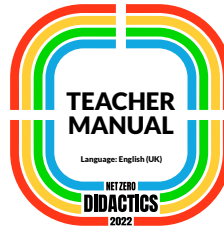




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The Net Zero Didactics Education Kit has been created as part of the Erasmus+ project Net Zero Didactics and with Heveas ApS as project coordinator and with the participation of three schools and two private companies.

The Carbon Events in The Net Zero Game 2050™ are based on trustworthy and normative sources, but they have been adjusted and adapted for the format of the game. The actual formulation and impact of the Carbon Event is the sole responsibility of the publisher. The Net Zero Game 2050™ is made from renewable resources. More information is available on our website.

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The editorial process was finalised in May 2022.

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# Education System

The complete Net Zero Didactics Education Kit consists of 6 documents.

1 x

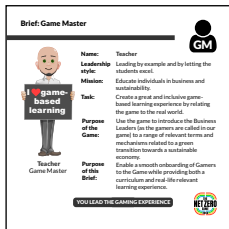


## Teacher Manual (this booklet)

Booklet, 52 pages, 15 x 15 cm.

Lays out and explains the didactics potential of the Game.

1 x

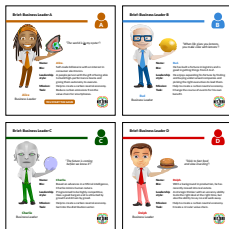


## Teacher Avatar Sheet (Game Master)

Zigzag folder, 8 pages, 15x15cm.

Onboarding tool making new players understand the Game faster and giving them a curriculum-relevant learning experience.

4 x



## Business Leader Avatar Sheets

Zigzag folder, 8 pages, 15x15cm.

Each player uses their individual Avatar Sheet as their individual onboarding tool.

# 1 Introduction

## 1.1 Gamification of the Green Transition

We believe that business is a strong lever for change in a time when rapid societal transformation is needed. Business will be one of the major drivers of the green transition towards a decarbonising and - ultimately - carbon-neutral world economy.

## 1.2 Teacher Manual

This Teacher Manual presents the mindset and thinking behind The Net Zero Game 2050™ and describes how the Game might be used for education and training purposes.

## 1.3 Our Ambition for Impact

We strive to bundle together pedagogy, didactics, reality, business jargon and climate jargon into a game with high replayability.

The players (or the Business Leaders as they are called in our Game) will be able to relate the framework presented in The Net Zero Game 2050™ to the daily stream of news in the mass media and thus become more active, informed and critical as leaders, employees, consumers, citizens and human beings.

## Disclaimer

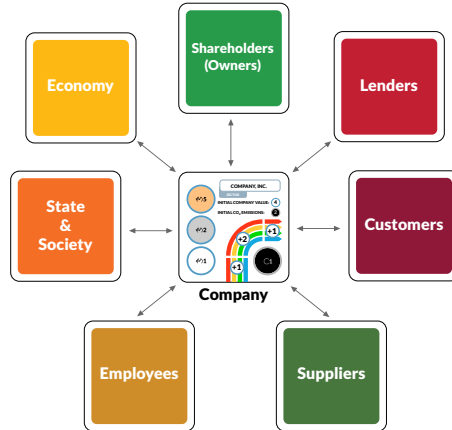
1.4

This is neither a textbook in business economics nor sustainability/ climate change.

## 1.5

## Stakeholder Capitalism

The Net Zero Game 2050™ is based on the concept of Stakeholder Capitalism<sup>6</sup>. This thought system is used as the capitalist, democratic and market economy-based model in contrast to the views of neoliberal economist Milton Friedman who famously stated that “*the business of business is business*”.



*The company  
stakeholders in  
Stakeholder  
Capitalism*

A growing general awareness combined with approaches such as ESG and CSR have led to new concepts affecting business such as *greenwashing*, *s\*\*\*storms* and even *greenhushing*.

### KEY REFLECTION AND LEARNING POINTS

- The high-level company stakeholder model provides the springboard for a taxonomy for all Carbon Events in the Game (as shown in 3.3)

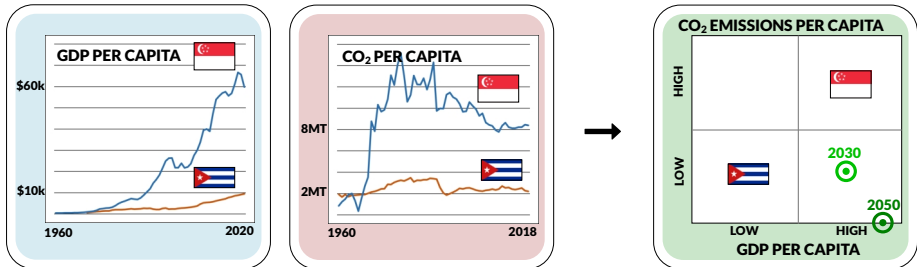
## 1.6

## Games and Society

Board games reflect the societies within which they are invented and played.

In 1959, Fidel Castro took over the leadership of Cuba and Lee Kuan Yew took over the leadership of Singapore.

It is a historical fact that whereas Castro ordered all *Monopoly*<sup>®</sup> sets in Cuba to be burned and replaced with the *Deuda Eterna* board game (in English: *Eternal Debt*), Lee Kuan Yew embraced market economy and capitalism. The two countries have developed from comparable starting points, with respect to GDP and carbon emissions, but have gone in very different directions.



*Cuba and Singapore: Two different approaches - and outcomes!*

One of the challenges in terms of moving towards a carbon neutral economy in 2050 is to combine the creation of value with the reduction of carbon emissions.

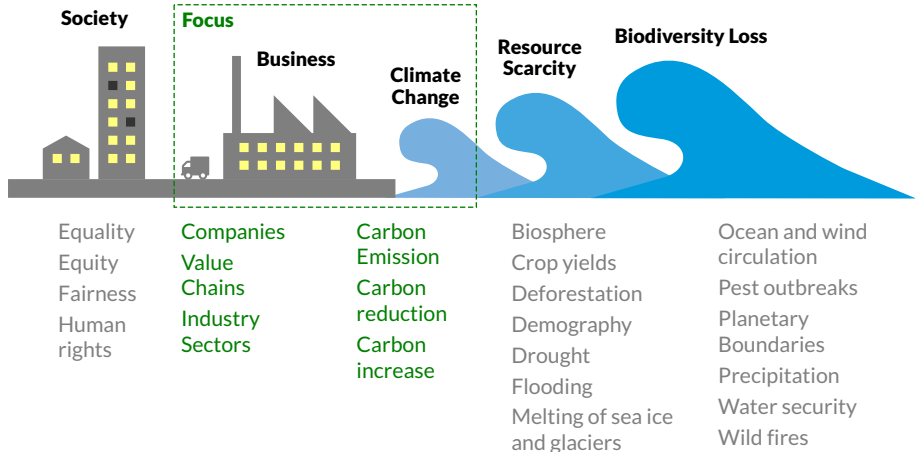
### KEY REFLECTION AND LEARNING POINTS

- Is it possible to measure societal progress by means of GDP? Why - or why not?
- Does a high level of GDP correlate with a high level of happiness? Why - or why not?
- Fun fact: Monopoly was launched (as The Landlord's Game) onto the market exactly 100 years before the birth of climate activist Greta Thunberg.

1.7

## Focus of The Net Zero Game 2050™

The focus of this game is to illustrate relevant aspects of the impact of climate change on business - as well as the impact of business on climate change.



### Other Challenges for Societies

A great many other challenges are likewise looming. In cases where these have an impact on the present value and/or carbon emissions of the companies featured in the Game, they have been included.

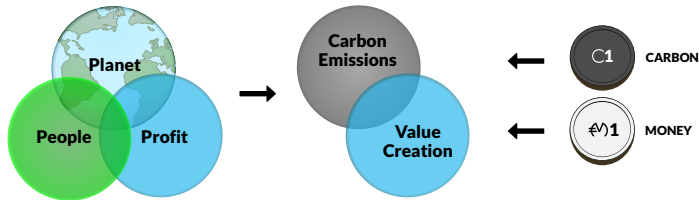
However, this is not a game about planetary boundaries and the consequences of climate change on the total biosphere as such.

