planet and concomitant growing pressure on business, but also increasing governmental action has played a big role. Naturally, the biggest target of this movement, besides maybe energy production in general, is the effect that large businesses, especially those that deal in industrial manufacturing, have on the environment (Quintás et al., 2018). Thus large enterprises have been the first adopters of new green business models as they have the biggest resources to adapt and have the most to lose if they do not. So the main driver of adopting green business models has been not only public pressure in itself or purely altruistic reasons but the race to stay competitive. Accordingly, the definition of a green business always includes two dimensions: green and economic (Lindgren et al., 2021), while a traditional business model focuses only on creating value for customers in cost-effective ways (Nair & Paulose, 2014). That means any green business model has to consider not only how to lessen the impact on the environment, but also how to channel green transformation into an economically viable and competitive framework.

The „green“ dimension focuses on the impact the firm`s business has on the environment. The main parameters that are tracked are „black“ and „green“ energy usage, water usage, material and resources consumption, waste and pollution (Lindgren et al., 2021). The most common method of tracking those parameters and assessing the impact that has been developed is Life-Cycle Analysis (LCA). As the name suggests, this is a technique that follows the entire life cycle of a product, starting

from raw material production through processing it to the final use by the consumer. The basic structure of this method is 4 stages: 1) goal and scope of the assessment, to decide which part of the product life cycle will be assessed; 2) inventory analysis, which is a description of energy and material flows in the product system, especially what kinds of materials and energy are used, what waste created, etc.; 3) impact assessment, were the impact of each category is described and is assessed, weighing each proportionally to the others.; 4) critical analysis and result presentation (Iyyanki V. Muralikrishna & Valli Manickam, 2017). LCA is the basis and the root of any green business model as it allows the business to see where exactly the highest impact of their product on the environment is. Most importantly, it allows it to not only focus on the activities of the company in question and its processes producing a certain product or service but also includes the activities of other companies it has business with – the so-called Scope 2 and Scope 3 emissions. The former refers to emissions generated when producing purchased energy and the latter - to indirect emissions that are generated in the production or use of products and services provided by the suppliers, or emissions generated by the sold product or service (Ranganathan et al., 2004). Since Scope 2 and Scope 3 emissions occur outside the company, it is more difficult to calculate their impact, especially for Scope 3. Nevertheless, it is very important as indirect emissions can contribute the highest share of overall emissions (Radonjič & Tompa, 2018). As is shown in the following chapters, this is also true of the tobacco industry and can be extended beyond emissions to other kinds of pollution and damage to the environment. Thus, although this current model is sometimes criticized because of its linear focus on the product (Böckin et al., 2022) (Tiruta-Barna, 2021), LCA remains the most objective way to determine a product`s effects on the environment.

While LCA`s importance is significant because it creates transparency and provides a clear picture of what is being done wrong or right, what makes a green business model is what a particular company decides to do about it. Although some experts are pushing for a more encompassing approach to a green business model, such as green human resource management (Martins et al., 2021) or servicizing products where possible (Agrawal & Bellos, 2017), the main focus currently is still on the product and innovation in technology. This means finding technological solutions that allow lower consumption of energy, water and other resources, changing their energy consumption from black to green and replacing current materials and resources with green ones (Lindgren et al., 2021). Depending on the exact pathways chosen, certain archetypes of green technology business models can be derived as suggested by Trapp and Kanbach (2021). They ascertain that there are 4 basic strategies for developing a green business model: maximize energy efficiency, maximize material efficiency, close resource loops (or circular economy) and substitute with renewables and natural

processes. This can be done through new technologies, enhancing current ones or just using existing technologies in new and innovative ways. By mixing and matching these different strategies and methods, companies can find green business models that work in their respective fields.

Although a model using the above-mentioned 4 strategies can be a useful tool, it appears too simplistic, especially for an industry such as tobacco, where many stages, including agriculture, are a part of the supply chain and put too much focus on technology only. Other aspects are important when building a green model, including protecting biodiversity, quality of soil and water, reducing other kinds of pollution besides greenhouse gas (GHG), etc. A similar but more nuanced and complete model can be derived from Regulation (Eu) 2020/852 of the European Parliament and of the Council (2020), which sets out 6 environmental objectives for any economic activity to reach to qualify as an environmentally sustainable activity. A detailed discussion of all six criteria and the resulting sub-criteria will follow in a later section.

So, a framework of a green business model comes into focus: first, you have to have a reliable accounting system of the way your business affects the environment; second, you have to find a strategy which allows you to answer the issues caused by your current business model; and third, you have to invest to implement that strategy through managerial instruments. Still, one might ask: where is the economic or competitive aspect of all of this? The answer is clear from the last paragraph: innovation. This is key in determining the success of a green business. Finding ways to use diminishing resources more effectively will be the indicator of success in this current era like automatization or digitalization were in eras prior (Nair & Paulose, 2014). This is especially true because of increasing government action as well, so developing a successful green business model will be more of a recipe for success as years go by and businesses should adapt to this new reality.

With environmental concerns increasing with each passing year, each business needs to reevaluate its business models. That is the main reason why green business models are increasingly accepted by various industries. As explained in this chapter, this model is adding a new dimension to the previously single-minded model of generating profit. By using technological innovations, better accounting of their impact on the environment and changes to their business models, these businesses can both help the environment and stay competitive – that is what should be strived for.

The focus on the E provides clarity for a business trying to be sustainable and responsible. However, this does not mean that the environmental aspect of a business is not complex. Quite the contrary – it is complex enough that concentrating more on it makes economic sense. Attention and finances are finite resources, so the right proportion of importance needs to be established. A useful comparison is with marketing mix theory. For simplicity and clarity`s sake, E.J. McCarthy distilled

the plethora of variables in marketing into four core components, or Four Ps, of a marketing strategy: Product, Place, Promotion, and Price (Perreault & McCarthy, 2002). Every business has to have these components in its marketing mix but for each industry, product or market the focus is different. For example, in the tobacco industry, where promotion tactics that are normal in other industries are heavily regulated or even banned, companies are left with focusing more on the other three components, with the most attention to various pricing methods and new products (Dewhirst, 2012, 2021). Similarly, this paper seeks to establish the most important environmental criteria mix, consisting of several components, that would be best suited for a successful green business model in the tobacco industry (without the ambition to find as catchy a name as "Four Ps").

1.3. The Environmental Set of Criteria and Subcriteria

Because the tobacco industry has begun receiving more attention regarding its environmental impact only recently, there is a relative scarcity of research enveloping the entire tobacco supply chain and possible mitigation methods, so developing precise criteria can only be done by piecemeal efforts. However, there is an abundance of literature detailing general principles and criteria for businesses to follow seeking to be considered green and to lessen their impact on climate change, pollution, and biodiversity loss. Specifically useful are inter-governmental reports, such as EU regulation and Intergovernmental Panel on Climate Change (IPCC) assessment reports, as well as ESG ratings, like the one prepared by MSCI. This paper will use a combined approach: individual research for more specific chains of the tobacco supply chain – mainly cultivation, curing and final disposal – and the intergovernmental or industry documents for general criteria along all stages of the supply chain. The resulting criteria and subcriteria will be considered as an initial version of the environmental mix. Later, a more optimal and focused environmental mix will be established.

Table 1 shows the criteria found during the literature review.

Table 1. Criteria for a green business model in the tobacco industry

Criteria	Subcriteria	Sources
Climate change mitigation	Generating or using renewable energy	(Cao et al., 2017; IPCC, 2022; The European Parliament And The Council, 2020)
	Increasing energy efficiency	(IPCC, 2022; The European Parliament And The Council, 2020; Q. Wang et al., 2018)
	Increasing clean or climate-neutral mobility	(IPCC, 2022; The European Parliament And The Council, 2020)

Table 1 continued

Criteria	Subcriteria	Sources
	Increasing use of carbon capture and carbon storage technologies	(The European Parliament And The Council, 2020)
	Strengthening land carbon sinks	(The European Parliament And The Council, 2020)
	Green building technologies (improved insulation, economical lighting, reusing waste heat, speciality building materials, etc.)	(Cao et al., 2017; ESG Research LLC, 2023; The European Parliament And The Council, 2020; Q. Wang et al., 2018)
The sustainable use and protection of water and marine resources	Safeguarding against hazardous wastewater in the environment	(IPCC, 2022; The European Parliament And The Council, 2020)
	Reducing the hazardousness of wastewater	(IPCC, 2022; The European Parliament And The Council, 2020)
	Developing a water management strategy to increase efficiency and reduce water intensity	(ESG Research LLC, 2023; Falloon & Betts, 2010; IPCC, 2022; The European Parliament And The Council, 2020)
	Sustainable use and protection of marine environments	(IPCC, 2022; The European Parliament And The Council, 2020)
	Using alternative sources of water	(ESG Research LLC, 2023; Falloon & Betts, 2010)
The transition to a circular economy	Using natural resources more efficiently	(IPCC, 2022; The European Parliament And The Council, 2020)
	Increasing recyclability of products, especially of cigarette filters	(Benavente et al., 2019; IPCC, 2022; Moroz et al., 2021; The European Parliament And The Council, 2020)
	Reducing the content of hazardous materials used in products	(The European Parliament And The Council, 2020)
	Preventing or reducing waste generation	(IPCC, 2022; The European Parliament And The Council, 2020)
	Re-using and recycling water	(Falloon & Betts, 2010; The European Parliament And The Council, 2020)
	Avoiding or reducing litter	(IPCC, 2022; The European Parliament And The Council, 2020)
Pollution prevention and control	Preventing or reducing pollution other than GHG	(The European Parliament And The Council, 2020)
	Improving air, land and water quality where the economic activity takes place	(IPCC, 2022; The European Parliament And The Council, 2020)
	Preventing adverse effects of the use or disposal of chemicals	(IPCC, 2022; The European Parliament And The Council, 2020)
	Cleaning up litter and other pollution	(IPCC, 2022; The European Parliament And The Council, 2020)
The protection and restoration of biodiversity and ecosystems	Nature and biodiversity conservation	(IPCC, 2022; The European Parliament And The Council, 2020)
	Sustainable land use management	(IPCC, 2022; The European Parliament And The Council, 2020)
	Sustainable agricultural practices	(IPCC, 2022; The European Parliament And The Council, 2020)

Table 1 continued

Criteria	Subcriteria	Sources
	Sustainable forest management	(IPCC, 2022; The European Parliament And The Council, 2020)
Green supply chain management	Eco-design, especially for efficient material use, biodegradability and recyclability	(Abdallah & Al-Ghwayeen, 2020; Benavente et al., 2019; Eltayeb et al., 2011; Hoek et al., 2020; IPCC, 2022; Moroz et al., 2021; The European Parliament And The Council, 2020)
	Green purchasing, i.e. increasing the use of sustainably sourced services and renewable materials	(Abdallah & Al-Ghwayeen, 2020; Eltayeb et al., 2011; IPCC, 2022; The European Parliament And The Council, 2020)
	Collaboration with customers, through common projects and education campaigns	(Abdallah & Al-Ghwayeen, 2020; Eltayeb et al., 2011; Hoek et al., 2020)
	Collaboration with suppliers	(Eltayeb et al., 2011)
	Green human resource management	(Longoni et al., 2018; Molina-Azorin et al., 2021; Tang et al., 2018)

Source: Made by the author

The six environmental objectives from Article 9 of the EU regulation 2020/852 on sustainable investment are used as the main framework for the research in this paper and stand in as criteria used to determine the most important areas of green investment for tobacco companies. However, one substitution is made: climate change adaptation will be excluded for the benefit of green supply chain management (GCSM). The former is only abstractly described in the regulation so there is little benefit in using it for this paper. On the other hand, including GCSM will allow the model to address the Scope 3 emissions and pollution more accurately, because it takes into account all activities in the entire product life cycle, from extraction of raw materials to final use.(Eltayeb et al., 2011; Shafique et al., 2017) So, it will act as a supplementary criterion that adds value to the other 5 criteria by including activities outside the company`s direct control. Additionally, research shows that it has a positive impact not only on the environment but also on the financial results of a company Thus, the six criteria are as follows:

1) Climate change mitigation (CCM).
2) The sustainable use and protection of water and marine resources (WMR).
3) The transition to a circular economy (TCE).
4) Pollution prevention and control (PPC).
5) The protection and restoration of biodiversity and ecosystems (PRBE).
6) Green Supply Chain Management (GSCM).

As a result, the bulk of the subcriteria used are from the same regulation as well. The regulation itself is the regulator`s, EU`s in this case, attempt to establish "the criteria for determining whether an economic activity qualifies as environmentally sustainable to establish the degree to which an investment is environmentally sustainable". This provides a broad overview of criteria for all industries and works as a "natural" foundation for a green business model. Not all criteria mentioned in the regulation are included in this paper: the chosen criteria represent some of the criteria in the regulation consolidated into one and were chosen by their applicability to the tobacco industry specifically. The first criterion – CCM – focuses on the main cause of climate change, CO2 emissions, and ways to reduce them or mitigate their effects, resulting the following subcriteria: generating or using renewable energy (produced by the electricity provider, for example), with a supplementary act to this being increasing energy efficiency; increasing clean or climate neutral mobility; switching to the use of sustainably sourced renewable materials; increasing use of carbon capture and carbon storage technologies; strengthening land carbons sinks such as forests or grasslands. WMR concerns maintaining the good status of various bodies of water by safeguarding against hazardous wastewater in the environment; reducing the hazardousness of said wastewater; improving water management and efficiency; sustainable use and protection of marine environments. TCE puts focus on waste prevention, re-use and recycling: using natural resources more efficiently, eco-designing products for more durability, reparability, upgradability and re-usability; increasing recyclability of products; reducing the content of hazardous materials used in products; increasing use of secondary materials (after recycling waste); preventing or reducing waste generation; re-using and recycling water; avoiding or reducing litter. PPC, as the name suggests, tackles pollution and its effects by preventing or reducing pollution other than GHG; improving air, land and water quality where economic activity takes place; preventing adverse effects of use or disposal of chemicals; cleaning up litter and other pollution. Last from the regulation is PRBE, which is about protecting biodiversity and ecosystems through: nature and biodiversity conservation; sustainable land use management; sustainable agricultural practices; and sustainable forest management.

