EIT RawMaterials
Connecting matters

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EIT RawMaterials RM@Schools

MODERN DEVICES – YES PLEASE! WHAT ABOUT MINING?

NEXT

Raw materials are crucial for the European economy. They form a strong industrial base, producing a wide range of everyday goods, applications and modern technologies.

Do you think that we get all the raw materials, which we need, to produce common goods in European factories from mines in Europe?

YES

NO

Yes, that is right. We only get as **low as 20 to 25%** of the raw materials we use from mines in Europe. But we do **have several deposits that we are not exploiting.**

First, let see which raw materials are deposited in Europe and which ones we mine. We will try to make some everyday objects.

NEXT

That would be great but unfortunately is not like that. We only get as **low as 20 to 25%** of the raw materials we use from mines in Europe. But we do **have several deposits that we are not exploiting.**

First, let see which raw materials are deposited in Europe and which ones we mine. We will try to make some everyday objects.

NEXT

For the beginning, let’s start with something easy– let's make a **can for soda**.

Which raw material a can is made from?

- Glass
- Metal
- Paper
- Plastic

No, a can is not made from that raw material.

The raw material used for can is solid and has a metallic luster.

TRY AGAIN

Yes, that is right! We need metal. In this case, some soft metal that is easy to bend. Any ideas?

We usually process it from **bauxite** – a mixture of minerals without clearly visible crystals. It leaves a red line on the paper.

(try to find it in front of you and/or click on the right picture)

No, that is not bauxite.

Bauxite is a mixture of minerals without clearly visible crystals. It leaves a red line on the paper.

TRY AGAIN

You have found bauxite! With different processes, we extract **aluminium metal** from it.

Now let's take a look at the map of Main Mineral deposits of Europe.

Do we have aluminium deposits in Europe?

YES

NO

Look more carefully.

Aluminum is the **second most abundant metal on earth**, so we probably have some in Europe.

TRY AGAIN

That’s right! We have aluminium deposits in Europe and we also extract it. But aluminum is the second most abundant metal on earth, so it is not that hard to find.

Let's try to make another product. You want to make something as simple and usual as **saltshaker.**

Which raw materials do you think you need for a full saltshaker like this one in the picture?

- Plastic, paper and salt
- Glass, aluminium and salt
- Aluminium and glass

Hmm, maybe you can buy a saltshaker made from plastic and paper but that one in the picture is not made from them. And yes, that is right, salt is also a raw material.

TRY AGAIN

That's right!

From which raw materials can we produce glass, aluminium, and salt?

- You already know that we need **bauxite** for aluminium.
- For glass we need **quartz sand** – small transparent grains.
- **Salt** is also a raw material that can be extracted in salt pans or mines.

(try to find them in front of you and/or click on the right picture)

No, those are not the right raw materials.

Quartz sand is composed of small transparent grains and you already know how bauxite and salt look like.

TRY AGAIN

You have found the right raw materials!

In Europe, we **have deposits of all these raw materials and we also exploit them.** The salshaker can then be made from European raw materials.

But what about some other rarer or more important raw materials or even **critical raw materials (CRMs).** Do you think we have deposits in Europe?

NEXT

If we want to make more technologically demanding devices, we need more and more raw materials.

For example, if we want to make a light bulb, we already need about **5 different raw materials** (copper, tungsten, quartz sand for glass, gas like argon and nitrogen…). But if we want to make a mobile phone, we need **about 50 different raw materials**.

Many of them are CRMs like tungsten, gallium, cobalt, platinum, antimony…

Can you find these CRMs on the Map of main mineral deposits of Europe?

YES NO

Look more carefully.

TRY AGAIN

Yes, that is right, we have deposits of all these CRMs in Europe. **So why are they critical raw materials then**?

They are economically important, but we **do not mine and produce them in Europe, or only in small quantities**. European mining often competes with mining in countries that have low environmental and social standards and can be economically more competitive. That is why, it is necessary to open new mines and maintain those that are productive. If you look at the world map the largest share of the EU supply of CRMs comes from China, Russia, or the USA.

NEXT

WE CREATED A CHALLENGE FOR YOU!

Use your acquired knowledge and try to set up a **successful company in Europe.**

You will produce **batteries** and your initial **budget is 1.000.000 €.**

NEXT

- Almost all **electronic devices** (phones, computers, electric scooters… everything that can be charged with electricity) need batteries.
- Due to the accelerated production of electric cars and green technology, the **demand for batteries has increased**, especially the demand for **lithium-ion batteries.**
- Lithium-ion batteries have the highest **charge density of all comparable systems**. This means that they can deliver a ton of energy without being very heavy.