1.8

## From Triple to Double bottom-line

The *triple bottom line* accounting (3BL) takes into consideration three parts of a business, namely its social, environmental and financial performance - this is often expressed as People, Planet and Profit.

In this Game, the focus is somewhat simpler because it only involves two aspects: value creation and carbon emissions. While money (value) can be transferred freely between companies, carbon emissions cannot.



*The 3BL model vs. the Game's model*

## From Sustainability vs. Business to Sustainable Business

To some extent, the Game also illustrates how modern businesses embrace (or in some cases: struggle to embrace) the concept of sustainability.



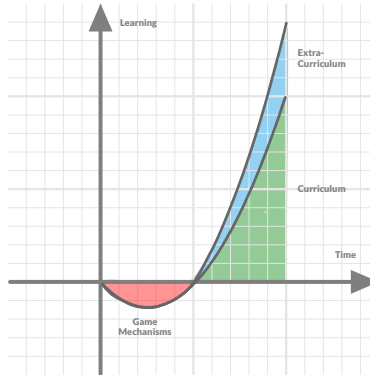
### KEY REFLECTION AND LEARNING POINTS

- This facet of the Game reflects the physical reality, but it does not reflect today's international emissions trading systems (ETS) where emissions may be offset.

## 1.9

## Pedagogical Investment and Outcome

At times when teachers are burdened with a heavy load of curriculum, the dilemma is whether to spend the extra time it takes to learn the Game to such an extent that it can be used as a teaching tool.



*Return of invested time for the teacher on the learning outcome.*

The red area in the graph illustrates the time spent learning how to play the Game (an activity that is not directly relevant to the curriculum). If the green area (curriculum relevant learning) is larger than the red area, then this is a justifiable investment.

On top of that, you might obtain some extra learning in the process (the blue area).

### KEY REFLECTION AND LEARNING POINTS

10

- The Avatar sheets were created to speed the onboarding of the Game, saving teachers time.
- The blue area reflects, situations where students for instance use the framework of the Game to understand daily business news.

## 2

# The Game

### 2.1

## The Mission of The Net Zero Game 2050™

In the same way that Business Leaders have to follow the Company mission, the students will also be presented with this mission.

### **Mission Brief**

*The Earth is heating up. You, the Business Leader, are given the responsibility of building a sustainable and carbon-neutral portfolio of companies operating in various value chains and industry sectors.*

*You will do this by reacting to Carbon Events that relate to markets, politics and technology, by buying and selling companies, and by hiring and deploying green management teams.*

*You will need many skills and a fair bit of luck to achieve your objectives.*

### 2.2

## Why Gamification

As knowledge is often generated from experience with complex tasks rather than from activities such as learning or practising as separate and isolated events, game-based learning is widely recognised as a powerful tool. Skills and knowledge are best acquired within context. The cycle of “doing, reflecting, understanding and applying” is generally facilitated by games.

### 2.3 Overview: Features of The Net Zero Game 2050™

- 📌 Event-driven business strategy/sustainability/negotiation board game
- ✌️ Collaborative/competitive
- 🎲 6 Game Modes
- 🕒 Play-time: 20-90 minutes depending on chosen Game Mode
- 👥 3-4 Business Leaders (players)
- 📅 Ages: 14+
- 🌐 Language: English (UK)

### 2.4 Carbon Events

The Game is driven forward by Carbon Events affecting the value and emissions of companies, value chains and industry sectors.

### 2.5 Game Modes

The Net Zero Game 2050™ can be played either competitively or collaboratively using different game modes. Pick one Game Mode (with its Key Performance Indicator(s), or KPIs) per game.

There are 6 different Game Modes.

## 2.6

## Game Modes Overview

The 6 different Game modes will help the teacher optimise learning objectives.

<b>Game Mode</b>	<b>Play-time*</b>	<b>KPI(s)</b>	<b>Name of Game mode</b>
#1	30-45 min	Company Value + Time	Short-term Value Creation
#2	30-45 min	Carbon Emissions	Portfolio Decarbonisation
#3	45-60 min	Company Value	Long-term Value Creation
#4	60-90 min	Carbon Emissions + Time	Net Zero before 2050
#5	60-90 min	Carbon Emissions + Circular Value Chain	Creating Circular Value Chains
#6	30-60 min	Individual	Secret Missions

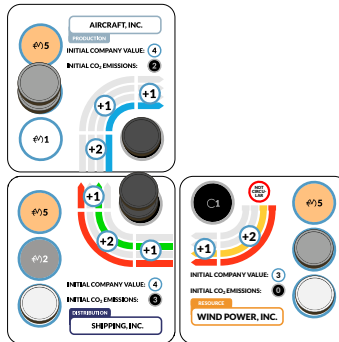
### KEY REFLECTION AND LEARNING POINTS

- Different choices of winner criteria and Game modes lead to very different types of games.

2.7

## Game mode #1: Short-Term Value Creation

The mindset is old-school capitalism with a focus on short-term value creation (i.e. within four Carbon Event Cards) without any consideration of carbon emissions and the potential value or damage of externalities. This affects (the execution of) the winning strategy.



*After 4 Carbon Events, this company portfolio has a value of 8 Money (which is the highest of all the portfolios).*

2.8

## Winner criterion

The Business Leader with the highest Company portfolio Value after 4 Carbon Events wins the game.

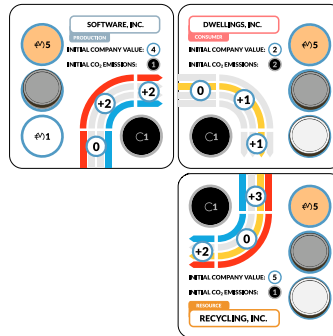
### KEY REFLECTION AND LEARNING POINTS

- All decisions related to the reduction of carbon emissions are devoid of any monetary value, and the GSO cards become practically worthless.

2.9

## Game mode #2: Portfolio Decarbonisation

It is all about optimising a double bottom-line of Company Value and Carbon Emissions. Some Business Leaders may prefer to reduce their company portfolio (creating “degrowth”) whereas others prefer to create value so that they can afford to invest in carbon reduction initiatives.



*A Company portfolio with zero Carbon emissions (no Carbon coins).*

2.10

## Winner criterion

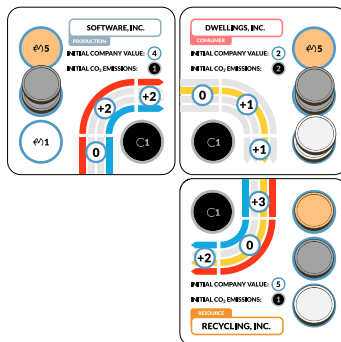
The Business Leader who first creates a company portfolio with zero Carbon Emissions wins the game.

### KEY REFLECTION AND LEARNING POINTS

- This is a great first-time game mode. This is the Game mode used when using the Avatar Sheets for onboarding.
- There are several proven winning strategies (depending on portfolio and team).

### 2.11 Game mode #3: Long-Term Value Creation

The focus is on the single bottom-line where the Business Leader with the highest Company Value in a zero-carbon-emission environment wins the game. It may take quite a few Carbon Event Cards to reach that zero-emission state.



*A Company portfolio with zero Carbon emissions and a total Company value of 18 Money.*

### 2.12 Winner criterion

The Business Leader with the highest Company Value in a zero-carbon emission economy (all company portfolios have zero emissions) wins the game.