The last set of subcriteria are under GSCM. It has been selected as the final criteria for a green business model because, in addition to its supplementary effects on the environmental performance of firms, it contributes to their financial performance as well, mainly by reducing wastage and reducing costs (Abdallah & Al-Ghwayeen, 2020; Eltayeb et al., 2011; Shafique et al., 2017). Moreover, as regulatory requirements and client requirements for green products grow, it provides a competitive advantage against firms that do not invest in a green supply chain (Khaksar et al., 2016; Shafique et al., 2017). Srivastava (2007) defines GCSM as "integrating environmental thinking into

supply chain management including product design, material sourcing and selection, manufacturing processes, delivery of the final product to customers, and end-of-life management of the product after its useful life.", encompassing the entire supply chain. Abdallah & Al-Ghwayeen (2020) discerned four categories of GCSM: eco-design, defined as coordinated efforts to design products with environmental safety in mind; green purchasing, defined as environmentally conscious purchasing of materials to ensure reaching environmental goals; cooperation with customers – seeking to incorporate customers into the decision-making process and solicit feedback and assistance towards environmental goals; and internal environmental management – essentially, making environmental sustainability part of the firm`s organizational strategy. Eltayeb et al. (2011) on the other hand separates green purchasing and collaboration with suppliers. The first is considered all activities related to ensuring that purchased materials and products have desirable environmental attributes, while the latter focuses more concretely on activities "that aim at improving environmental performance and capabilities of suppliers at undertaking joint projects for developing green products and innovations". Additionally, Eltayeb et al add the concept of reverse logistics – collecting used products for recycling or reusability. One last subcriterion for GSCM is green human resource management (GHRM). GHRM is a subset of general human resource management (HRM). HRM focuses on recruiting, managing, evaluating, and guiding people toward the stated goals of an organization (Molina-Azorin et al., 2021). GHRM adds an environmental objective dimension to HRM and because of this becomes more beneficial to external stakeholders than traditional HRM. This is because it includes specific practices - like green training or employee bonuses related to environmental goals - that focus on ecosystems and the effects the company`s economic activities have on them (Tang et al., 2018). In this way, it is similar to Abdallah & Al-Ghwayeen`s internal environmental management and is included in the subcriteria, even though some authors consider it as a mediating factor between GSCM and firm performance, rather than an integral part of it (Longoni et al., 2018). The following paragraphs deal with complementary research that adds either more context or industry-specific details to the criteria and subcriteria discussed in this section.

MSCI is a major investment research company, whose data and indexes are used by investors globally. One of its offerings is ESG ratings (ESG Research LLC, 2023). As explained in a previous section, this paper only considers the E pillar of ESG, meaning the environment. MSCI distinguishes 4 themes of environmental key issues: climate change, natural capital, pollution and waste, and environmental opportunities. Additionally, it lists 13 key issues, which be seen in Figure 2. Although most can be neatly put under the already mentioned criteria and subcriteria, few are worth mentioning separately. The three environmental opportunities – clean tech, green building and renewable energy

– provide an interesting twist, as they reframe what could be considered issues and obstacles for companies to something positive, that could give a competitive advantage, whether by being an early-mover, improving efficiency or getting subsidies. Most important, is the Waters stress key issue. It is the only key issue mentioned for the tobacco industry specifically, meaning this is the issue that separates the tobacco industry from other industries – its externalities are much higher than elsewhere. Consequently, water management strategy, reducing water intensity and using alternative water sources is of particular importance to the environmental goals of the tobacco companies.

Figure 1. Environment pillar of MSCI ESG ratings

Source: (ESG Research LLC, 2023)

The IPCC report provides a global assessment of climate change mitigation progress. This is a vast document covering various topics but the criteria for this paper were chosen from two chapters in the report: Agriculture, Forestry, and Other Land Uses; and Industry. The word "efficiency" is key. Material efficiency, by designing with less and reducing waste and energy efficiency improvements have been chosen as criteria from the report. Related to material efficiency is the next criterion eco-design, meaning designing your products from the start to use less materials, use renewable materials and be easily recyclable or re-used. Another criterion from the IPCC report is green procurement – the practice of sourcing materials and services from other environmentally sustainable businesses. Another recurring topic from all research resources is the recyclability and reusability of materials

and waste, which is also included as a criterion. Lastly, fuel switching to renewable fuels and protection, improved management, and restoration of forests and other ecosystems are also chosen as criteria.

Although, as stated above, individual research was mainly used for setting up industry-specific criteria, research by Wang et al (2018) can also be grouped with the general criteria as it describes the best way to cut emissions in industrial buildings. The catch is that the paper focused on tobacco enterprises, so it also provides industry-specific insights. Not surprisingly, it is found that the most successful method of reducing emissions is improving energy efficiency, a point referenced in almost every body of text discussing reducing the impact on climate change, but specifically by optimizing refrigerating, air handling (AHU) and lighting systems. Also, one of the methods mentioned is waste heat utilization, which might be feasibly used in other stages of the supply chain, like curing or tobacco processing. Falloon & Betts (2010) article focused on agriculture`s adaptation and mitigation measures regarding water management in the face of changing climate. This is specifically important to the tobacco industry as it uses a lot of water in its tobacco growing stage which is coupled with high use of fertilizer and pesticides, thus carrying huge risks of soil, groundwater, and marine water contamination. Although the authors admit that most measures have both positive and negative outcomes, for the demand side of water (households and enterprises) they mention improvement in water efficiency by reusing wastewater, promoting indigenous practices for water use, industrial conservation of water (which applies to the manufacturing side of the tobacco business) and reduction in water demand by changing the cropping calendar, crop mix, irrigation method, etc. Next in industry-specific research is a paper by Cao et al (2017), which focuses on the curing of tobacco leaves. It is the most CO2-emitting stage of the entire supply chain, and finding ways to limit that emission is especially significant. The authors found that by using only electric pumps instead of burning coal/gas or other materials, the energy-saving rate can be increased from 20% to 50%. If this is paired with improvements in barn insulation, the saving rate increases to 60%. Both actions have been included in the criteria. And lastly, in industry-specific research, the paper focuses on research regarding tackling cigarette butt littering and pollution. Benavente et al (2019) show that recycling to recover cellulose acetate tow from cigarette filters is possible. It is a valuable polymer that can be either reused in cigarette filter production or used in other industries. The latter point is the focus of research by Moroz et al (2021) which further expands on the possible use of recycled cigarette filters, from chemical absorption to the creation of materials, showing there is potential in setting up cigarette butt recycling systems. While Hoek et al (2020) surveyed respondents, which included both smokers and non-smokers, which measures they would favour in reducing

cigarette butt pollution. Most discussed measures included governmental action, but from the supply side it was said that cigarette companies should create more biodegradable filters to reduce the problem, so it is included in the criteria. Additionally, education campaigns regarding littering are also offered as a solution. Since some of the tobacco companies also engage in these education campaigns, it has been added as a criterion as part of collaboration with customers.

Criteria mentioned in the table do not yet hold any evaluation, meaning these are not what were necessarily judged to be the most important criteria. They are only a representation of the most prominent solutions offered in each paper or ones that are most applicable to the tobacco industry given the composition of its supply chain and the nature of the business.

2. Overview of the Global Tobacco Industry

To build a successful business model, one first has to understand the industry he is dealing with. In pursuit of this goal, this section will overview the global tobacco industry: who are the main players and how it came to be like this. Then it will dig deeper into the environmental impact the industry has. Finally, the three-fold pressures the companies are under regarding sustainability will be discussed.

2.1. Current State of Tobacco

It might seem that the tobacco industry is in a dire state these days. More and more restrictions, especially in developed markets, are put on the tobacco industry every year in the defense of the public interest. EU banned flavoured cigarettes in 2020 and did the same for flavoured heated tobacco products from the end of 2023. The USA moved on flavoured cigarettes, except menthol, even earlier, in 2009, but now are even considering a ban on menthol. Excise taxes and other forms of taxation are increasing cigarette prices constantly. For example, in the US, the average price of a cigarette rose by 29.5% from 2015 to 2021. This is decreasing affordability and it can be shown by decreasing sales of cigarettes: the number of cigarette packs sold has decreased by 27.2% and the dollar sales decreased by 6.0% during the same period (Ali et al., 2022). This is reflected in overall smoking prevalence statistics, even when accounting for developing markets, not only developed ones. The global prevalence of smoking has decreased from 32.7% in 2020 to 22.3% in 2020, while the total number of smokers has decreased from 1367 million to 1298 million and is predicted to decrease further to 1270 million (World Health Organization, 2021). So restrictions on the business are increasing, sales dropping, and the number of potential clients falling – things could not be worse. Right?

On the contrary, business is booming. Despite the above-mentioned numbers regarding decreasing the number of smokers, it is still higher than in 1990 (Reitsma et al., 2021) and it depends on the region – the number of smokers is still increasing in Africa, the Middle East and the Western Pacific region (mainly China), spurred by population growth (World Health Organization, 2021). The value of the global tobacco product market in 2021 reached 935 billion USD, has been growing since 2016 and will exceed 1 trillion USD in 2023 (Euromonitor International, 2022b). That is almost double the size of the beauty & personal care market and almost ten times the size of the movie industry.

This huge market is dominated by four Transnational Tobacco Companies (TTC), which are sometimes referred to as Big Tobacco – Philip Morris International (PMI), British American Tobacco

(BAT), Japan Tobacco (JT) and Imperial Brands (IB) – and China National Tobacco Corporation (CNTC). The tobacco industry can be divided in half - China and the rest of the world – as 46.4 % of all retail volumes are accounted for by China. CNTC dominates its domestic market, but the other top four TTCs dominate the markets elsewhere in the world. BAT accounts for 13% of the market share, PMI – 12.6%, JT – 8.9 %, and IB – 3.5%. This means there is a huge market concentration in the tobacco industry – excluding China, the top four companies have grown their global market share from 66 % in 2016 to 71% in 2021. (Eurominitor International. Passport., 2022) The average maximum market share in a country by one of these five companies is about 50%, with PMI having the highest share in 38 countries and BAT being dominant in 24 countries (Rajani et al., 2023). After a hit to revenues during the start of the pandemic in 2020, Big Tobacco rebounded rapidly and is again reporting huge profits. In 2021, BAT reported a profit before taxes of 13bn USD (British American Tobacco, 2022), PMI – 9.3bn USD (Philip Morris International, 2022), IB – 3.2bn USD (Imperial Brands, 2023), JT – 2.5bn USD (Japan Tobacco, 2022). But most impressive of all is CNTC, which is by some measures the most profitable company in the world (Chang Che, 2022). CNTC reported 214bn USD in profits in 2021 and accounts for 9-12% of total state revenues in China (TobaccoTactics, n.d.). With 300 million smokers, China is the biggest cigarette market in the world, and CNTC being the state monopoly allows it to be by far the largest and most profitable tobacco company in the world.

How do tobacco companies achieve this? First, tobacco products have exceptionally high margins. For example, IB reported that their margins for 2021 were 24.1%. The reason why tobacco companies can continue demanding such high margins, even with ever-increasing excise duties (PMI paid 50bn USD from their total revenues of 82bn USD in 2021), is that they sell a very elastic and highly addictive product. Additionally, they have little ongoing R&D expenditures on their main products (Robert Branston, 2021), which have stayed essentially the same for decades. However, one area they have been spending on is the so-called new-generation products – mainly e-cigarettes and heated tobacco products (HTP). These are promoted as “reduced-risk products” (RRP) (Japan Tobacco, 2022), offering health benefits in comparison with regular cigarettes, which is supported by current research (Znyk et al., 2021). While cigarette sales volume decline has been outpacing created value, the opposite trend has been true for RRP and especially for HTP which is expected to grow by an average of 85% over the next five years, with value outpacing increasing volumes. In 2021, RRP accounted for 7.3% of the total tobacco product market but is expected to reach 11.7% by 2026 (Euromonitor International, 2022b). Although numbers are comparatively small, one has to consider that this is offset by the huge China market, where cigarette sales should continue growing. The

biggest growth of HTP and other RRP will be in the developed markets like Japan and Europe, meaning their disproportional importance to Big Tobacco. For example, BAT reported 56%, 79%, and 70% growth in e-cigarettes, HTP, and oral tobacco pouches respectively (British American Tobacco, 2022). However, the biggest driver of this shift from traditional tobacco products has been PMI, which has even announced it will phase out cigarettes and create a ”smoke-less future”. It has invested millions of dollars in 8 factories producing its flagship IQOS devices and heated tobacco sticks, including a 120 million USD factory in Switzerland and a 320 million USD facility in Germany. Moreover, in 2017 it established the Foundation for a Smoke-Free World, committing almost 1bn USD, despite a lot of backclash regarding its actual purpose as a vessel advancing tobacco harm reduction (Bialous & Glantz, 2018).

Another factor, although less appreciated, has also been a big contributor to its overall success: rapid and aggressive internationalization, especially in the 90s and 00s, which has consolidated the market and left only a few major players we know today. The main incentives to expand operations have been market-based. These market incentives can be divided into three basic categories: the decline of home markets, the opening of new, previously closed, markets, and the continued growth of those new markets. As Big Tobacco companies hail from developed and declining markets of USA, Europe and Japan, the openings of markets in Asia in the 1980s and 1990s after the collapse of the Soviet Union provided ample expansion opportunities, spurred even further during the trade liberalization era of 1990s and 2000s (Lee et al., 2013). By buying up local champions in the newly opened markets, TTCs quickly increased their global foothold. In the last 30 years, JTI acquired RJR and Gallagher (both the biggest Japanese foreign acquisitions at that time) (Iwashita, 2022), UK-based Imperial Brands acquired Germany`s Reemstma and Spain`s Altadis, BAT merged with Rothmans (Bialous & Peeters, 2012) and PMI`s recently confirmed acquisition of Swedish Match, the 7th most valuable tobacco company in the world – and this only a small portion of all acquisitions done by TTCs.