As a director, **your first task** is to become familiar with the lithium-ion battery. How does it work, and what raw materials do you need to buy to produce this battery?

LEARN MORE

LITHIUM-ION BATTERY

- A battery consists of an **anode, cathode, separator, electrolyte,** and two current collectors (positive and negative).
- The anode and cathode store the lithium. Lithium is extremely reactive in its elementary form, which is why lithium-ion batteries use **lithium-ions.**
- **Lithium metal oxides** are used in the cathode (various possible formulations, usually cobalt and nickel are used in combination with lithium) and **lithium-carbon** (graphite) compounds in the anode.
- The electrolyte (lithium salt) carries **positively charged lithium ions** from the anode to the cathode and vice versa **through the separator**.

NEXT

Which are the most essential raw materials to make a lithium-ion battery:

- Lithium, carbon, oxygen and copper
- Iron, copper, lithium and cobalt
- Lithium, cobalt, graphite and nickel
- Graphite, lithium, gold and silver

No, **those are not the most essential raw materials** that you need to produce a lithium-ion battery.

Try to read the slide about lithium-ion battery one more time.

TRY AGAIN

That's right, so this is your shopping list! Two of these raw materials are currently listed as **CRMs** by the European Commission: **cobalt and natural graphite. Lithium**, for now, isn't CRM but the demand for it is currently very high, so we can say that it is **strategic raw material.**

So it will not be easy to buy these raw materials!

Raw materials are **limited**, and their price depends heavily on many factors.

The colored countries on the map have **the largest share of the global production of battery materials.**

NEXT

Europe also has a **small share** in the global production of battery materials.

In addition, there are some potential production sites that could be opened in the future.

Thus **batteries can be made from European raw materials**, but these are not enough for the needs of the European market.

NEXT

Final instructions before you make the first decision for your company:

- Don’t forget that you have **a budget of 1.000.000 €**. Your negative limit is **- 50.000 €.**
- **Think carefully** about what you will invest your money in. Keep in mind the circular **economy scheme**.
- in the first phase of a company, many **key decisions** are made which have significant and lasting consequences from a raw materials perspective.
- Don't forget that at some point you will also **have to pay monthly costs** for your company (production energy, payments...). Sometimes you will also have some **unforeseeable costs.**

NEXT

First you need to know the **indicative quantities** of the raw materials you want to buy. Your product specialist tells you the estimated quantities.

He also informs you that his team can provide you with a **new design of the battery** for an additional budget (200.000 €).

If you want to know more about the design of a product click **LEARN MORE** button.

LEARN MORE

Do you want to invest in a new design?

YES

NO

DESIGN OF THE PRODUCT

Better designs deliver a product that is more functional and is made from optimal materials to deliver the best performance while minimizing its negative impact throughout its life cycle.

Better design can:

- **Minimize raw materials consumption** (you need less raw materials for production of a battery).
- **Improve** the possibilities for **repair and reuse**.
- Enable materials to **continue** their life **through recycling**.
- **Minimize waste** at every step of the production cycle.
- Enable a product to **perform even better**.

BACK TO DECISION

Perfect, you have invested money in the new design!
Now you **have to buy raw materials**.

You have to examine different suppliers. Think about **possible risks** in some countries. The prices already **include the transport costs**. You have to decide at what price and from where you will import most of raw materials:

- Buy the most expensive raw materials (500.000 €)
  (they are mined in Europe)
- Buy the raw materials at an average price (400.000 €)
  (they are mined in South America)
- Buy the raw materials at the best price (300.000 €)
  (they are mined in Africa)

Great, you have bought the raw materials and now **you can start production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Since your budget is getting smaller, your **options are limited**. Chose one:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 1

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. The **most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 290.000 €

1. New design 200.000 € ✓
2. Purchase of RM 300.000 € ✓
3. Alternative RM 150.000 € ✓
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Because of your previous investments you have more options for a solution. You have enough time to **find a new supplier** in Europe, but because **price and demand for this raw material** increased rapidly, this could cost you a lot of money (400.000 €). But you also invested in alternative raw materials so you can **replace this raw material with an alternative raw material** which will cost you a lot less (150.000 €).

BUDGET = 290.000 €

1	New design 200.000 €	✓
2	Purchase of RM 300.000 €	✓
3	Alternative RM 150.000 €	✓
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. Also your experts for alternative raw materials tell you that your product **can be made partly from recycled materials**. But you need to invest (100.000 €) in new production equipment for recycling and making batteries partly from secondary raw materials.