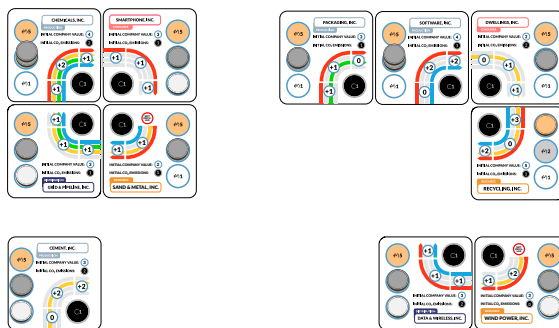
#### KEY REFLECTION AND LEARNING POINTS

- No Business Leader wants to sacrifice any value in order to reach Carbon neutrality. However, sometimes you have to break an egg to make an omelette.

## 2.13 Game mode #4: Net Zero before 2050

Time is running out if we are to reach carbon-neutrality in 2050 (or, in this game mode, the number of Carbon Event Cards is limited to 12), so Business Leaders have to cooperate, compromise and accept less than optimal short-term individual results in order to reach the overall desired outcome (just like at the UN Climate Summits, e.g. COP26).

The four company portfolios may end up looking like this:



*All companies in the four company portfolios reached zero Carbon Emissions after 12 Carbon Event Cards played.*

## 2.14 Winner criterion

The Business Leaders work together to create a world where all four company portfolios have zero emissions within 12 Carbon Events. The Business Leaders either all win or all lose.

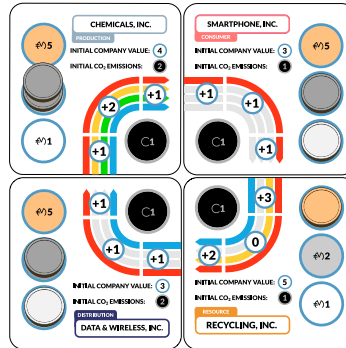
### KEY REFLECTION AND LEARNING POINTS

- A cooperative way of playing the Game can also be a platform for the students to develop personal skills.
- Often, the players end up arguing about who will give and who will take, just like at, for example, the COP26 summit.

2.15

## Game mode #5: Creating Circular Value Chains

The companies of the future will have to establish circular value chains. As only a couple of companies have the ability to enable a circular value chain, the value increase of those companies may turn out to be extremely high.



*All companies in the portfolio are connected via the Electronics value chain, and none of them have any Carbon Emissions.*

2.16

## Winner criterion

The Business Leader who first creates a fully circular value chain with zero Carbon Emissions wins the game.

### KEY REFLECTION AND LEARNING POINTS

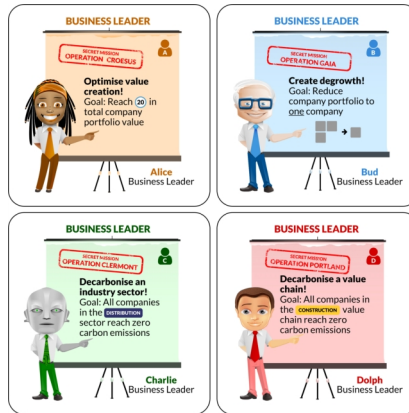
- This is one of the most challenging Game modes as there are only two circular Resource Company Cards available. The price for these companies may become very high.
- Creating true circular value chains has proven difficult. This game mode illustrates this point.

18

2.17

## Game mode #6: Secret Missions

This game mode shows how different missions (and winning criteria) affect the strategy and tactics employed by different Business Leaders.



*Each Business Leader card shows the individual secret mission of a Business Leader*

2.18

## Winner criterion

Each Business Leader is given a secret mission. The first to accomplish their specific goals, wins the game.

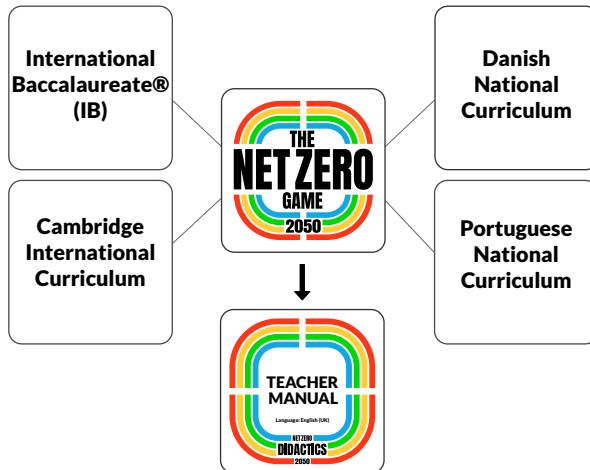
### KEY REFLECTION AND LEARNING POINTS

- For experienced players: Which mission is the easiest to accomplish in the Game? And why?
- For all players: Which mission is the easiest to accomplish in real life? And why?
- It is encouraged, perfectly possible and also good fun to create one's own secret missions.

## 3 Using the Game

### 3.1 Fit to Curricula

The way in which the Game fits into a given curriculum has been analysed for four different European curricula.



The examples on the following pages can be used as an inspiration.

#### KEY REFLECTION AND LEARNING POINTS

- All curricula match to the themes of the Game in one way or another.
- Luckily, it seems that other curricula - not investigated in detail here - also feature themes pertaining to sustainable development themes.

## Danish National Curriculum<sup>69</sup>

### Target users

- Students (age 14-18) in secondary schools.

### Use cases

- Single class (45 minutes) with a regular social studies teacher.
- Single class (45 minutes) with a substitute teacher using the Education Kit to introduce the students to the Game.

### Relevant subjects

- Social Studies.
- Education in UNDP Sustainable Development Goals (SDG).

## KEY REFLECTION AND LEARNING POINTS

- It can be used to, for example, to create your own Carbon Event based on present events in mass media.

<sup>69</sup> <https://emu.dk/grundskole>

## International Baccalaureate® (IB)<sup>69</sup>

### Target users

- Students (age 14-18) in secondary schools following the IB (International Baccalaureate) Programme.

### Use cases

- **CAS:** Activity of CAS (Creativity, activity, service):
  - Green Initiatives (e.g. playing with people from the local community)
  - Study Hall (e.g. introducing other students to the Game)
  - Organising a competition between different schools in various European countries
- **Internal Assessment:** As the game is centred around Carbon Events and the impact these have on business operations, students are presented with real-world issues that are aligned to the Internal Assessment project where a real business problem must be investigated through the key concept of either sustainability, change, ethics or creativity.

### Relevant subjects

- Business Management.

## KEY REFLECTION AND LEARNING POINTS

- Dig deep, set your curiosity free and explore the investigative feeling of discovering whether something is really true. An example: Are wind turbine wings recyclable?

3.4

## Portuguese National Curriculum<sup>Ⓔ</sup>

### Target users

- Students (aged 14-18) in secondary schools following the Portuguese National Curriculum.

### Use cases

- Double classes (90 minutes).

### Relevant subjects

- Geography
- Citizenship and Development

## KEY REFLECTION AND LEARNING POINTS

- The students can learn about resource scarcity and renewable energy.

<sup>Ⓔ</sup> <http://www.dge.mec.pt/documentos-curriculares-em-vigor-0>

## Cambridge International Curriculum

### Target users

- Students (aged 14-18) in secondary schools following the Cambridge International Programme.

### Use cases

- Double classes of Business and Science (90 minutes). Both teachers can take turns explaining the themes used during the Game. Seeing Science being used for practical purposes often motivates the students to learn
- As part of extra curriculum events such as the Environmental Week: PEACE (Programme on Environmental Awareness and Civic Education) developed by Prime School in 2019.
- As part of other Erasmus+ mobility projects related to the green transition, e.g. “Eco-Schools”.