Besides providing economies of scope and scale, global expansion through mergers and acquisitions (M&A) allows for another way of increasing efficiency – it buys time. At the time when JT was considering further expansion after its first M&A, they calculated that it would take at least 10 years to pursue an organic growth strategy of building brands, manufacturing and distribution infrastructure, and sufficient human resources (Iwashita, 2022). By continuing its internationalization through more acquisitions, it expanded much more quickly than it might have through gradual growth. A similar model has been deployed by other TTCs, creating the market structure we see today.

All of this is to show that Big Tobacco, through consolidation of the market, has not only increased its financial performance but also made the tobacco industry a global one. These four companies have global interests and the power to lobby for those interests. Unfortunately, this means that the effects these companies` decisions have are also global. In the context of this Master`s thesis, it first and foremost means the environmental effects that the tobacco industry has on the world. The next chapter focuses on the various ways in which the tobacco industry is damaging the environment and how this is reflected across various stages of its supply chain.

2.2. Life Cycle Assessment of the Tobacco Supply Chain

The tobacco supply chain and the life cycle of a cigarette can be divided into six distinct links or stages (a more detailed discussion of each stage follows Figure 1):

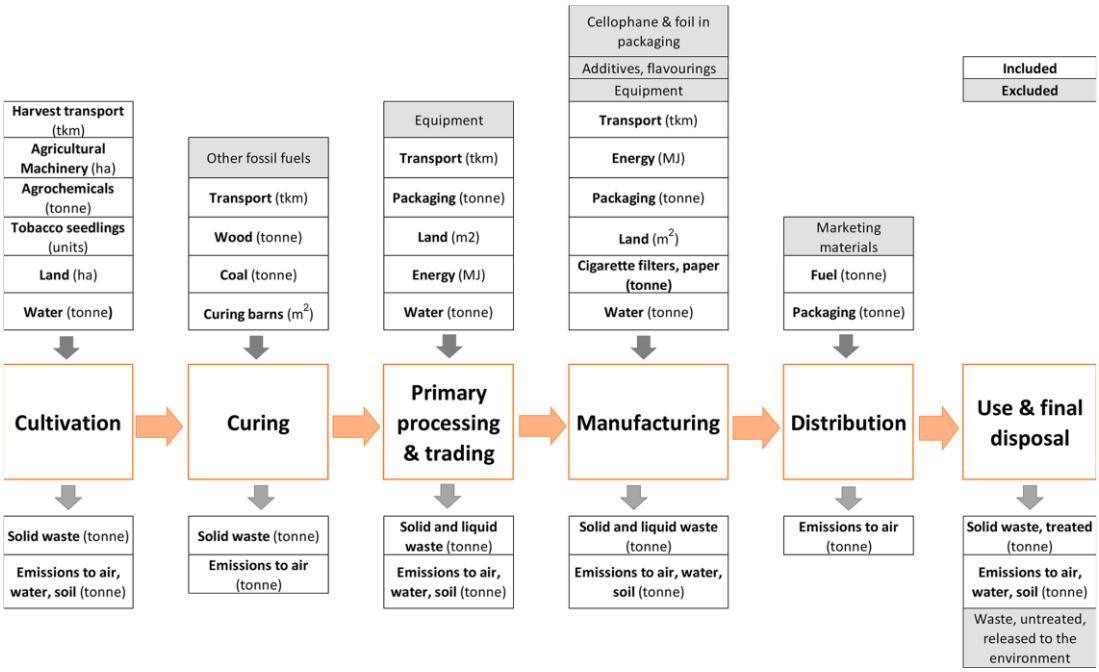

Figure 2. The conceptual framework developed for global cigarette production and consumption
Source: (Zafeiridou et al., 2018)

Cultivation. Farming, irrigation, and fertilizer use account for more than 70 per cent of all environmental damage across most impact categories (Zafeiridou et al., 2018). When compared to other crops, tobacco also uses massive amounts of water – for example, 8 times more than potatoes. Moreover, continuous tobacco plantation farming causes acidification of soil, so both the quality of the soil and its productivity are reduced over time, requiring even more fertilizers, pesticides, and other hazardous materials to maintain the same production (Zhang et al., 2016). Also, deforestation

resulting from freeing up land for tobacco growing and using wood for curing, accounts for 5 percent of all deforestation on the planet.

Curing. It is a process during which tobacco leaves are dried and prepared for processing. There are three basic methods of curing: sun-curing, air-curing and flue-curing. The first two use natural ways of drying, but the flue-curing uses generating heated air to dry the leaves in barns. Since cigarette tobacco needs flue-curing to achieve a high level of tobacco quality, most curing is done via this third method. The flue-curing process is a major source of CO2 emissions. Since it involves burning wood or coal, it produces more carbon emissions than all other stages combined – at least 45 Mt CO2 equivalent globally (Zafeiridou et al., 2018).

Primary processing and trading. During this stage, tobacco leaves are processed and graded by size, colour, and position of the leaf on the plant. Etc. Generally one of the least impactful stages, in which the main factors to be considered are transport use for tobacco distribution, and energy use in processing and packaging.

Manufacturing. After cultivation and curing, the most environmentally harmful stage is the industrial manufacturing of cigarettes. It involves numerous environmental costs: from metals used in the manufacture of cigarette machines to the kind of energy used to direct emissions and waste (World Health Organization, 2017). According to Zafeireidou et al (2018), the annual CO2 emissions equivalent is around 16 Mt. Also, since cigarette manufacturing is water intensive, a lot of water is used in the process – around 15 Mt, out of which almost 9 Mt ends up as wastewater. Additionally, the manufacturing process creates more than 1 Mt of solid waste. These numbers are hugely significant because of the large number of different toxic ingredients – flavourings, solvents, plasticizers, etc. - that are used in production (Baker et al., 2004).

Distribution. The logistics include all types of transport – air, sea and land – and the current lack of electrification of fleets (or use of sustainable fuel) contributes to the total emissions of the industry. On another hand, packaging has a significant impact because plastics are used along with other forms of packaging, creating more than 2 Mt of packaging waste annually (Zafeiridou et al., 2018). Also, the growth in popularity of smokeless forms of tobacco is causing more and more environmental problems as they are packed in plastic or non-biodegradable sachets or pouches (World Health Organization, 2017).

Use and final disposal. Evidently, not only does the production of cigarettes and other tobacco products pollute the environment but also the smoking itself. It involves burning and emitting materials that are incorporated into the tobacco and cigarette paper. Since these are toxic, the particles left cause a phenomenon called third-hand smoke. These toxic particles gather in dust, on surfaces

and in other objects (Daisey, 1999). Toxic emission includes formaldehyde, nicotine, and various greenhouse gases – CO2, methane, and nitrous oxides (World Health Organization, 2017). It has been calculated that tobacco smoke alone emits the equivalent of 0.87 Mt of CO2 (Zafeiridou et al., 2018). Even more worrying is the amount of cigarette butts littered in the environment. By different measures, 5.5 to 6 trillion cigarettes are produced each year and since most are with filters, this amounts to about 4.5 trillion filters deposited in the environment. It is estimated that currently 0.98Mt of filters and paper plug wrap ends up as waste; a figure expected to rise to 1.2Mt by 2025 (Evans-Reeves K, 2022; Torkashvand et al., 2020; Zafeiridou et al., 2018). It is among the 10 most common plastics found in the world`s oceans (Evans-Reeves K, 2022) and by some measures it is the single most common form of litter if counted by individual pieces (Proctor, 2011).

The tobacco business is more and more reliant on the developing world: on one hand, the main increase in the number of smokers is happening there; on the other hand, more and more tobacco growing and production is moving from Western countries to countries such as China, Brazil, Malawi etc. Currently, more than 90 % of tobacco growing occurs in the developing world (World Health Organization, 2017). This double shift from Western markets to the Global South allows tobacco companies to be complacent about investing in new, truly eco-friendly products, being more transparent and renewing the infrastructure and work methods across their supply chain.

Pressure for change is building from all directions: consumers who want to be more conscious about their habits` impact on the environment; activists urging quick action against climate change before it is too late; international organizations like the UN building coalitions to tackle climate change and tobacco industry`s impact more specifically; and regulators from Food and Drugs Administration (FDA) to EU pushing for ever more stringent rules. Deciding how and where to invest to be the most effective in adapting to this new environment has become of strategic importance, especially for the biggest players in the market – Philip Morris, British American Tobacco and other multinational companies have been putting efforts into being more transparent about their operations` environmental impact and changing their practices to more sustainable ones (China National Tobacco Corporation, by far the biggest cigarette producer in the world, is the obvious exception). However, these efforts have been met with scepticism and their success is far from clear. Also, the importance of ESG theory in the current business environment muddles things even more by requiring companies` attention to be divided between multiple objectives. Thus, creating unambiguous criteria for investing in green changes in the industry is still of high importance and deserves a closer academic and expert look.

2.3. Pressures on the Tobacco Undustry

In light of the impact of the tobacco industry both on health and sustainability issues, there has been a threefold pressure on tobacco companies to act more sustainably: consumer, investor and regulatory.

2.3.1. Consumer Pressure

As mentioned in the previous section, smoking prevalence worldwide is decreasing, meaning a constantly contracting market for tobacco companies and the resulting increased competition for those consumers. What is more, consumer behaviour is changing. As more consumers are switching to alternative tobacco products – vapes, HTPs, nicotine pouches – it is becoming more difficult for tobacco companies to be environmentally friendly as these products usually bring even more sustainability issues – these new products usually employ electronic devices to provide the smoking experience. E-vapour products produce three types of waste: plastic waste, as they either use single-use cartridges or are single-use and disposable themselves; electronic waste, as they contain circuit boards and lithium batteries; and hazardous chemical waste, such as e-liquids used in e-vapour products (Pourchez et al., 2022). HTPs, while more reusable and use heated tobacco sticks instead of plastic cartridges, still involve environmental trade-offs because of using electronic heating devices. On the other hand, these alternatives to cigarettes are considered RRP, so are promoted by governments as possible cessation tools or at least as less harmful alternatives (Mcneill et al., 2022). In this way, tobacco companies are stuck balancing between the need to move away from harmful cigarettes and the need to become more environmentally friendly.

This balancing act is exacerbated by the attitudes of consumers themselves. In a 2020 survey by McKinsey, it was shown that 66 % of all respondents and 75% of millennials take sustainability into account when considering their purchases (The Business of Fashion and McKinsey & Company, 2020). Moreover, there has been a 71% increase in searches of sustainable goods from 2016 to 2021, showing increased interest in more environmentally friendly alternatives (The Economist Intelligence Unit, 2021). For smokers this increased interest in sustainability is even more pronounced, with smokers being slightly more committed to reducing their environmental impact than non-smokers (Euromonitor International, 2023). At the same time, smokers are still cost-sensitive, especially with recent inflationary pressures in the global economy, and seek convenience in their product choices. The disposable vapes are a prime example of this, as their popularity has increased despite their big negative environmental impact, because of their ease of use and affordability when compared to other

products (Euromonitor International, 2023). All in all, it is increasingly difficult to balance these two aspects – sustainability and healthier products – so it provides a big incentive for tobacco companies to build a good strategy moving forward.

2.3.2. Investor Pressure

Almost all big tobacco companies are publicly owned at least to some extent, making them sensitive to demands from their investors. At the same time ESG, despite some of the criticism it has received, has increased in importance for investors. Ernst & Young`s 2022 Global Corporate Reporting and Institutional Investor Survey has reported that 74 % of investors conduct a methodical and rigorous evaluation of companies` ESG disclosures as part of their investment decision process – up from 32% in 2018. Additionally, 78% of investors said companies should strive to solve ESG issues, "even if it reduces profits in the short term" (Ernst & Young, 2022). PwC report in 2022 estimated that ESG-linked assets controlled by asset managers will increase almost two-fold from 2021 to 2026 – to 33.9 trillion USD, which is almost 30% of all assets (PwC, 2022). For tobacco companies, this new focus on ESG adds additional pressure they have already been receiving is considered a "sin" stock, grouped with weapon, gambling and alcohol industries (ESG Research LLC, 2023; Paradis & Schiehll, 2021). With their stocks being shunned by investors since tobacco health impacts have become known, the increased attention to its sustainability efforts provides additional risks. In this case, it seems, that tobacco companies have gotten the message and have been investing in their ESG credentials by participating in various reporting initiatives and touting their environmental credentials. All Big Tobacco companies have been participating in the Carbon Disclosure Project (CDP) and Ecovadis and they generally get good ESG ratings, in some cases even outperforming non-sin stocks, with their ESG risk ratings at Sustainalytics, one of the main global sources of ESG ratings, being in the top half in the food products category (Sustainalytics, 2023). Despite this good recent performance, it seems that the tobacco industry will get more and more scrutiny, primarily because of the third kind of pressure: regulatory.

2.3.3. Regulatory Pressure

Euromonitor International singles out three key drivers in new environmental legislation towards the tobacco industry: leaf cultivation, supply chain emissions and product waste (Euromonitor International, 2023). While all of these aspects have received attention before, the biggest push for more regulation of the tobacco industry has come from a familiar source: the World Health Organization (WHO). While focusing more on the industry`s health impacts, recently the

organization has also expanded its criticisms to the environmental impacts of the tobacco supply chain as well. In 2017 WHO released their overview of tobacco and its environmental impact (World Health Organization, 2017). With it, the organization attempted to provide the first "cradle to grave" assessment of the entire tobacco supply chain and galvanize support from governments and other organizations for more regulation of the industry. It followed it up with its 2022 report "Tobacco: Poisoning Our Planet" (World Health Organization, 2022), a more focused and detailed account of the damage the tobacco supply chain has on the environment. The main message of the WHO is that global health cannot be considered as a separate problem from other factors like societal stability or the environment, thus tobacco is not only a threat to individual human health, but a threat to the entire human development.

Whether it is because of WHO`s efforts or general increased concern about the environment, more pressure has been mounting on the tobacco industry. The most visible and, it seems, the most urgent issue that has been stressed by regulators is littering. The method to tackle this problem is commonly referred to as "extended producer responsibility" (EPR). While EPR is not a completely new tactic as it has been used in places like San Francisco and Korea (Andrew Brown et al., 2023), the most comprehensive such legislation has come from the EU, as part of its Single Use Plastic Directive (SUP)(The European Parliament and the Council of the European Union, 2019). While SUP targets a broad range of single-use plastics, it specifically tackles cigarette butt littering as well. EPR, which is part of the requirements set out for the member states, is effectively a tax on manufacturers of tobacco products to cover the costs of waste collection, transport and treatment, as well as the costs of gathering data and reporting (Nikitara et al., 2022). This tax has already been implemented in France and will soon take effect in Germany, where it will be 8,972 EUR per kilogram, imposing big costs on tobacco companies. With the concept of "turbo taxation" (Euromonitor International, 2022a), the tactic of exponentially increasing taxes every year to make the products unaffordable while also generating big tax revenues, well entrenched in developed economies, the taxes will likely become more and more of a burden. The intention is to push manufacturers to provide more sustainable alternatives to currently available products without an outright ban on single-use filters. With the mentioned inflationary pressures weighing on consumers, the tobacco companies will be hard-pressed to transfer these additional costs through pricing – at least that is the expectation.

Additionally, the environmental impact of the tobacco supply chain is gaining more attention as well. Still, at the moment the industry is mostly subject to broader environmental legislation. One of the actions proposed by the EU Commission is to require companies operating in the union to provide proof that their supply chains are not contributing to deforestation. With tobacco companies

being big contributors to deforestation because of the need for land for tobacco leaf growing, as well as wood for leaf curing, this legislation could provide significant risks to them. Additionally, the EU is considering due diligence law, aimed at companies with more than 500 employees and revenue over 150 million EUR, which will seek to ensure that these firms act to minimize its negative impacts in the areas of human rights and the environment (Euromonitor International, 2023). Since most of the tobacco market is big multi-national companies, they would fall under these laws and would be forced to focus even more on their supply chain and put pressure on their supplier. In the future, the tobacco industry may be targeted by environmental legislation directly.

This three-fold pressure on tobacco companies is forcing them to make a lot of efforts to increase their environmental performance even if costs of that are increasing and it is becoming more difficult to transfer them to their customers. The strategy to counter these pressures and build a green business model has to be comprehensive but also focused enough to be able to solve the most pressing issues.

3. Building a Green Business Model for the Tobacco Industry

This section will try to distil this environmental mix of criteria and subcriteria into a green business model for the tobacco industry by establishing relative weights for each component of the mix and removing less significant components from the model.

3.1. Analytical Hierarchy Process

The main scientific method used in this paper will be the Analytical Hierarchy Process, or AHP, introduced by T.L. Saaty (1980). The AHP method is a theory of measurement, using pairwise comparison of criteria to establish ratio scales of said criteria. The first step when using the AHP method is to establish and define the problem. Also important when doing this is to determine what kind of knowledge the researcher is seeking (Russo & Camanho, 2015). Once these have been distinguished, the next step of the process is to create a hierarchic structure to present that problem. Generally, this means beginning with the main objective of the study as the first level of the structure which originates from the broad perspective, then moving to the second level of criteria that focus on specific aspects of the objective and then, if necessary, down to sub-criteria and, eventually, to alternatives that are being compared as solutions to the established objective (Russo & Camanho, 2015; R. W. Saaty, 1987). The general structure can be seen in Figure 3.

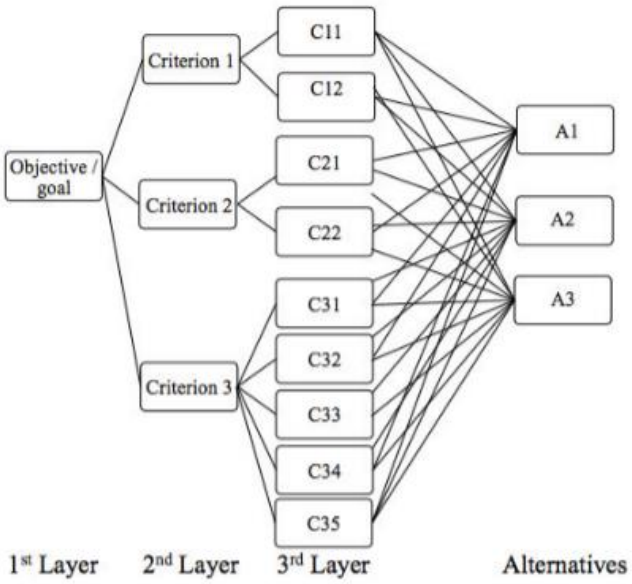

Figure 3. Standard of hierarchical structure

Source: (Russo & Camanho, 2015)

Each group of criterion and sub-criteria can be considered as homogenous clusters, which include elements that are close in nature and that the comparison could be meaningful (R. W. Saaty, 1987). For example, apples should be compared to oranges or pears (other fruits), instead of being compared to types of meat. Additionally, elements in each level should be considered constraints (or instructors of) the elements above (R. W. Saaty, 1987).

The structure itself should be complex enough to accurately portray the issue at hand but also simple enough to be flexible and allow for changes along the way. Generally, up to 3 levels are recommended in a structure and no more than 7 elements in each level (Russo & Camanho, 2015).

The next step is to construct a matrix of pairwise comparisons of each element in each layer and cluster. Chosen experts are requested to rate each pair of elements on a scale from 1 to 9, thus establishing not only the dominance of one element over the other but also the relative intensity of that dominance. The overview of the scale is shown in Table 2.

Table 2. The fundamental scale of importance

Intensity of importance on an absolute scale	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgement slightly favour one over another
5	Essential or strong importance	Experience and judgement strongly favour one over another
7	Very strong importance	An activity is strongly favoured and its dominance is demonstrated in practice
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgements	When compromise is needed

Source: (R. W. Saaty, 1987; T. L. Saaty, 2013)

The matrix is considered consistent when all the elements hold:

$$a_{ij} = a_{ik} \times a_{kj} \tag{1}$$

AHP uses the priority vector $\omega = (\omega_{1,}\, \omega_2, \omega_3 \dots \dots \omega_n)$, derived from the pairwise comparison matrix (PCM). There are several methods to derive this vector, one of them is the eigenvector:

$$Aw = \lambda w \tag{2}$$

where $\omega \sum_{i=1}^{n} \omega_1 = 1$ where $\omega_i \geq 1$ and $i = 1, 2, 3, \dots, n$.

An expert`s judgements are considered consistent only when $\lambda_{max} = n$, but also $\lambda_{max} \geq n$. To determine the consistency, we use the consistency index (CI):

$$\mu = \frac{(\lambda_{max} - n)}{(n-1)} \quad (3)$$

To determine the consistency of the entire PCM, we use the consistency ratio (CR), which is the ratio between CI and random index (RI) value:

$$CR = \frac{CI}{RI} \quad (4)$$

The requirement for a PCM to be considered consistent is for the CR value to be no more than 0.1 or 10%. The requirement is set so the results are not trivialized, but also some inconsistency is allowed for: without it, new knowledge cannot be created as experience shows us that you need to regularly revise your understanding to move knowledge forward (T. L. Saaty, 2013).

The last step is to normalize the matrix and obtain the relative importance of each element according to the pairwise comparisons done by the experts. This can be done manually by adding up the value of each column to normalize and then summing up the lines to obtain the relative weights. Instead, this paper will use the Microsoft Excel template prepared by Klaus D. Goepel (2013). This template has the advantage of not only providing a convenient presentation of pairwise comparisons but also providing a mechanism to correct inconsistencies in the experts` judgements. Once comparisons are done, the template automatically calculates and informs about the current CR, so the expert can adjust his responses as he goes through the survey, rather than having it returned to him afterwards for corrections. This not only saves time but provides more consistent evaluations as little time elapses between initial decisions and corrections. Lastly, Goepel uses a consensus index to measure the level of agreement between experts. The online tool made by Goepel (2018) is used to make this calculation and evaluate the consensus (see Table 3 on how to interpret the consensus index). Additionally, the online tool also provides the possibility to conduct a cluster analysis of experts – and divide them into more homogenous clusters with similar responses to the survey. This will also be presented in the results section of this paper.

Table 3. Interpretation of the consensus index

Below 50%	Very low
50% - 62.5%	Low
62.5% - 75%	Moderate
75% - 87.5%	High
87.5% - 100%	Very High

Source: (Goepel, 2022)

The number of respondents in AHP can vary a lot, from 3 to dozens (Misran et al., 2020), depending on the complexity of the problems and availability of respondents. The respondents (see Table 4), or the experts, used in this thesis can be divided into two groups. First are tobacco industry "insiders", with working experience in the tobacco supply chain. Additionally, their positions are, to a certain degree, directly involved in the decision-making process concerning environmental questions. These are experts 1-4. The second group are tobacco industry "outsiders", but with direct experience of researching or working with environmental issues in their jobs. These are experts 5-8. The first group were chosen so the industry`s views on the green transition are represented in the research. The second group were chosen to provide a different perspective on the challenges facing the tobacco industry.

Table 4. Summary of experts

Respondent	Company/Institution type	Position
Expert 1	Tobacco industry supply chain	Head of Quality and R&D
Expert 2	Tobacco industry supply chain	Head of Procurement
Expert 3	Tobacco industry supply chain	Global Product Development Manager
Expert 4	Tobacco company	Head of Procurement
Expert 5	University	Researcher
Expert 6	University	Researcher
Expert 7	University	Researcher
Expert 8	Bank	Analyst

Source: Made by the author

It is worth mentioning that the AHP method has its critics, especially regarding the correctness of this method when choosing the most suitable alternative with the devised relative weights and corresponding ranks (Asadabadi et al., 2019). However, the method is suitable for this study. First,

alternatives will not be ranked in this study, only the right environmental mix will be established for tobacco companies. Second, the immediacy of the adjustments of judgments will allow for less errors. Lastly, AHP should not be considered as the only and final tool to make decisions. It should be used in tandem with other methods or just judgements of final decision makers.

3.2. Expert Survey Results

In this thesis, the first level of the hierarchy, the goal, is the "right" environmental mix for the tobacco industry. The second level, as explained in the previous section, is the five criteria from Article 9 of the EU regulation 2020/852 and the additional criteria of GSCM. The third and last level is the sub-criteria presented in Table 1. The experts in the tobacco industry were asked to evaluate the sub-criteria of each cluster in pairwise comparisons and then were asked to do the same comparisons of the main criteria. This sequence was chosen so the experts would have a better understanding of each criterion and what constricts, or contributes to, it before making the decision.

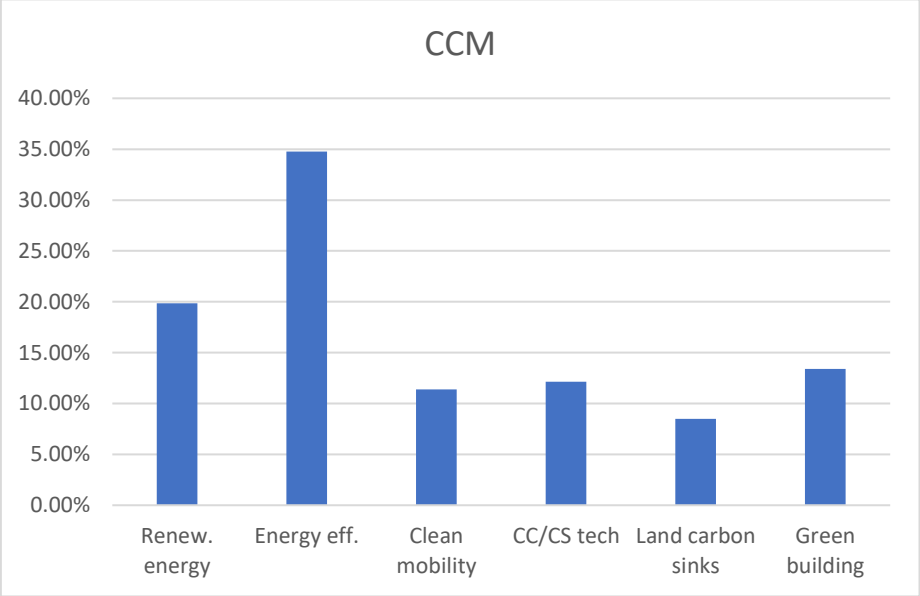

Figure 4. Subcriteria weights of CCM

Source: Made by the author

The first cluster the experts were requested to conduct pairwise comparisons of was CCM (see Figure 4). The experts judged that the most important subcriterion in this cluster is "Increasing energy efficiency", marking its importance weight at 34.78%. This is to be expected considering the importance most researchers place on energy efficiency as it allows you to make environmental gains without making substantial changes to the production process or type of materials used. The second most important criterion was judged to be "Generating or using renewable energy" at 19.85% and it

can be interpreted as a complementary component to energy efficiency, at least in the transitional phase until the economy fully switches to renewable energy. "Green building technologies" was judged to have 13.39% importance weight, „Increasing use of carbon capture and carbon storage technologies" – 12.13%, "Increasing clean or climate neutral mobility" – 11.37% and "Strengthening land carbon sinks – 8.48%".