### Relevant subjects

- Business Management
- Science (Biology, Chemistry and Physics)
- Career Programme
- Sustainability Management

### KEY REFLECTION AND LEARNING POINTS

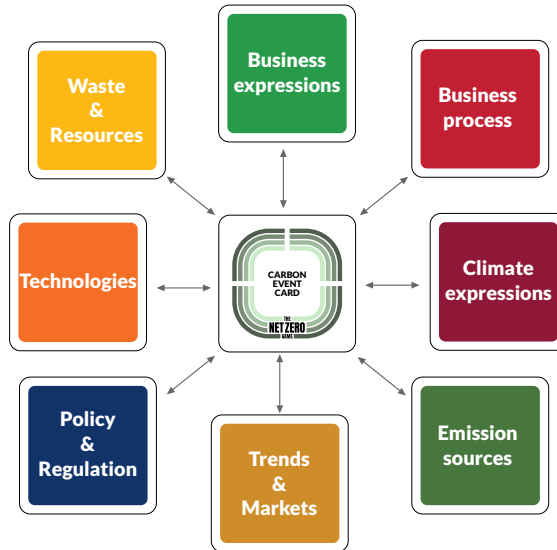
- The use of the Game during extracurricular events such as an *Environmental Week* or similarly themed weeks is a way for a school to stand out from the competition.
- Double learning is possible when the Game is used with mixed subject classes.

 <https://www.cambridgeinternational.org/Images/557020-2022-syllabus.pdf>

**3.6****Carbon Event Terminology**

As the Game is driven forward by Carbon Events, the Business Leaders will be exposed to different expressions that relate to business and society. The vocabulary reflects stakeholder capitalism.

Here are the main areas covered by the game:



These reflect the complexity of the real world. Some of the terms and expressions used are categorised and listed below.

3.7

### Business expressions

---

Consumption	Economically viable	International transport	Quality
Cost effective	Fulfilment	Lifetime	Re-manufacturing
Cost efficiency	Global average income	Local supply chains	Resources
Cost of output	Goods	Maintenance cost	Smart Industry
Demand	Growth	Market share	Supply chain
Digitalisation	Harvest yields	Market uptake	Transit times
Distribution sector	Infrastructure	Purchasing Power	

3.8

### Business process

---

Cloud computing	Dynamic route planning	Logistics systems	Resources extraction methods
Design-for-repair	Efficiency	On-site Services	Sorting protocol
Digitalisation	Efficient-route planning	Railway freight	

3.9

### Climate expressions

---

Captured CO <sub>2</sub>	Carbon-free energy	Cost of recycling	Negative carbon impact
Carbon Capture and Storage (CCS)	Carbon-neutral jet fuel	Energy	Net-zero impact
Carbon emissions	Carbon-neutral oil	Fossil fuels	Zero-carbon buildings
Carbon pricing	CO <sub>2</sub>	Gas extraction	
Carbon-efficient resource		Low carbon-footprint	

3.10

## Emission Sources

---

Airlines	Clean chemical production	Fuel efficient strategies	Offshore facility
Air travel	District heating	Methane emissions from livestock	Offshore installation
Buildings	Experimental aircraft	Methane leaks	Railway freight
Carbon-neutral oil and gas extraction	Fertiliser	Mining companies	Red meat
Cattle feed			

3.11

## Trends and Markets

---

Aircraft	Eco-conscious	Incentive-based recycling	Plant-based
Manufacturers	Emerging economies	Infrastructure	Plant-based foods
Cities	Flight shame	Middle-class	Population growth
Clean	Global middle-class	Passenger traffic	Urbanisation
Connected world	Green capital		
Consumer electronics			

3.12

## Policy and Regulation

---

Carbon emission taxes	Energy efficiency standards for buildings	Energy Efficiency Standards	Incentives
Carbon pricing	Extended Producer Responsibility	Government incentives	Sustainability tax
		Incentive-based	Tax schemes

3.13

## Technologies

---

Carbon-neutral turbines	Energy storage technology	Leak detection	Renewable energy
Cement	Fuel efficient strategies	Local heating systems	Smartphones
Chemicals	Gas pipelines	New housing	Smart power grids
Cloud computing	Hybrid-electric technology	Offshore facility	Turbines
Connected drones	Hydrogen-fuelled jet engines	Power quality	Vertical farming
Devices	Jet Fuel	Power-to-X	Wind energy
Drone inspections		Recycling technology	Wind turbine
Electric lorries			Wireless monitoring

3.14

## Waste and Resources

---

100% recycled plastics	Energy waste	Non-coal/coke-based fuels	Recycled
Biomass	Household waste	Plastic recycling	Recycled plastics
Building waste	Methane leaks		Renewable energy sources
Combustible waste	Mined earth metal		
Crushed concrete			

## 4 Climate

### 4.1 Net Zero vs. Zero

One definition of *net zero* is:

*“Net zero refers to a state in which the greenhouse gases going into the atmosphere are balanced by removal out of the atmosphere.”*

This means that hard-to-abate industries such as manufacturers of cement, can still become part of the net zero economy as long as they can offset their emissions by means of projects that reduce carbon emissions.

For that reason, this game features companies such as “Cement, Inc.” and is therefore called the Net Zero Game and not the Zero Game.

### 4.2 Greenhouse Gas

Greenhouse gas (GHG): All emissions that cause a greenhouse effect, such as CO<sub>2</sub> and methane. As around 80%<sup>∞ ∞</sup> of all GHG-emissions are CO<sub>2</sub> and in order to facilitate direct comparison, CO<sub>2</sub>-equivalents (CO<sub>2</sub>-e) are often used. CO<sub>2</sub>-emissions and emissions of other GHGs are often called carbon-emissions since all the involved molecules are organic. This Game also uses that terminology.

#### KEY REFLECTION AND LEARNING POINTS

- What is meant by the word “net”, i.e. what is the difference between *Net Zero Emissions* and *Zero Emissions*?
- Economists use the expression: “A zero sum game”. Is Net Zero Emissions a zero-sum game? Why - or why not?


<sup>∞</sup> <https://netzeroclimate.org/what-is-net-zero/>

<sup>∞ ∞</sup> <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

4.3

### Year 2050

A significant year where many countries will (or at least have promised to) reach a carbon-neutral economy.

*“President Joe Biden on Wednesday signed an executive order to make the federal government carbon-neutral by 2050, aiming for a 65 percent reduction in planet-warming greenhouse gas emissions by 2030 and an all-electric fleet of car and trucks five years later.”* 

4.4

### Green Transition

A general term used to describe the desired journey towards a carbon neutral and in other ways sustainable economy.




*“Unlimited activity, of whatever kind, must end in bankruptcy.”*

Goethe

#### KEY REFLECTION AND LEARNING POINTS

- If “net zero” in 2050 has to be met, how much must carbon emissions be reduced over the coming year, assuming a linear trend?
- What could be the reasons why committed emission reduction goals are often placed quite a long time into the future (e.g. for the years 2030, 2045, 2050 and 2070)?

30

 <https://www.whitehouse.gov/ceq/news-updates/2021/12/13/icymi-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/>

4.5

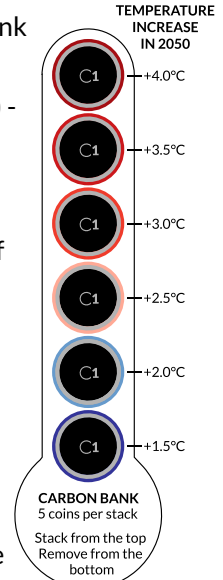
## Carbon Bank

To visualise carbon emissions, the game includes a Carbon Bank shaped as a thermometer which can hold 30 Carbon coins.

Each Carbon placed in a company (i.e. as part of the economy) - as opposed to being placed in the Carbon Bank - represents a global rise in temperature of  $0.1^{\circ}\text{C}$ .

Each Carbon coin stored in the Carbon Bank represents a reduction of global warming by  $0.1^{\circ}\text{C}$  compared to the case of  $4.5^{\circ}\text{C}$  in 2050 (or zero Carbon coins in the Carbon Bank).

The best-case scenario (all the carbon coins in the Bank) is equivalent to an increase of  $1.5^{\circ}\text{C}$  (which is, presently, considered acceptable by most climate scientists).



4.6

## Expanding the economy

When a Company is being sold from the bank to a Business Leader (i.e. becomes an active part of the economy), the forecasted temperature goes up. The forecasted temperature can only go down by decarbonisation of the value chains - or by companies exiting the economy.