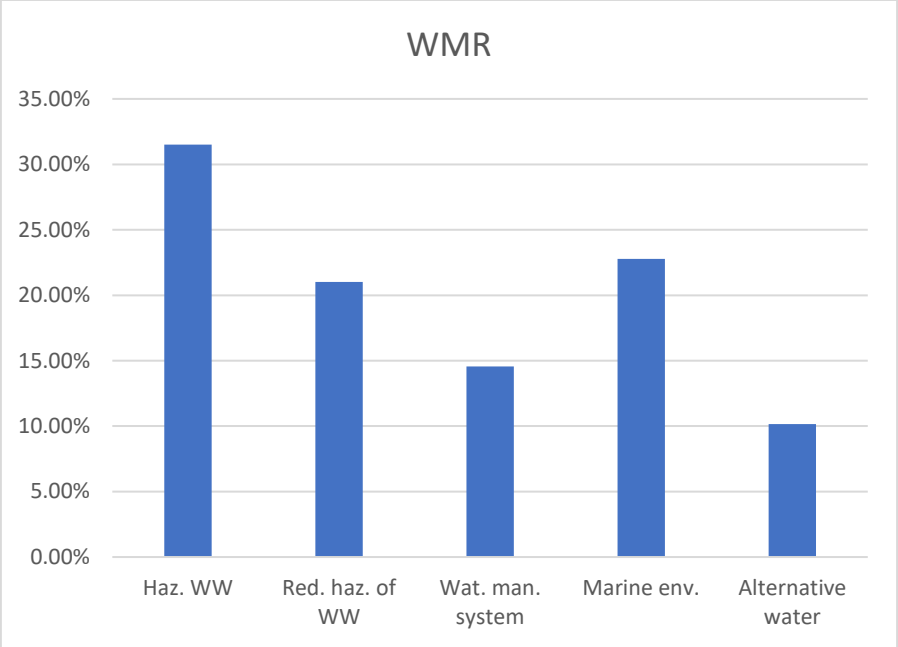

Figure 5. Subcriteria weights of WMR

Source: Made by the author

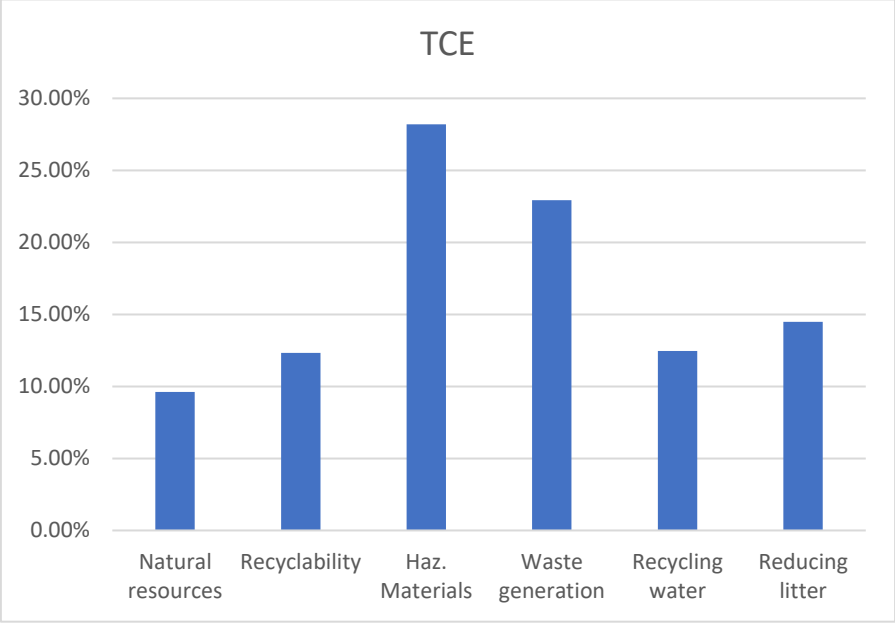

Figure 6. Subcriteria weight of TCE

Source: Made by the author

Next was the cluster of WMR (see Figure 5). In this cluster, the experts decided that the most important factor was “Safeguarding against hazardous wastewater in the environment“ with a weight of 31.50%. In the processing stage of the supply chain, 7.61 tonnes of wastewater are emitted per 1 tonne of tobacco output, while during the manufacturing phase, the ratio is 1.5 tonnes to 1 tonne of products (Zafeiridou et al., 2018), so the experts deemed this the most urgent topic to tackle. A connected issue of reducing the „Reducing hazardousness of wastewater“ has been decided as the third most important with a weight of 21.01%. As a big part of tobacco product waste finally finds its way to marine waters, the „Sustainable use and protection of marine environments“ component has the second biggest weight of 22.78% in the WMR cluster. “Developing a water management strategy to increase efficiency and reduce water intensity“ ended up with a weight of 14.56% and “Using alternative sources of water” with 10.15%.

In the cluster of TCE (see Figure 6), “Reducing the content of hazardous materials used in products“ was judged to be the most important component with a weight of 28.20%. With many toxic and carcinogenic materials used in tobacco products, the need to reduce the amount of these materials used seems crucial. The second most important was „Preventing or reducing waste generation“ with a weight of 22.93%, reflecting the fact the industry generates 25 million tons of solid waste every year (Zafeiridou et al., 2018). „Avoiding or reducing litter“ came in third with the weight of 14.48%; next was “Re-using and recycling water“ with 12.46%, “Increasing recyclability of products, especially of cigarette filters“ with 12.33% and “Using natural resources more efficiently“ with 9.61%.

The fourth cluster under consideration by the experts was PPC (see Figure 7). The subcriteria “Improving air, land and water quality where the economic activity takes place“ was deemed to have the most positive impact on the environment in this cluster with a weight of 35.58%. Second place went to “Preventing adverse effects of use or disposal of chemicals“ which got a weight of 25.8%. „Preventing or reducing pollution other than GHG“ and “Cleaning up litter and other pollution“ received weights of 21.26% and 17.38% respectively.

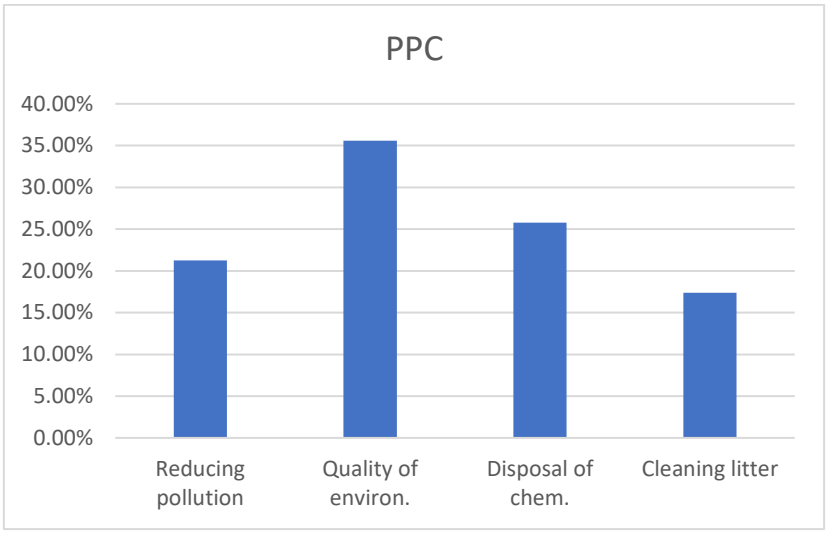

Figure 7. Subcriteria weights of PPC

Source: Made by the author

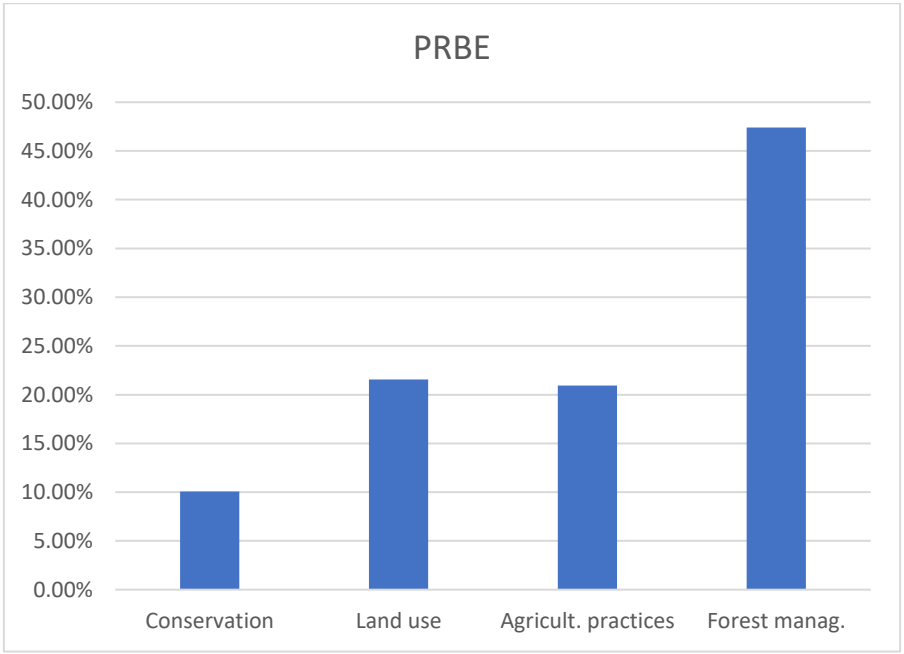

Figure 8. Subcriteria weight of PRBE

Source: Made by the author

In the next section, the experts were asked to do pairwise comparisons of PRBE (see Figure 8). By far, the most importance was given to "Sustainable forest management", at a weight of 47.41%. With around 5% of all deforestation attributed to tobacco growing (and even more if you calculate tobacco curing and other processes in the supply chain), it makes sense it is of huge importance in this cluster. The other two components that are tightly related – "Sustainable land use management" and "Sustainable agricultural practices" – were also considered to have similar importance, getting

21.57% and 20.95% respectively. While still being important, “Nature and biodiversity conservation“ was determined to be the least important factor of PRBE, getting a weight of 10.07%.

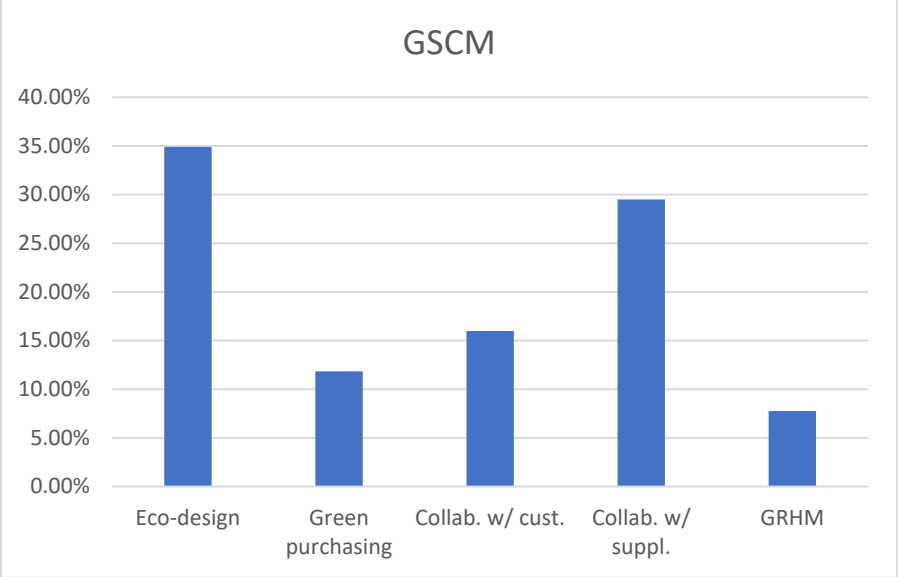

Figure 9. Subcriteria weights of GSCM

Source: Made by the author

The last cluster of the third level of the hierarchy was GSCM (see Figure 9). Two of the subcriteria were considered more important than the rest – “Eco-design, especially for efficient material use, biodegradability and recyclability“ and “Collaboration with suppliers“, with 34.89% and 29.49% of importance weight respectively. The first component was likely judged the most important as all other stages of the value chain start with the design, so designing from the start to ease environmental pressure in all the stages is important. It is interesting, that “Collaboration with suppliers“ was judged to be much more important than “Collaboration with customers, through common projects and education campaigns“, which only received a weight of 15.99% - almost half of the former. This seems to recognize the pressure tobacco companies can apply to their supplier as their client and the difficulty of educating and engaging end-consumers. “Green purchasing, i.e. increasing use of sustainably sourced services and renewable materials“ was judged to have a weight of 11.85%, while “Green human resource management“ – 7.77%.

Lastly, the experts were asked to do pairwise comparisons of the second level of the hierarchy, or criteria (see Figure 10). PRBE was judged to have the most importance over the entire tobacco industry`s effect on the environment, with a weight of 27.76%. As can be seen in Table 5, across almost all impact categories investigated in Zefeiridou et al.'s (2018) study of the tobacco industry, the farming and curing stages of the supply chain – the ones with the most direct impact on the ecosystems because of intensive land and water use and deforestation – cause the most negative effect

on the global environment. Among these impact categories is climate change, so it seems the experts recognize the fact even here PRBE is even more important than the criteria of CCM can do alone, even though it is called after the said impact category. CCM was judged to be only the third most important criterion with a weight of 17.34%. The second and fourth criteria in terms of relative weight for in a similar range to CCM: TCE with 19.28% and WMR with 16.52%. The third group of criteria that received the lowest importance weight were PPC with 11.06% and GSCM with 8.04%.

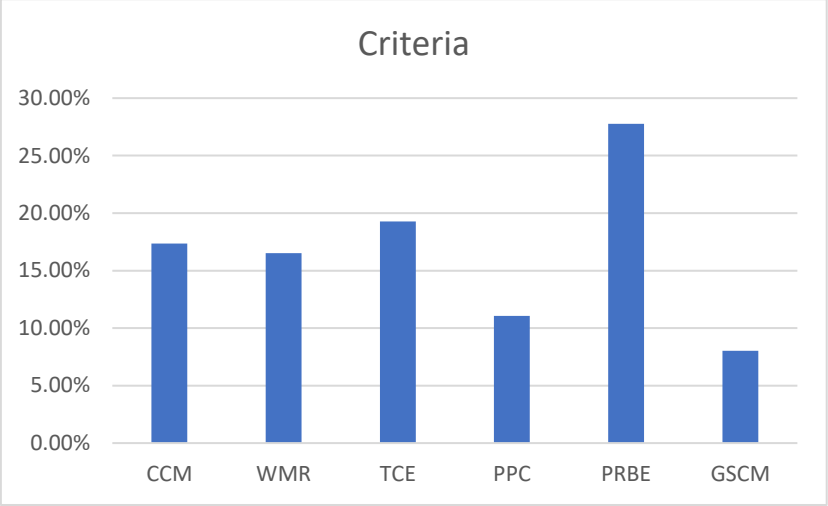

Figure 10. Weights of criteria

Source: Made by the author

Table 5. Total Annual Environmental Impacts of the Global Tobacco Supply Chain, in millions

Impact category	Unit	Farming	Curing	Processing	Cigarette manufacturing	Distribution	Use and disposal	Total
Climate change	kg CO2equiv	20849	44674	1073	15720	386	870	83572
Terrestrial acidification	kg SO2equiv	119	240	11	78	2.4	2.9	453
Freshwater eutrophication	kg P equiv	6.8	0.6	0.3	8.3	0.03	0.3	16
Marine eutrophication	kg N equiv	11	3.7	0.4	4.3	0.2	1.0	21

Source: Adapted from (Zafeiridou et al., 2018).