### KEY REFLECTION AND LEARNING POINTS

- Initially in the Game, the more carbon emissions there is, the more economic activity there is. How the Business Leaders respond to that depends on the chosen game mode. This illustrates the impact of KPIs on the strategizing process and decision-making processes.
- If the carbon in the Carbon Bank is counted after each Carbon Event Card has been dealt with, it is possible to map the journey towards a (potentially) decarbonised economy - and relate that to the actions of individual Business Leaders.

4.7

## Scope 1, 2 and 3 emissions

The carbon emissions of a company fall into three categories<sup>∞</sup>:

- **Scope 1:** Direct emissions from company-owned and controlled resources.
- **Scope 2:** Scope 2 emissions are indirect emissions from the generation of energy purchased from a utility provider.
- **Scope 3:** All other indirect emissions – not included in scope 2 – that occur in the value chain of the reporting company, including both upstream and downstream emissions. In other words, Scope 3<sup>∞</sup> includes all other emissions that occur in a company's value chain - including the emissions from the use of the product.

4.8

## Implications

In this Game, each company is “born” with carbon emissions (Scope 1 and Scope 2). The more a Business Leader owns or controls of the supply chain, the better their insights into the business processes are likely to be, which increases the chances of implementing efficient carbon-reduction initiatives with a fast implementation time (and thus lower Scope 3 emissions). In the Game, this is called synergies.

“Intel commits to net-zero emissions in its global operations by 2040. Intel is also committed to addressing climate impacts throughout its upstream and downstream value chain, also known as Scope 3 emissions”<sup>∞∞</sup>

### KEY REFLECTION AND LEARNING POINTS

- Comparing the carbon emissions of Samsung (a vertically integrated company owning large parts of its value chain) with Apple (which has outsourced production) would not make any sense without the inclusion of Scope 3 emissions.

32

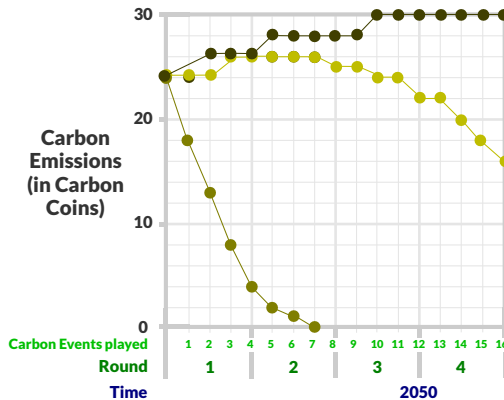
<sup>∞</sup> <https://www.carbontrust.com/resources/briefing-what-are-scope-3-emissions>

<sup>∞∞</sup> [https://www.business-standard.com/article/companies/intel-commits-to-net-zero-emissions-in-its-global-operations-by-2040-122041400050\\_1.html](https://www.business-standard.com/article/companies/intel-commits-to-net-zero-emissions-in-its-global-operations-by-2040-122041400050_1.html)

## 4.9

## Carbon Emissions over time

In the Game (as in real life) it is possible to map the carbon emissions at any given time (or Carbon coins in the companies) using the number of played Carbon Events (or turns) as a counter - and as an equivalent to a period of time.



*Total Carbon Emissions from all companies as a function of rounds played.*

## 4.10

## Decarbonising strategies

In Game mode #4 (reaching Net Zero before 2050) it is implied that when 12 Carbon Event Cards have been played then year 2050 has come around. Using that calibration and the fact that a Carbon coin in this Game is equivalent to  $0.1^{\circ}\text{C}$ , the curve presented is equivalent to the temperature-time graph presented by Nobel laureate William D. Nordhaus<sup>∞</sup> for different decarbonisation strategies.

### KEY REFLECTION AND LEARNING POINTS

- Different games and game modes lead to different durations of the game and different decarbonisation results

<sup>∞</sup> <https://www.nobelprize.org/uploads/2018/10/nordhaus-lecture.pdf>

## 5 Business Management

### 5.1 Introducing the language of business

This Game uses a fair amount of business terminology. Many expressions are part of the curriculum and also found in textbooks, whereas others perhaps are not (but still worth knowing as they are commonly used).

### 5.2 Market Economy

The game is based on market economy. The price of most assets is (except for the hostile takeover-situation) decided by auction amongst the Business Leaders, i.e. by supply and demand.

### 5.3 Strategy

The chosen game mode and winning criteria (or Key Performance Indicators, KPIs) affect the possible winning strategies for the Business Leaders - making the game a truly strategic game.

The game encourages Business Leaders to reflect, (re)strategise and (re)define tactics based on the performance of their own company portfolio as well as the ones of other Business Leaders (e.g. the type of companies in their company portfolio and their company value and carbon emissions). This illustrates the significance of Business Intelligence.

#### KEY REFLECTION AND LEARNING POINTS

- The Business Leaders may see that the auctions lead to behaviour from Business Leaders that is not always rational.
- In the beginning of the game, Team members can be hired for 1 Money each. Later in the game, the average price seems to be higher. Why?

#### 5.4 **Company**

In this game, a company is a separate legal entity that can be described by its:

- Static descriptors: Company name, industry sector, in which value chains it operates, and how it connects upstream and downstream with other companies
- Dynamic descriptors: Company value and carbon emissions.

#### 5.5 **Daily management**

How and in which company portfolio a company operates can be changed by management teams (the GEOs, GSOs and GROs) and by the ultimate decision maker (the Business Leader).

#### 5.6 **Value allocation**

In this game, as in real life, the Business Leader can (re)-allocate capital to specific companies. The allocation of capital and resources is at the core of capitalism.

#### 5.7 **Company bankruptcy**

No Business Leader is obliged to reallocate resources to a company needing an infusion of money.

In fact, company bankruptcy is a convenient way to get rid of carbon intensive companies with low present Company value.

### **KEY REFLECTION AND LEARNING POINTS**

- As in real life, some companies that end up in distress are not worth saving. It is likely that companies in specific carbon intensive industry sectors will not be able to survive the green transition.

5.8

## Value Chain

Four value chains have been picked for this game: Food, Electronics, Construction and Aerospace. The value chains are very carbon intensive and contribute significantly to the total global emissions.



5.9

## Industry Sectors

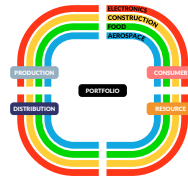
All value chains have been simplified so that they consist of companies within four industry sectors: Resource, Distribution, Production and Consumer Electronics.



5.10

## Complete Economy

The companies - combined into value chains - form the complete economy in this Game. In rare cases, it is possible to create a genuinely circular economy.



## KEY REFLECTION AND LEARNING POINTS

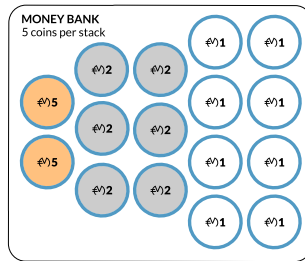
- All the chosen value chains create products that are known from and form part of daily life for individual final consumers, e.g. red meat, smartphones, dwellings and airline flights. This makes the game very relatable.
- What other carbon intensive value chains with a clear consumer focus are there? Textiles and Personal Transportation could be relevant answers<sup>99</sup>.

## 5.11

## Money Bank

To visualise the size of the economy emissions, the Game includes a Money Bank which can hold up to 150 in Money value.

The Money Bank serves various practical purposes in the game. One purpose is to indicate the economic activity and prosperity of the business society: The more money in the Bank, the less valuable the companies are.



## 5.12

## Currency

The Game does not use a specific currency such as dollars or euros. The main reason for this is that the actual values of companies and the quantitative impact of a Carbon Event have been calibrated to fit the format of the Game.

### KEY REFLECTION AND LEARNING POINTS

- Did you create a positive Return on Investment (ROI) of the initially allocated 15 Money? Why or why not?
- Would you be able to decarbonise slower/faster if you had started out with 10 or 20 Money instead of 15?
- What would happen if all Business Leaders suddenly got 5 Money each from the Bank? Would it create inflation? Would it depend on game mode and winning criteria?