While the results of the survey are consistent – the aggregate consistency ratio is below 10% for every criterion and subcriterion – it seems the consensus between the experts is relatively low, averaging 58.7% (see Table 4). The biggest disagreements are on the subcriteria of TCE and PPC, followed by WMR and the second-level criteria. The issue in this case is not with consistency, but with consensus, so any additional number of experts would not necessarily improve the level of consensus (Goepel, 2017). Because of this, the survey results can still be used as a "consensus" result in the sense that it acts as a compromise between differing points of view regarding a green business model in the tobacco industry. Still, it is useful to see if there is a consensus between some of the

experts. AHP group consensus cluster analysis shows that the experts can be divided into two groups (see Figure 11). Interestingly, three of the four industry insiders are in one group, while the outsiders, along with one of the insiders, are in another group. The insider group seem to be putting more emphasis on CCM and WRM, reflecting a view that the areas the tobacco industry can most improve on are the areas of material and energy efficiency. The outsider group, on the contrary, places more importance on TCE and PRBE, thus on efforts to improve the circularity of the product and its manufacturing process, and, mostly, on sustainable land/forest management. This shows that there is an incongruity in the way that the industry sees its green transformation and how it is interpreted from the outside by researchers and those making investment decisions.

Table 6. Breakdown of consistency ratios and consensus index

Cluster	CR	Consensus index
Criteria	1.6%	57.1% - low
CCM	1.1%	70.1% - moderate
WMR	0.2%	53.6% - low
TCE	0.4%	48.5% - very low
PPC	1.1%	42.5% - very low
PRBE	1.3%	72.5% - moderate
GSCM	0.9%	63.8% - moderate

Source: Made by the author

0	2	8	6	5	7	4	3	1
2	100%	93%	89%	87%	87%	78%	78%	77%
8	93%	100%	85%	88%	83%	79%	77%	80%
6	89%	85%	100%	87%	81%	80%	82%	79%
5	87%	88%	87%	100%	86%	78%	74%	73%
7	87%	83%	81%	86%	100%	78%	75%	71%
4	78%	79%	80%	78%	78%	100%	94%	89%
3	78%	77%	82%	74%	75%	94%	100%	87%
1	77%	80%	79%	73%	71%	89%	87%	100%

Figure 11. Similarity matrix of experts

Source: Made by the author

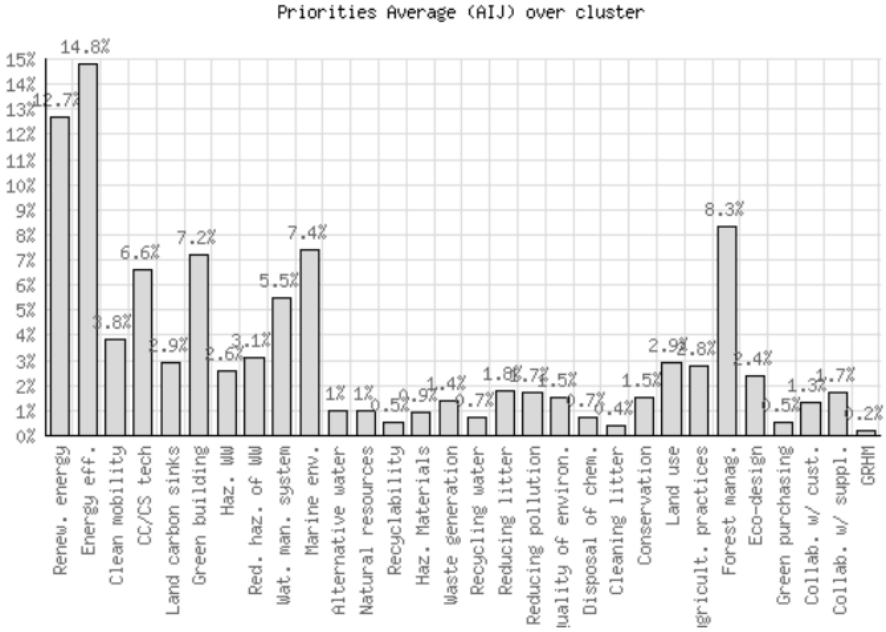

Figure 12. Priority averages of tobacco insiders

Source: Made by the author

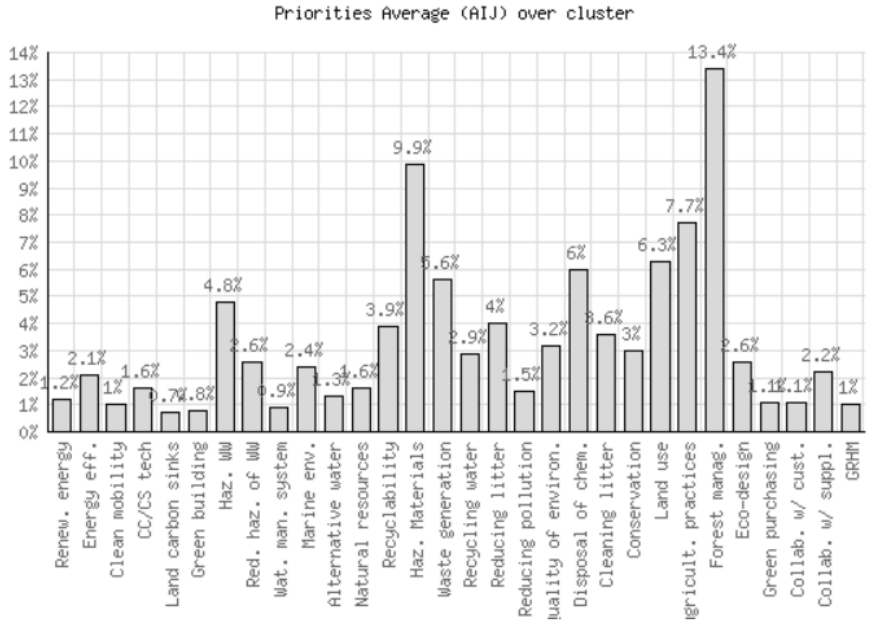

Figure 13. Priority averages of tobacco outsiders

Source: Made by the author

3.3. Construction of a Green Business Model

To construct a green business model it is not enough to find the weights of each criterion and subcriteria. Such a model provides a fragmented view of the environmental mix, as we would know

only the relative importance of each subcriterion in contrast with other subcriterion in that cluster. To improve on this, there is a need to find global priority weights for the subcriterion, that is, to know each subcriterion`s importance weight in connection with the weight of its cluster in the entire model. Table 7 shows the full representation of all criteria and subcriteria with their weights, as well as the global priority weights of each subcriterion.

Table 7. Local and global weights of criteria and subcriteria

Criteria of a green business model	Criteria weight, %	Sub-criteria	Sub-criteria weight, %	Global priority weight, %
Climate change mitigation	17.34	Generating or using renewable energy	19.85	3.5
		Increasing energy efficiency	34.78	6.1
		Increasing clean or climate-neutral mobility	11.37	2.0
		Increasing use of carbon capture and carbon storage technologies	12.13	2.1
		Strengthening land carbon sinks	8.48	1.5
		Green building technologies	13.39	2.3
The sustainable use and protection of water and marine resources	16.52	Safeguarding against hazardous wastewater in the environment	31.50	5.2
		Reducing the hazardousness of wastewater	21.01	3.4
		Developing a water management strategy to increase efficiency and reduce water intensity	14.56	2.3
		Sustainable use and protection of marine environments	22.78	3.7
		Using alternative sources of water	10.15	1.7
The transition to a circular economy	19.28	Using natural resources more efficiently	9.61	1.9
		Increasing recyclability of products, especially of cigarette filters	12.33	2.4
		Reducing the content of hazardous materials used in products	28.20	5.4
		Preventing or reducing waste generation	22.93	4.4
		Re-using and recycling water	12.46	2.4

Table 7 continued

Criteria of a green business model	Criteria weight, %	Sub-criteria	Sub-criteria weight, %	Global priority weight, %
		Avoiding or reducing litter	14.48	2.8
Pollution prevention and control	11.06	Preventing or reducing pollution other than GHG	21.26	2.4
		Improving air, land and water quality where the economic activity takes place	35.58	3.9
		Preventing adverse effects of the use or disposal of chemicals	25.78	2.9
		Cleaning up litter and other pollution	17.38	1.9
The protection and restoration of biodiversity and ecosystems	27.76	Nature and biodiversity conservation	10.07	3.0
		Sustainable land use management	21.57	6.5
		Sustainable agricultural practices	20.95	5.6
		Sustainable forest management	47.41	12.5
Green supply chain management	8.04	Eco-design, especially for efficient material use, biodegradability and recyclability	34.89	2.8
		Green purchasing, i.e. increasing the use of sustainably sourced services and renewable materials	11.85	1.0
		Collaboration with customers, through common projects and education campaigns	15.99	1.3
		Collaboration with suppliers	29.49	2.4
		Green human resource management	7.77	0.6

Source: Made by the author

Table 8 shows the same criteria and subcriterion but listed in the order of their global weights. From it, we can see that the most important subcriteria are “Sustainable forest management”, “Sustainable land use management”, “Increasing energy efficiency”, “Sustainable agriculture practices” and “Reducing the content of hazardous materials used in products”. The least important criteria are “Green human resource management”, “Green purchasing”, “Collaboration with customers”, “Strengthening land carbon sinks” and “Using alternative sources of water”.

Table 8. Summary of global priority weights

Subcriteria	Global priority weight, %
Sustainable forest management	12.5
Sustainable land use management	6.5
Increasing energy efficiency	6.1
Sustainable agricultural practices	5.6
Reducing the content of hazardous materials used in products	5.4
Safeguarding against hazardous wastewater in the environment	5.2
Preventing or reducing waste generation	4.4
Improving air, land and water quality where the economic activity takes place	3.9
Sustainable use and protection of marine environments	3.7
Generating or using renewable energy	3.5
Reducing the hazardousness of wastewater	3.4
Nature and biodiversity conservation	3
Preventing adverse effects of the use or disposal of chemicals	2.9
Avoiding or reducing litter	2.8
Eco-design, especially for efficient material use, biodegradability and recyclability	2.8
Increasing recyclability of products, especially of cigarette filters	2.4
Re-using and recycling water	2.4
Preventing or reducing pollution other than GHG	2.4
Collaboration with suppliers	2.4
Green building technologies	2.3
Developing a water management strategy to increase efficiency and reduce water intensity	2.3
Increasing use of carbon capture and carbon storage technologies	2.1
Increasing clean or climate-neutral mobility	2
Using natural resources more efficiently	1.9
Cleaning up litter and other pollution	1.9
Using alternative sources of water	1.7
Strengthening land carbon sinks	1.5
Collaboration with customers, through common projects and education campaigns	1.3
Green purchasing, i.e. increasing the use of sustainably sourced services and renewable materials	1
Green human resource management	0.6

Source: Made by the author

Although this could be used as the final environmental mix for the green business model as all of the subcriteria are working towards the goal of improving the environmental performance of a firm, further streamlining is in order. To make the model more efficient, only significant activities should be included to lower the number a firm focuses on. To do this, the least significant subcriteria will be removed from the model. These are determined by calculating the 1st quartile value of the data set, which in this case is 2.0. Anything below this value is considered not significant to the

streamlined green business model. As such all 5 of the least important subcriteria are removed. Additionally, “Cleaning up litter and pollution” and “Using natural resources more efficiently” also fall under this definition, so they are removed from the final model as well. All the removed items are in the grey background in Table 8.

After normalization, the resulting green business model in the tobacco industry looks as presented in Figure 12. The final model has reduced the number of the least important criteria – GSCM – to only two criteria – “Eco-design” (3.11%) and “Collaboration with suppliers” (2.67%). So, in total three subcriteria - “Green human resource management”, “Green purchasing” and “Collaboration with suppliers” - have been removed from this cluster, which is expected given its low importance in the overall model. On the other hand, the most important cluster retained all four of its subcriteria, with three of its subcriteria into the top four subcriteria globally – “Sustainable forest management” (13.89%), “Sustainable land use management” (7.22%) and “Sustainable agricultural practices” (6.22%). When looking at the “middle” of the importance scale in the model, all four criteria “lost” one of their subcriteria: “Strengthening land carbon sinks” was removed from CCM, “Using alternative sources of water” – from WMR, “Cleaning up litter and other pollution” – from PPC and “Using natural resources more efficiently” from TCE. In total, there were 30 subcriteria, out of which 7 subcriteria were removed to streamline the model into a more efficient one with 23 significant subcriteria.