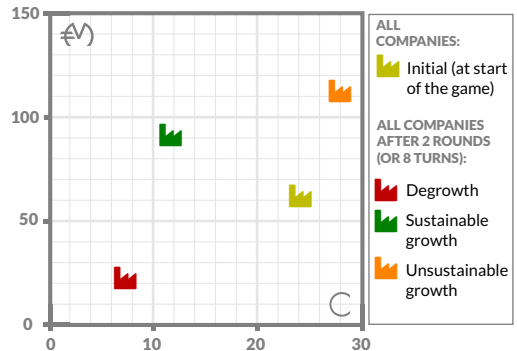
5.13

## Money and Carbon

In this Game, the total amount of Money provided is 150, and the total amount of Carbon is 30.

This means that the whole economy (without externalities) or parts of it (e.g. industry sectors, value chains, company portfolios or even individual companies) can be plotted into an emission-value chart.

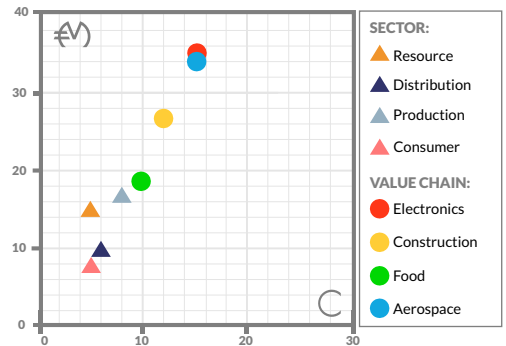
The graphs show a start scenario where 15 out of 18 companies form part of the economy (and 3 are owned by the bank).



5.14

## Dynamics

As the Game evolves, the positions may change, and the total economy may either shrink or expand.



### KEY REFLECTION AND LEARNING POINTS

- Individual Business Leaders may be able to gain portfolio value while the whole economy is shrinking. What could be the reason(s) for that?

5.15

## Synergy

Synergy is often described as:

$$1 + 1 = 3$$

A slightly more elaborated definition says:

*“Synergy is the concept that the combined value and performance of two companies will be greater than the sum of the separate individual parts. Synergy is a term that is most commonly used in the context of mergers and acquisitions (M&A). Synergy, or the potential financial benefit achieved through the combining of companies, is often a driving force behind a merger.”*<sup>69</sup>

In real life, synergies have been used to justify conglomerates consisting of a substantial number of different companies operating in different industries.

However, quite often the “cost of complexity” has turned out to be higher than the value of the harvested synergies.

<sup>69</sup> <https://www.investopedia.com/terms/s/synergy.asp>

5.16

## A new type of synergy

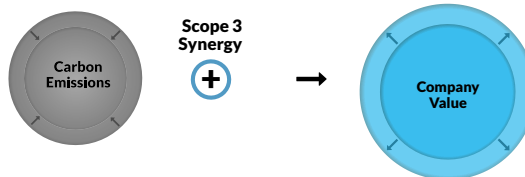
As mentioned in the Climate Chapter, Scope 1, 2 and 3 emissions will become vital issues for companies in the coming years. Large companies will soon have to report Scope 1, 2 and 3 emissions<sup>☞</sup>, which will increase the focus on the decarbonisation of their complete value chains.

### Market Valuation

It has been reported that companies with clear carbon-emission reduction goals trade with a price premium<sup>☞☞</sup>. This indicates that the market and investors see carbon emissions as future liabilities - and (plans for) decarbonisation as being worth while for the long(er) term return on investments.

### Scope 3 Synergy

The synergies between companies - by coordinating and optimising the combined effort in reducing Scope 3 emissions - could be called *Scope 3 Synergy*<sup>☞☞☞</sup>.



Because of this, the Business Leaders in our Game are rewarded for creating a portfolio of companies operating in the same value chain(s).

☞ <https://www.sec.gov/news/press-release/2022-46>

☞☞ <https://edition.cnn.com/2021/04/22/investing/net-zero-pledge-companies-stocks/index.html>

☞☞☞ We have coined the term *Scope 3 Synergy*. It is - to our best knowledge - not a general business-climate term - but we hope that it will be soon!

## 6 Portfolio Management

### 6.1 Portfolio Management

An important part of the Game is to optimise one's own company portfolio and also keep an eye on the portfolios of other Business Leaders.

It is the job of any holding company and investor - or in this Game the Business Leader - to (re)allocate funds (in this game: Money coins) to and between its portfolio companies in order to optimise returns.

The Game therefore incorporates various ways to acquire and divest companies in order to increase company value and/or reduce emissions - and by that (depending on Game Mode) potentially win the game.

#### KEY REFLECTION AND LEARNING POINTS

- Which returns must be optimised depends on the chosen KPIs.
- How can a company like Intel influence their suppliers behaviour (upstream) and their customers' use of their product (downstream).

6.2

### **Buy a Company at a Bank Auction**

The Business Leader picks a company available in the Bank for auction. As all Business Leaders can bid, the price of the company reflects the market value of the company in general as well as its strategic importance for specific Business Leaders.

The Bank, at least in this Game, prefers not to have any companies on their books. Even so, the Bank's ambition is always to increase its profit by selling the companies at as high a price as possible.

6.3

### **Uninvited (Hostile) Takeover**

The Business Leader can - by deploying a GEO - take over another Business Leader's company at its present value. This can be fended off by another GEO.

In real life, sometimes outside Business Leaders may think that they are the "right owner" of a certain company. They may think that the present company strategy is not optimal or that the executives running the company are performing poorly. More often than not, the existing Business Leaders of the company disagree.

This is what lies behind the GEO vs. GEO mechanism in the Game.

#### **KEY REFLECTION AND LEARNING POINTS**

- If a company represents, for a specific potential buyer, a value that is higher than the actual value of the company, then the company is an attractive target for a takeover attempt.
- In this Game, a fully decarbonised company is often attractive.
- In some game modes (where creating a circular value chain is a KPI), companies within the resource sector that have the ability to form a truly circular value chain become very valuable.

**6.4**

### **Sell a Company to Other Business Leaders**

A Business Leader may offer other Business Leaders the opportunity to take over a specific company. The price of the company can be negotiated freely, and any Business Leader may choose to take part in the negotiation.

In this Game, selling a company can be a way to raise cash (for investment or for survival) or get rid of companies that do not fit into the value chain(s).

Achieving that in this Game requires persuasion skills and convincing arguments. In real life, this is often done by M&A firms and brokers making *pitch decks* to show to potential buyers listed in a so-called *pitch book*.

**6.5**

### **Trade a Company with other Business Leaders**

In this Game, a Business Leader may offer other Business Leaders the opportunity to trade a specific company with a company owned by another Business Leader.

The offer can be made more attractive by adjusting the values of the specific companies (e.g. by offering additional cash). These types of deals are rarely seen in real life where companies usually want to consolidate industries.

**6.6**

### **Solvent Company Liquidation**

If a company has zero value and zero emissions, the Business Leader is allowed to hand it over to the Bank. The rationale for this is that a Business Leader eliminates their risk of acquiring additional carbon emissions (due to an unfortunate Carbon Event) but also their chance of creating value (due to a fortunate one). Nobody loses any value, except for the Business Leader.

#### **KEY REFLECTION AND LEARNING POINTS**

- Some companies will be divested in order for a Business Leader to reduce the carbon emissions of the remaining total company portfolio.
- Closing a deal requires social intelligence and interpersonal skills.

## 7 Human Resources

### 7.1 Business Leader

A non-gender specific term for the individuals with the overall responsibility. In this Game, the business leader can be seen as the leader of a holding company that, at least initially, owns quite a few companies.

During a Game, any Business Leader gets to make 10 high-value, high-impact decisions in an hour. In real life, the figure is likely 10 such decisions a year!

### 7.2 Team

The green transition requires a new breed of business leaders and executives with a focus on both value creation and sustainability. To emphasise this new type, we call them: **Green** Executive officers (**GEO**, **GSO** and **GRO**). As opposed to commonly used titles such as CEO, CFO, CSO, CTO or CxO.

*"If you want to walk fast, go alone. If you want to walk far, walk together." <sup>∞</sup>*

The game introduces the importance of a diverse team with specific skills that supplement each other.

Further, most genders found in today's society will find themselves represented in the avatars used in a game where only talent and skills count. Also, it is possible to play "nice" or "nasty" reflecting various real-life leadership styles.

#### KEY REFLECTION AND LEARNING POINTS

- What is the function of executives?
- What is the role of different CxOs within in a company?

**7.3**

### HR Pool

All team members who are not hired are placed in the HR Pool. This is the equivalent of the labour market.

**7.4**

### Market Price

As all team members are hired by auction (except at the beginning of the game), the average market price may go up or down.

Obviously, in real life, any potential team member would be free to reject a job offer (otherwise it would be a violation of basic human rights). In this Game, however, they are eager to join the team of any Business Leader.

**7.5**

### Other Leadership and Human Resource issues

Note that this game is not concerned with the many, often intricate and vital, issues of leadership, team building and people management.



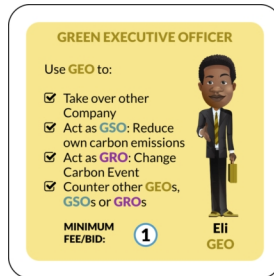
#### KEY REFLECTION AND LEARNING POINTS

- The price of hiring team members is likely to go up during the game! Why?
- Does the signing-on fee for new team members go down if there are many team cards in the HR Pool? Why - or why not?
- This Game trains its Business Leaders in making fast and important decisions (or at least to show good judgement) under stress.

7.6

## Green Executive Officer (GEO)

The Chief Executive Officer (CEO) becomes (in our Game) a Green Executive Officer (GEO).



As is often the case in real life, the CEO (or here the GEO) is responsible for M&A activities which are often of a critical strategic issue with considerable amounts of money involved.

Also in case another CxO is absent - where x stands in for various letters- the CEO will become interim manager taking over the responsibilities of the absent manager. This is also often the case in real life.

The GEO is therefore also, as in real life with a CEO, considered the most valuable team member and is thus offered the highest remuneration package (salary, bonuses, perks).

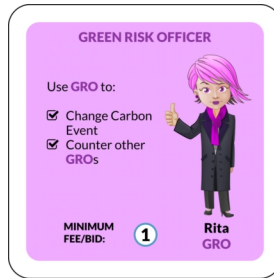
### KEY REFLECTION AND LEARNING POINTS

- Do you know any companies where the CEO “is” the company?
- Would Tesla and SpaceX have become what they are today without Elon Musk?
- Would Apple have become the Apple we know now without Steve Jobs?
- What do you see as the pros and cons of creating a “person cult” around top executives?

7.7

## Green Risk Officer (GRO)

The Chief Risk Officer (many companies assign this role the Chief Financial Officer, CFO) becomes the Green Risk Officer (GRO) in our Game.



The GRO is a personification of several functions:

- **Lobbyism:** a company can influence (or delay) certain political initiatives by communicating their point of view to political decision makers.
- **Risk management:** A *proactive* risk management plan makes it possible for a company to plan and prepare for unforeseen events (except so-called black swans) or specific scenarios (such as base case, good case, worst case).

### KEY REFLECTION AND LEARNING POINTS

- The word *lobbyist* is often associated with negative connotations. Why?
- Do the words *influencer* or *adviser* give you similar associations? Why? Or why not?

7.8

## Green Sustainability Officer (GSO)

Up until now, many companies have not had a Chief Sustainability Officer. The sustainability teams that do exist often report to a lower level. We foresee, that this will change. This Game therefore has a Green Sustainability Officer (GSO) who has the ability to reduce carbon emissions.



In our Game, the GSO is the personification of any initiative in a company with the aim of reducing carbon emissions, e.g. by means of investments in new technology or by process improvements or similar.

As in real life, the market price of the GSO is lower at the beginning of a game. This corresponds to picking the low-hanging fruits first - e.g. “turn off the lights when you leave” - whereas the last carbon reduction efforts to reach net zero are much more expensive (e.g. implementing a low-carbon (re)design of production or business procedures).

### KEY REFLECTION AND LEARNING POINTS

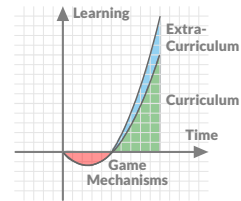
- In the game modes where carbon emissions are not part of the KPIs, the GSO has zero value!
- 20 years ago, there were very few sustainability managers in companies. Why?

## 8 Onboarding

### 8.1 How to onboard the board game

An efficient and well-designed onboarding process reduces the time spent on non-curricular-related learning.

Using the framework from 1.9 the impact of efficient onboarding is to reduce the red area and increase the time spent on curriculum-relevant learning (increase the green area)



### 8.2 Onboarding methods

There are several ways to onboard a new board game:

- **The old school way:** Read the rule book, then start playing the game following the instructions. This is time consuming.
- **The Modern way:** Watch a demonstration video. This is passive (and a bit boring).
- **Our way:** Use Avatar Sheets.

Using the Avatar Sheets (which are part of the Education Kit) makes the onboarding both interactive, fun and also presents real learning. It makes important decisions for first-timer players so that they can focus on learning how to play the game.

8.3

### First preparations for the Game session

- **Allocate time:** The duration of the first round of onboarding using the Avatar Sheets: 45 minutes.
- **Gamers:** A sufficient number of students aged +14 years.

8.4

### Prepare the classroom

- **Negotiation tables:** Arrange tables and chairs so that 4 students may sit around the table.
- **Create groups of four:** For the first round (i.e. the first four turns) of the game, it is important to have teams of 4 students as the Avatar Sheets have been designed for 4 players. In case of an odd number of students, students can form small teams.

8.5

### Materials required per group

1 ✘ The Net Zero Game 2050™

1 ✘ Business Leader Avatar Sheets (A, B, C, D) per group of 4 students

1 ✘ Teacher Avatar Sheet per teacher (or *Game Master Sheets*)



### KEY REFLECTION AND LEARNING POINTS

- A classroom of students with furniture has now transformed into a board room of Business Leaders seated around a board table ready to lead, strategise and execute their strategies.
- A teacher (perhaps a substitute teacher) may use the Teacher Avatar Sheet to speed up decision making time on the relevance of the Game without having to consult the Teacher Manual.

### **8.6 Introduce the Game and the universe**

The Mission Brief (see page 11) may be used as inspiration.

### **8.7 Hand out the Business Leader Avatar Sheets**

Each player receives one Avatar Sheet which makes them a Business Leader.

### **8.8 Setting up the Game**

The four pages on the front side of the zig-zag flyer provides clear steps on how to set up the game.

Players have to find the different cards and coins and set up their company portfolio.

Some will also try to understand the meaning of the symbols and numbers printed on the cards - so allocate time for all players to read the list of symbols so they can understand the Carbon Event cards.

## **KEY REFLECTION AND LEARNING POINTS**

- The first students to finish setting up their own company portfolio and team can start stacking Money coins in the Money Bank and Carbon coins in the Carbon Bank.
- Save time by picking the Carbon events used in the first round and place them on top in the Carbon Event deck.

8.9

## Playing the game

The player with Avatar A starts the Game.

For the first round, all players have precise instructions for what they have to do. Some will want to “do more sooner” - but they have to be patient.

Via the Teacher Avatar Sheet the teacher can follow all the tasks the different players have to complete.

8.10

## Climbing the learning curve

Each player just needs to follow the instructions from their own Avatar Sheets. The complexity of the tasks in the Avatar sheet increases by each turn.

After the first full round (or four turns), all the important and most commonly used rules of the Game have been introduced, and the game may continue (without consulting the Teacher Manual or the Rule Book).

8.11

## Preparing for the debriefing and the “aftermath”

The Teacher Avatar Sheet contains hints and information that can be used to stage a discussion after the game has been played. A QR code leads to the source of the Carbon Event.