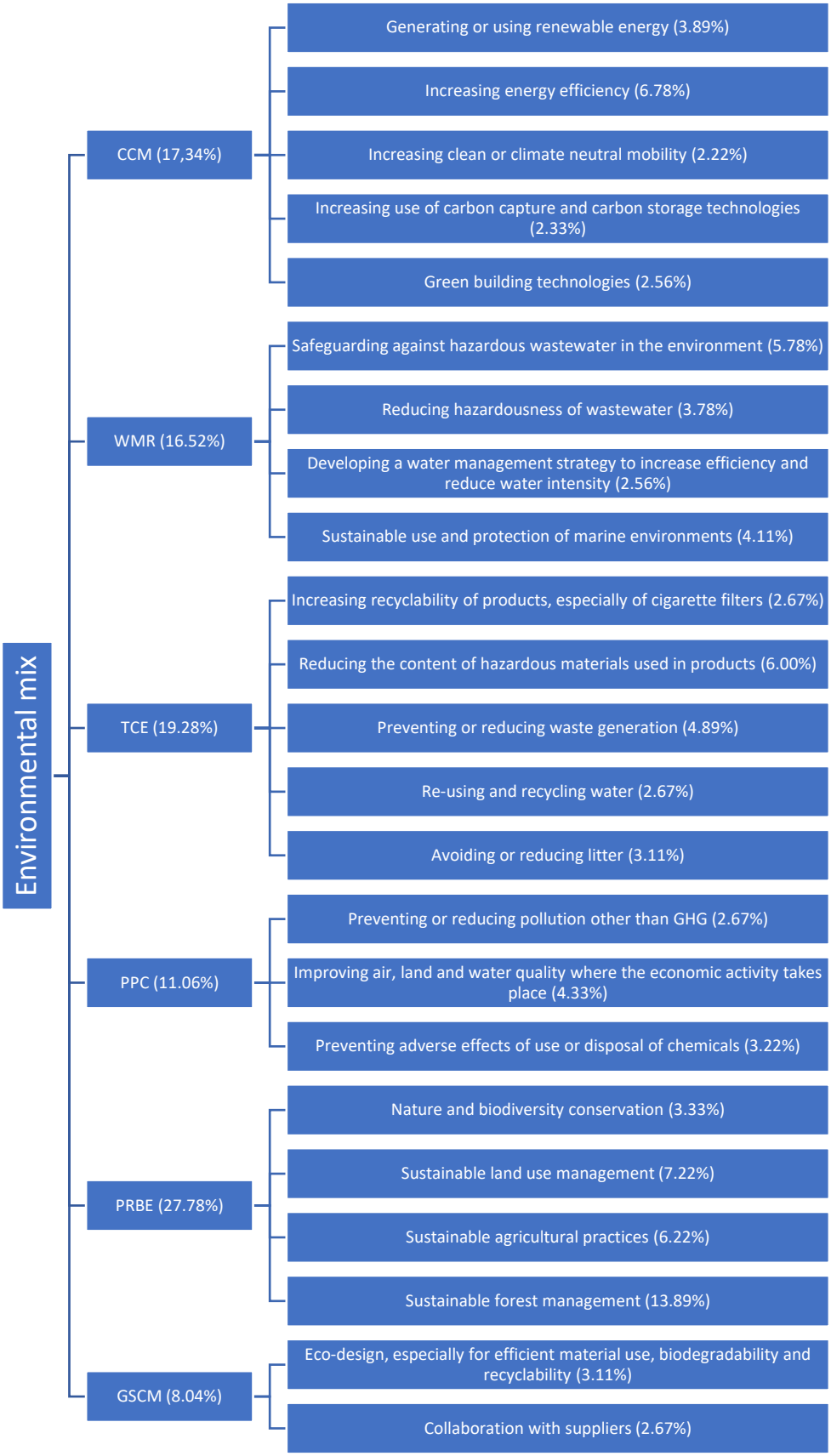

Figure 14. Final Green business model in the tobacco industry

Source: Made by the author

CONCLUSIONS

1. The emergence of ESG has broadened the understanding of sustainability in business. Not only environmental concerns have to be taken into account when building a business strategy but also societal and governance issues. This creates a diffusion of attention and resources which is counterproductive. This is especially true for the tobacco industry as its products` harmful health effects will not allow it to score highly on any ESG ratings. Moreover, negative views of the industry in society will be hard to change. It is thus recommended for tobacco companies to focus on where it can produce a positive impact – the environment. By creating a balanced environmental mix of policies and objectives the tobacco companies can get ahead of increasing pressures from consumers, investors and regulators while maintaining their competitive edge.
2. The tobacco industry is globalized in more ways than one. Almost three-fourths of the entire global market (excluding China) belongs to 4 big TTCs – BAT, PMI, JT and IB. Because of this high concentration much of the market belongs to companies whose operations span the entire globe. Moreover, the supply chain in the tobacco industry is also global in its distribution and impacts. Most of the agricultural processes occur in developing countries like Brazil, Zimbabwe and Malawi, manufacturing is widespread across all continents. Because of these reasons taking a global approach and tackling all stages of the supply chain is crucial to finding a successful green business model.
3. While the entire tobacco supply chain contributes to the industry`s impact on the environment, it can be divided into distinct stages and its impacts evaluated separately. The supply chain consists of six stages: cultivation, curing, processing, manufacturing, distribution & trading and use & final disposal. The research shows that the most damaging stage is the curing stage with 44674 million kg of annual CO2 equivalent emissions; second is cultivation, or farming, with 20849 million kg of annual CO2 equivalent emissions; and third is manufacturing with 15720 million kg of annual CO2 equivalent emissions.
4. The environmental objectives set out by the EU are the basis for the criteria of a green business model as they provide a convenient general framework of what a business should strive for to be environmentally sustainable. The subcriteria for each of the criteria are taken from the same source but are supplemented by industry-specific research and are thus formed into clusters around the main criteria. Moreover, Green supply chain

management (GSCM) is added as an additional cluster to make sure the model is comprehensive and includes the entire supply chain.

5. Using the AHP method, relative weights are distributed and a green business model is developed. The experts deemed the Protection of ecosystems and biodiversity (PRBE) to be the most important criteria in the environmental mix of the green business model with an importance weight of 27.78%, showing that experts recognize that the most harmful stages of the tobacco supply chain are related to agriculture and curing of tobacco leaves. However, the relatively even distribution of the rest of the criteria shows that one cannot discount any of the criteria and companies need to set aside resources for all of them, although in varying degrees. Not surprisingly, the most important of the subcriteria are from the PRBE cluster – Sustainable forest management (13.89% global weight), sustainable land use management (7.22%) and sustainable agricultural practices (6.22%) being in the top five of most important subcriteria.
6. Although GSCM was added as an additional criterion to make sure the entire supply chain is taken into account in the model, the experts decided that it is the least important criterion and cluster of subcriteria. The prevailing view is that resources are better used in improving your processes than engaging with suppliers (and customers especially as this subcriteria was deemed insignificant).
7. The difference between how the industry is seen by industry insiders and outsiders is significant. Although the insiders also determined the PRBE cluster to be important, the level of that importance was much higher among outsiders. On the other hand, outsiders placed much less importance on Climate change mitigation (CCM) than did the insiders. One hypothesis that can arise from this is that insiders are unwilling to admit that the most damage the industry does is upstream of the supply chain or just do not consider it their concern (especially given the low importance of GSCM). Another hypothesis is that the insiders have more direct knowledge of the impacts of the industry`s processes and can better find the best value per invested resources than the outsiders can, thus resulting in different priorities. This divergence needs to be studied in further research.
8. Lastly, the most important contribution of this thesis is the construction of a green business model for the tobacco industry. It provides a comprehensive framework around which tobacco companies can build their business strategy and improve their environmental performance across the entire supply chain. Besides being comprehensive, it is also relatively streamlined to remove practices and policies that might have the least impact on

the environmental performance of the firm. However, the model is theoretical. Further research needs to be done to see how it can be implemented in the real world and what influence it has on the actual environment when compared to the alternatives.

REFERENCES

Abdallah, A. B., & Al-Ghwayeen, W. S. (2020). Green supply chain management and business performance [Article]. *Business Process Management Journal*, *26*(2), 489–512. https://doi.org/10.1108/BPMJ-03-2018-0091

Agrawal, V. v, & Bellos, I. (2017). The Potential of Servicizing as a Green Business Model [Article]. *Management Science*, *63*(5), 1545–1562. https://doi.org/10.1287/mnsc.2015.2399

Ali, F. R. M., Seaman, E. L., Schillo, B., & Vallone, D. (2022). Trends in Annual Sales and Pack Price of Cigarettes in the US, 2015-2021 [Article]. *JAMA Network Open*, *5*(6), e2215407–e2215407. https://doi.org/10.1001/jamanetworkopen.2022.15407

Andrew Brown, B., Laubinger, F., Börkey, P., Brown, A., Frithjof Laubinger, oecdorg, & Peter Börkey, oecdorg. (2023). *New Aspects of EPR: Extending producer responsibility to additional product groups and challenges throughout the product lifecycle Environment Working Paper No.225*. www.oecdilibrary.org

Asadabadi, M. R., Chang, E., & Saberi, M. (2019). Are MCDM methods useful? A critical review of Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) [Article]. *Cogent Engineering*, *6*(1). https://doi.org/10.1080/23311916.2019.1623153

Baker, R. R., Massey, E. D., & Smith, G. (2004). An overview of the effects of tobacco ingredients on smoke chemistry and toxicity [Article]. *Food and Chemical Toxicology*, *42*, 53–83. https://doi.org/10.1016/j.fct.2004.01.001

Benavente, M. J., Caballero, M. J. A., Silvero, G., López-Coca, I., & Escobar, V. G. (2019). Cellulose Acetate Recovery from Cigarette Butts [Article]. *Proceedings*, *2*(20), 1447. https://doi.org/10.3390/proceedings2201447

Bialous, S. A., & Glantz, S. A. (2018). Heated tobacco products: another tobacco industry global strategy to slow progress in tobacco control. *Tob Control*, *27*, 111–117. https://doi.org/10.1136/tobaccocontrol-2018-054340

Bialous, S. A., & Peeters, S. (2012). A brief overview of the tobacco industry in the last 20 years. *Tobacco Control*, *21*(2), 92–94. https://doi.org/10.1136/TOBACCOCONTROL-2011-050395

Böckin, D., Goffetti, G., Baumann, H., Tillman, A.-M., & Zobel, T. (2022). Business model life

cycle assessment: A method for analysing the environmental performance of business [Article]. *Sustainable Production and Consumption*, *32*, 112–124. https://doi.org/10.1016/j.spc.2022.04.014

British American Tobacco. (2022). *Annual Report and Form 20-F 2021*.

Cao, G., Bao, Y., Wu, C., & Wang, Y. (2017). Analysis on efficiency optimization of tobacco leaf flue-curing process [Article]. *Procedia Engineering*, *205*, 540–547. https://doi.org/10.1016/j.proeng.2017.10.413

Chang Che. (2022). *China Tobacco: The world's most profitable company you've never heard of*. https://thechinaproject.com/2022/03/31/china-tobacco-the-worlds-most-profitable-company-youve-never-heard-of/

Daisey, J. M. (1999). Tracers for Assessing Exposure to Environmental Tobacco Smoke: What Are They Tracing? [Article]. *Environmental Health Perspectives*, *107*, 319. https://doi.org/10.2307/3434424

Dewhirst, T. (2012). Price and tobacco marketing strategy: lessons from 'dark' markets and implications for the WHO Framework Convention on Tobacco Control. *Tobacco Control*, *21*(6), 519–523. https://doi.org/10.1136/TOBACCOCONTROL-2012-050693

Dewhirst, T. (2021). 'Beyond nicotine' marketing strategies: Big Tobacco diversification into the vaping and cannabis product sectors [Article]. *Tobacco Control*, tobaccocontrol-2021-056798. https://doi.org/10.1136/tobaccocontrol-2021-056798

Eltayeb, T. K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes [Article]. *Resources, Conservation and Recycling*, *55*(5), 495–506. https://doi.org/10.1016/j.resconrec.2010.09.003

Ernst & Young. (2022). *How can corporate reporting bridge the ESG trust gap?*

ESG Research LLC, M. (2023). *Methodology Document MSCI ESG Research LLC ESG Ratings Methodology*.

Eurominitor International. Passport. (2022). *World Market for Tobacco*. https://www.euromonitor.com/locations.

Euromonitor International. (2022a). *Global Tobacco Legislation*.

Euromonitor International. (2022b). *Tobacco_in_World_Datagraphics*.

https://www.portal.euromonitor.com/analysis/tab

Euromonitor International. (2023). *Sustainability_in_Tobacco*.

Evans-Reeves K. (2022). The “filter fraud” persists: the tobacco industry is still using filters to suggest lower health risks while destroying the environment. [Other]. In *Tobacco control* (Vol. 31, Issue e1, p. e80). https://doi.org/10.1136/tobaccocontrol-2020-056245

Falloon, P., & Betts, R. (2010). Climate impacts on European agriculture and water management in the context of adaptation and mitigation—The importance of an integrated approach [Article]. *The Science of the Total Environment*, *408*(23), 5667–5687. https://doi.org/10.1016/j.scitotenv.2009.05.002

Goepel, K. D. (2013). Implementing the Analytic Hierarchy Process as a Standard Method for Multi- Criteria Decision Making In Corporate Enterprises – A New AHP Excel Template with Multiple Inputs. *Proceedings of the International Symposium on the Analytic Hierarchy Process*, 1–10.

Goepel, K. D. (2017). *AHP Group Consensus Indicator – how to understand and interpret?* https://bpmsg.com/ahp-group-consensus-indicator-how-to-understand/

Goepel, K. D. (2018). Implementation of an Online Software Tool for the Analytic Hierarchy Process (AHP-OS). *International Journal of the Analytic Hierarchy Process*, *10*(3), 469–487.

Goepel, K. D. (2022). *AHP Consensus Word Scale – BPMSG*. https://bpmsg.com/ahp-consensus-word-scale/

Hendlin, Y. H., & Bialous, S. A. (2019). The environmental externalities of tobacco manufacturing: A review of tobacco industry reporting [Article]. *Ambio*, *49*(1), 17–34. https://doi.org/10.1007/s13280-019-01148-3

Hill, J. (2020). Defining and measuring ESG performance. *Environmental, Social, and Governance (ESG) Investing*, 167–183. https://doi.org/10.1016/B978-0-12-818692-3.00009-8

Hoek, J., Gendall, P., Blank, M.-L., Robertson, L., & Marsh, L. (2020). Butting out: an analysis of support for measures to address tobacco product waste [Article]. *Tobacco Control*, *29*(2), 131. https://doi.org/10.1136/tobaccocontrol-2019-054956

Houghton, F., Houghton, S., Doherty, D. O., McInerney, D., & Duncan, B. (2018). “Greenwashing” tobacco products through ecological and social/equity labelling: A

potential threat to tobacco control. In *Tobacco prevention & cessation* (Vol. 4) [Unknown]. https://doi.org/10.18332/tpc/99674

Houghton, F., Houghton, S., O'Doherty, D., McInerney, D., & Duncan, B. (2019). Greenwashing tobacco—attempts to eco-label a killer product [Article]. *Journal of Environmental Studies and Sciences*, *9*(1), 82–85. https://doi.org/10.1007/s13412-018-0528-z

Imperial Brands. (2023). *ANNUAL REPORT AND ACCOUNTS 2022*. www.imperialbrandsplc.com

IPCC. (2022). *Mitigation of Climate Change Climate Change 2022 Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://www.ipcc.ch/site/assets/uploads/2018/05/uncertainty-guidance-note.pdf.