**7 Warm-Up Round: Alice's turn**

**Learning Action**

- 1. Alice becomes the first Business Leader in turn.
- 2. Alice plays a Carbon Event.
- 3. The Business Leader in turn, Caroline, gives Alice a **CO2 card**.
- 4. Alice, as **OCEANOLA INC.**, changes its value to 10.
- 5. Alice, as **OCEANOLA INC.**, changes its emissions to 10.
- 6. Alice plays a **CO2** to reduce carbon emissions of **OCEANOLA INC.**
- 7. The Business Leader in turn, Caroline, gives Alice a **CO2 card**.
- 8. Alice gives the authorization.
- 9. Alice, as **OCEANOLA INC.**, reduces its emissions by 10.
- 10. The **CO2** moves to the HR Pool.

**Some learning points from Alice's turn:**

1. Different companies in different value chains may be characterized by their company value and carbon emissions.
2. The **Team Card** introduces a new range of green business leaders when used by the **Chief of CO2 emissions** Game.
3. The value and emissions of a company may be influenced by external and internal factors (as illustrated by the Carbon Event).
4. Playing the **CO2** card represents an investment of the Business Leader (reduction/avoidance of carbon emissions of its own company, to keep and then "steal" to reduce emissions).

**LINK TO SOURCE:** 

## KEY REFLECTION AND LEARNING POINTS

- After this first round, the players know most of the rules and will be able to play the game freely, using randomly picked Carbon Events.
- The decisions pre-made for them have been made based on an equal start capital of 15 Money - so it is fair just to continue playing.

8.12

### **Debriefing and “Aftermath”**

A good way to stimulate reflection is if the teacher explains the relevant business theory and the students then make the connection to what they have just experienced while playing.

8.13

### **Q&A-session**

If there is time for a more thorough debriefing, there are several interesting questions to ask. A few ideas are:

- Which Carbon Event was the most interesting? Why?
- Identify the core concepts in the Game! Then explain them!
- Who had the worst company portfolio, and who had the best? Explain why?
- Was it frustrating to lose the game? Why - why not?

#### **KEY REFLECTION AND LEARNING POINTS**

- The teacher may pre-pick specific Carbon Events whose content is of high relevance to the students.

## 9

# Example: Lesson Plan

### 9.1

## Lesson plan to understanding key concepts in The Net Zero Game 2050™

Learning objectives – Students will gain an understanding of the key concepts in a circular economy and how businesses can drive the world towards sustainability.

### 9.2

## Topics covered

- Sustainability
- Sectors of the economy
- Stakeholder capitalism
- The circular economy

### 9.3

## Materials

A3 or A4 card boards, computer, access to the internet, a copy of The Net Zero Game 2050

### 9.4

## Duration

2 x 60 minutes if the optional task involving PechaKucha<sup>®</sup> presentations is excluded.

9.5

## Part 1 - Sectors of the Economy

Watch Quickonomics, The sectors of the economy<sup>∞</sup>

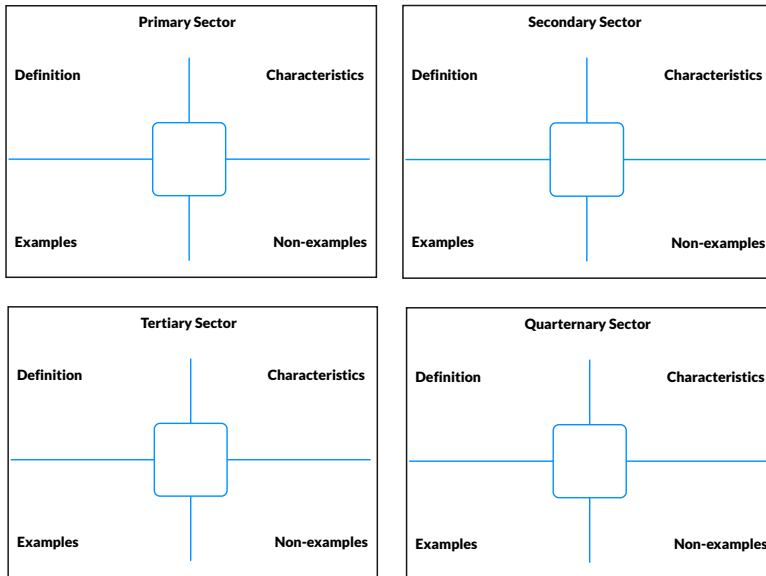
9.6

### Task 1 (20 min)

Using real-world companies, apply the Frayer Concept Model to define, characterise, and provide examples and non-examples of the following business sectors.

9.7

### The Frayer Concept Model applied



<sup>∞</sup><https://www.youtube.com/watch?v=tFhj9fwAOzw&t=26s> (2:49)

9.8

### Task 2 (10 min)

Identify the main sector of the economy for the following businesses, which are all included in the Game:

Software \_\_\_\_\_

Wind power \_\_\_\_\_

Shipping \_\_\_\_\_

Chemicals \_\_\_\_\_

Cement \_\_\_\_\_

Smartphones \_\_\_\_\_

Farming \_\_\_\_\_

Dwellings \_\_\_\_\_

Aircraft \_\_\_\_\_

9.9

### Part 2 - Stakeholders

9.10

### Task 3 (10 min)

Watch the video from MSCI on Stakeholder Capitalism<sup>∞</sup> Explain what is meant by 'stakeholder'

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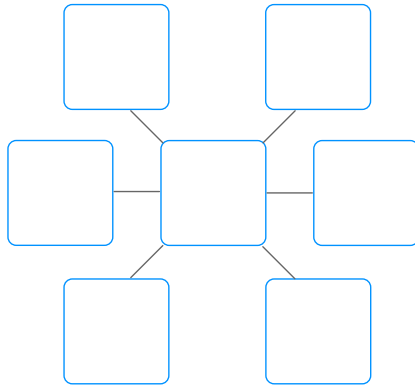
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<sup>∞</sup> <https://www.youtube.com/watch?v=w3PfqdTlY34> (2:01)

**9.11 Task 4 (15 min)**

Using one of the companies from above, place the company in the centre of the diagram below and identify six stakeholder groups relevant to the company.



**9.12 Which stakeholder group do you think is most important - and why?**

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9.13

### Part 3 - The Circular Economy

9.14

#### Task 5 (10 min)

Watch CNBC Explains: 'What is the circular economy?' - Outline briefly what is meant by 'a circular economy' <sup>∞</sup>

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9.15

#### Task 6 (30 min)

Choose a company from below and create a poster of A3 or A4-size where you illustrate four ways in which the company is working towards a sustainable business model. Compare your findings with those of the other students:

- Rio Tinto: <https://www.riotinto.com/en/sustainability/our-approach>
- Coca-Cola: <https://www.coca-colacompany.com/sustainable-business>
- Volkswagen: <https://www.volkswagenag.com/en/sustainability.html>
- Nestlé: <https://www.nestle.com/sustainability/regenerative-food-systems>
- Maersk: <https://www.maersk.com/sustainability>
- Microsoft: <https://www.microsoft.com/en-us/sustainability/approach?activetab=pivot1%3aprimaryr4>
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<sup>∞</sup> [https://www.youtube.com/watch?v=\\_0Spwj8DkM](https://www.youtube.com/watch?v=_0Spwj8DkM) (3:43 min)

9.16

### Optional task

Share your findings in a PechaKucha presentation.

PechaKucha<sup>∞</sup> (Japanese for “chit chat”) is a storytelling format. Students create a presentation of 20 slides. During the presentation, the students can speak for 20 seconds with each slide, a total of around six minutes.

Examples of points to be included:

- What is the circular economy model?
- Which company is the most sustainable?
- Has any of the firms achieved a circular business model?
- Which are some of the biggest challenges facing the companies?
- Can you think of other solutions?

9.17

After the class discussions the students are now ready to play the Game.



*"I never lose.  
I either win or I learn."*

*Nelson Mandela*



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