Iwashita, H. (2022). Globalisation of a state-owned enterprise: A history of Japan Tobacco (1985-2014) [Article]. *Business History*, *ahead-of-print*(ahead-of-print), 1–32. https://doi.org/10.1080/00076791.2022.2072487

Iyyanki V. Muralikrishna, & Valli Manickam. (2017). Chapter Five - Life Cycle Assessment [Bookitem]. In *Environmental Management* (pp. 57–75). Elsevier Inc. https://doi.org/10.1016/B978-0-12-811989-1.00005-1

Japan Tobacco. (2022). *Integrated Report 2021*.

Lee, S., Holden, C., & Lee, K. (2013). Are transnational tobacco companies' market access strategies linked to economic development models? A case study of South Korea [Article]. *Global Public Health*, *8*(4), 435–448. https://doi.org/10.1080/17441692.2012.758762

Lindgren, P., Knoth, N. S. H., Sureshkumar, S., Friedrich, M. F., & Adomaityte, R. (2021). "Green Multi Business Models" How to Measure Green Business Models and Green Business Model Innovation? [Article]. *Wireless Personal Communications*, *121*(2), 1303–1323. https://doi.org/10.1007/s11277-021-09189-2

Longoni, A., Luzzini, D., & Guerci, M. (2018). Deploying Environmental Management Across Functions: The Relationship Between Green Human Resource Management and Green Supply Chain Management [Article]. *Journal of Business Ethics*, *151*(4), 1081–1095. https://doi.org/10.1007/s10551-016-3228-1

Martins, J. M., Aftab, H., Mata, M. N., Majeed, M. U., Aslam, S., Correia, A. B., & Mata, P. N. (2021). Assessing the Impact of Green Hiring on Sustainable Performance: Mediating Role

of Green Performance Management and Compensation [Article]. *International Journal of Environmental Research and Public Health, 18*(11), 5654. https://doi.org/10.3390/ijerph18115654

Mcneill, A., Simonavičius, E., Brose, L., Taylor, E., East, K., Zuikova, E., Calder, R., & Robson, D. (2022). *Nicotine vaping in England: an evidence update including health risks and perceptions, 2022 A report commissioned by the Office for Health Improvement and Disparities*.

Misran, M. F. R., Roslin, E. N., & Mohd Nur, N. (2020). AHP-consensus judgement on transitional decision-making: With a discussion on the relation towards open innovation [Article]. *Journal of Open Innovation, 6*(3), 1–17. https://doi.org/10.3390/joitmc6030063

Molina-Azorin, J. F., López-Gamero, M. D., Tarí, J. J., Pereira-Moliner, J., & Pertusa-Ortega, E. M. (2021). Environmental Management, Human Resource Management and Green Human Resource Management: A Literature Review [Article]. *Administrative Sciences*, *11*(2), 48. https://doi.org/10.3390/admsci11020048

Momas, C. (2023). Tobacco greenwashing in environmental, social and governance disclosures [Article]. *Tobacco Prevention & Cessation*, *9*(Supplement). https://doi.org/10.18332/tpc/162455

Mondal, S., Singh, S., & Gupta, H. (2022). A meta-analysis of green and sustainable business models: A comprehensive approach. *Journal of Cleaner Production*, *371*, 133623. https://doi.org/10.1016/J.JCLEPRO.2022.133623

Moroz, I., Scapolio, L. G. B., Cesarino, I., Leão, A. L., & Bonanomi, G. (2021). Toxicity of cigarette butts and possible recycling solutions—a literature review [Article]. *Environmental Science and Pollution Research International*, *28*(9), 10450–10473. https://doi.org/10.1007/s11356-020-11856-z

Nair, S., & Paulose, H. (2014). Emergence of green business models: The case of algae biofuel for aviation [Article]. *Energy Policy*, *65*, 175–184. https://doi.org/10.1016/j.enpol.2013.10.034

Nara, E. O. B., Gelain, C., Moraes, J. A. R., Benitez, L. B., Schaefer, J. L., & Baierle, I. C. (2019). Analysis of the sustainability reports from multinationals tobacco companies in southern Brazil [Article]. *Journal of Cleaner Production*, *232*, 1093–1102. https://doi.org/10.1016/j.jclepro.2019.05.399

Nikitara, K., Lagou, I., Plyta, Z., Mocanu, K., & Vardavas, C. (2022). The EU Single-Use Plastics Directive and its impact on tobacco products: A policy analysis [Article]. *Public Health and Toxicology*, *2*(3), 1–4. https://doi.org/10.18332/pht/153936

Paradis, G., & Schiehll, E. (2021). ESG Outcasts: Study of the ESG Performance of Sin Stocks [Article]. *Sustainability (Basel, Switzerland)*, *13*(17), 9556. https://doi.org/10.3390/su13179556

Perreault, W. D. and, & McCarthy, E. J. (2002). Basic Marketing: A Global-Managerial Approach (14 edn). In *Mc-Grow hill, Irwin.*

Philip Morris International. (2022). *2021 Annual Report*.

Pourchez, mie, Mercier, ment, & Forest, rie. (2022). *From smoking to vaping: a new environmental threat?* https://doi.org/10.1016/S2213-2600(22)00187-4

Proctor, R. N. (2011). Golden holocaust : origins of the cigarette catastrophe and the case for abolition [Book]. In *Golden holocaust: origins of the cigarette catastrophe and the case for abolition* (1st ed.). University of California Press. https://doi.org/10.1525/j.ctt1pnxdm

PwC. (2022). *Asset and wealth management revolution 2022: Exponential expectations for ESG*.

Quintás, M., Martínez-Senra, A., & Sartal, A. (2018). The Role of SMEs' Green Business Models in the Transition to a Low-Carbon Economy: Differences in Their Design and Degree of Adoption Stemming from Business Size [Article]. *Sustainability (Basel, Switzerland)*, *10*(6), 2109. https://doi.org/10.3390/su10062109

Radonjič, G., & Tompa, S. (2018). Carbon footprint calculation in telecommunications companies – The importance and relevance of scope 3 greenhouse gases emissions [Article]. *Renewable & Sustainable Energy Reviews*, *98*, 361–375. https://doi.org/10.1016/j.rser.2018.09.018

Rajani, N. B., Hoelscher, J., Laverty, A. A., & Filippidis, F. T. (2023). *A multi-country analysis of transnational tobacco companies' market share*. https://doi.org/10.18332/tid/157090

Ranganathan, J., Corbier, L., Schmitz, S., Oren, K., Dawson, B., Spannagle, M., Bp, M. M., Boileau, P., Canada, E., Frederick, R., Vanderborght, B., Thomson, H. F., Kitamura, K., Woo, C. M., Naseem, &, Kpmg, P., Miner, R., Pricewaterhousecoopers, L. S., Koch, J., … Camobreco, V. (2004). *GHG Protocol Initiative Team World Business Council for Sustainable Development Pankaj Bhatia World Resources Institute World Business Council for Sustainable Development Peter Gage World Resources Institute Revision*

Working Group Core Advisors.

Rasche, A., & Waddock, S. (2014). Global Sustainability Governance and the UN Global Compact: A Rejoinder to Critics [Article]. *Journal of Business Ethics*, *122*(2), 209–216. https://doi.org/10.1007/s10551-014-2216-6

Reitsma, M. B., Kendrick, P. J., Ababneh, E., Abbafati, C., Abbasi-Kangevari, M., Abdoli, A., Abedi, A., Abhilash, E. S., Abila, D. B., Aboyans, V., Abu-Rmeileh, N. M., Adebayo, O. M., Advani, S. M., Aghaali, M., Ahinkorah, B. O., Ahmad, S., Ahmadi, K., Ahmed, H., Aji, B., … Zuniga, Y. H. (2021). Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990–2019: a systematic analysis from the Global Burden of Disease Study 2019. *The Lancet*, *397*(10292), 2337–2360. https://doi.org/10.1016/S0140-6736(21)01169-7

Robert Branston, J. (2021). *Industry profits continue to drive the tobacco epidemic: A new endgame for tobacco control?* https://doi.org/10.18332/tpc/138232

Russo, R. de F. S. M., & Camanho, R. (2015). Criteria in AHP: A Systematic Review of Literature [Article]. *Procedia Computer Science*, *55*, 1123–1132. https://doi.org/10.1016/j.procs.2015.07.081

Saaty, R. W. (1987). The analytic hierarchy process—what it is and how it is used. *Mathematical Modelling*, *9*(3–5), 161–176. https://doi.org/10.1016/0270-0255(87)90473-8

Saaty, T. L. (1980). The Analytical Hierarchy Porocess. In *Priority Setting. Resource Allocation, MacGraw-Hill, New York International Book Company*.

Saaty, T. L. (2013). The Modern Science of Multicriteria Decision Making and Its Practical Applications: The AHP/ANP Approach [Article]. *Operations Research*, *61*(5), 1101–1118. https://doi.org/10.1287/opre.2013.1197

Shafique, M., Asghar, M., & Rahman, H. (2017). The impact of Green Supply Chain Management practices on performance: moderating role of institutional pressure with mediating effect of green innovation [Document]. *Business, Management and Education*, *15*(1), 91. https://doi.org/10.3846/bme.2017.354

Srivastava, S. K. (2007). Green supply-chain management: a state-of-the-art literature review. *International Journal of Management Reviews*, *9*(1), 53–80.

Sun, H., Pofoura, A. K., Adjei Mensah, I., Li, L., & Mohsin, M. (2020). The role of environmental entrepreneurship for sustainable development: Evidence from 35 countries

in Sub-Saharan Africa [Article]. *The Science of the Total Environment*, *741*, 140132–140132. https://doi.org/10.1016/j.scitotenv.2020.140132

Sustainalytics. (2023). *Company ESG Risk Ratings and scores - Sustainalytics*. https://www.sustainalytics.com/esg-ratings

Tang, G., Chen, Y., Jiang, Y., Paillé, P., & Jia, J. (2018). Green human resource management practices: scale development and validity [Article]. *Asia Pacific Journal of Human Resources*, *56*(1), 31–55. https://doi.org/10.1111/1744-7941.12147

The Business of Fashion and McKinsey & Company. (2020). *The State of Fashion 2020*.

The Economist. (2022). *ESG should be boiled down to one simple measure: emissions*. https://www.economist.com/leaders/2022/07/21/esg-should-be-boiled-down-to-one-simple-measure-emissions

The Economist Intelligence Unit. (2021). *An Eco-wakening: Measuring global awareness, engagement and action for nature*.

The European Parliament And The Council. (2020). *Regulation (EU) 2020/852 Of The European Parliament And Of The Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN

The European Parliament and the Council of the European Union. (2019). *Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment*.

Tiruta-Barna, L. (2021). A climate goal–based, multicriteria method for system evaluation in life cycle assessment [Article]. *The International Journal of Life Cycle Assessment*, *26*(10), 1913–1931. https://doi.org/10.1007/s11367-021-01991-1

TobaccoTactics. (n.d.). *China National Tobacco Corporation*. Retrieved February 25, 2023, from https://tobaccotactics.org/wiki/china-national-tobacco-corporation/

Torkashvand, J., Farzadkia, M., Sobhi, H. R., & Esrafili, A. (2020). Littered cigarette butt as a well-known hazardous waste: A comprehensive systematic review [Article]. *Journal of Hazardous Materials*, *383*, 121242. https://doi.org/10.1016/j.jhazmat.2019.121242

Trapp, C. T. C., & Kanbach, D. K. (2021). Green entrepreneurship and business models: Deriving green technology business model archetypes. *Journal of Cleaner Production*, *297*. https://doi.org/10.1016/j.jclepro.2021.126694

Wang, C., Zhao, M., & Zhang, Z. (2021). Research on the Relationship Between Corporate Governance Performance and Financing Cost Under the Background of ESG Theory. *E3S Web Conf. , 235*(01054). https://doi.org/10.1051/e3sconf/202123501054

Wang, Q., Han, R., Huang, Q., Hao, J., Lv, N., Li, T., & Tang, B. (2018). Research on energy conservation and emissions reduction based on AHP-fuzzy synthetic evaluation model: A case study of tobacco enterprises [Article]. *Journal of Cleaner Production*, *201*, 88–97. https://doi.org/10.1016/j.jclepro.2018.07.270

World Health Organization. (2017). *Tobacco and its environmental impact: an overview*. https://apps.who.int/iris/bitstream/handle/10665/255574/9789241512497-eng.pdf

World Health Organization. (2021). *WHO global report on trends in prevalence of tobacco use 2000-2025 Fourth edition WHO global report on trends in prevalence of tobacco use 2000-2025, fourth edition ISBN 978-92-4-003932-2 (electronic version)*. http://apps.who.int/bookorders.

World Health Organization. (2022). *Tobacco: poisoning our planet*.

Zafeiridou, M., Hopkinson, N. S., & Voulvoulis, N. (2018). Cigarette Smoking: An Assessment of Tobacco's Global Environmental Footprint Across Its Entire Supply Chain [Article]. *Environmental Science & Technology*, *52*(15), 8087–8094. https://doi.org/10.1021/acs.est.8b01533

Zhang, Y., He, X., Liang, H., Zhao, J., Zhang, Y., Xu, C., & Shi, X. (2016). Long-term tobacco plantation induces soil acidification and soil base cation loss [Article]. *Environmental Science and Pollution Research International*, *23*(6), 5442–5450. https://doi.org/10.1007/s11356-015-5673-2

Znyk, M., Jurewicz, J., Kaleta, D., Ashley, D., & Tchounwou, P. B. (2021). *Exposure to Heated Tobacco Products and Adverse Health Effects, a Systematic Review*. https://doi.org/10.3390/ijerph18126651