BUDGET = 140.000 €

1. New design 200.000 € ✓
2. Purchase of RM 300.000 € ✓
3. Alternative RM 150.000 € ✓
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. Mine closure 150.000 € ✓
8. Recycling ? € ☐

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in new production equipment?

YES

NO

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

You have **successfully adapted** to the market and sustainable development. In the following weeks, the prices of primary mineral resources rose sharply, but since you now also use a share of secondary mineral resources for your production, this does not affect you as much. Sales go very well and soon you have enough budget for an expansion.

Congratulations, you have established a good company that strives for a sustainable development and a circular economy.

Your company has succeeded!

2

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

3

Reason: you didn't adapt to the market and to sustainable development goals!

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Chose one option:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)
- You invest in even better equipment (50.000 €)
  (you hope that this will calm local community)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 4

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. **The most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 440.000 €

1. New design 200.000 € ✓
2. Purchase of RM 300.000 € ✓
3. Alternative RM 0 € ✗
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Since you haven't invested into alternative raw materials, you only have one option to save your company. But you have invested into new design, so you have **enough time to find a new supplier** in Europe. However, this was very difficult because prices and demands for this raw material increased rapidly so this transition cost you a lot of money (400.000 €).

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. But because you haven't invested in alternative raw materials you don't know if you can make batteries out of secondary raw materials. You need to invest 100.000 € into **research about application possibilities** for secondary raw materials and 50.000 € into new production equipment for recycling.

BUDGET = 40.000 €

1. New design 200.000 € ✓
2. Purchase of RM 300.000 € ✓
3. Alternative RM 0 € ✗
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. Mine closure 400.000€ ✓
8. Recycling ? € ☐

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

(you can't invest because your budget is too low…)

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

5

Reason: you didn't adapt to the market and sustainable development, because you ran out of budget!

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 340.000 €

1. New design 200.000 € ✓
2. Purchase of RM 30.000 € ✓
3. Alternative RM 0 € ✗
4. Monthly costs 200.000 € ✓
5. Resistance 100.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Since you haven't invested into alternative raw materials, you only have one option to save your company. But you have invested into new design, so you have **enough time to find a new supplier** in Europe. However, this was very difficult because prices and demands for this raw material increased rapidly so this transition cost you a lot of money (400.000 €). Now you are out of budget…

Your company didn't succeed.

6

Reason: you spent to much budget on new equipment and didn't invest into alternative raw materials, so you ran out of budget when mine is closed in Africa!

TRY AGAIN

Great, you have bought raw materials so now **you can start production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

BUDGET = 400.000 €

1. New design 200.000 € ✓
2. Purchase of RM 400.000 € ✓
3. Alternative RM ? €
4. Monthly costs ? €
5. ? ? €
6. First sale ? €
7. ? ? €
8. Recycling ? €

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Since your budget is getting smaller, your **options are limited**. Chose one:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 7

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. The **most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 190.000 €

1. New design 200.000 € ✓
2. Purchase of RM 400.000 € ✓
3. Alternative RM 150.000 € ✓
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Because of your previous investments you have more options for a solution. You have enough time to **find a new supplier**, but because price and demand for this raw material increased rapidly this could cost you a lot of money (300.000 €). But you also invested in alternative raw materials so you can **replace this raw material with an alternative raw material** which will cost you a lot less (100.000 €).

BUDGET = 190.000 €

1	New design 200.000 €	✓
2	Purchase of RM 400.000 €	✓
3	Alternative RM 150.000 €	✓
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	Riots ? €	
8	Recycling ? €	

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. Also your experts for alternative raw materials tell you that your product **can be made partly from recycled materials**. But you need to invest (100.000 €) in new production equipment for recycling and making batteries partly from secondary raw materials.

BUDGET = 90.000 €

1. New design 200.000 € ✓
2. Purchase of RM 400.000 € ✓
3. Alternative RM 150.000 € ✓
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. Riots 100.000 € ✓
8. Recycling ? € ☐

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in new production equipment?

YES

NO

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

You have **successfully adapted** to the market and sustainable development. In the following weeks, the prices of primary mineral resources rose sharply, but since you now also use a share of secondary mineral resources for your production, this does not affect you as much. Sales go very well and soon you have enough budget for an expansion.

Congratulations, you have established a good company that strives for a sustainable development and a circular economy.

Your company has succeeded!

8

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

9

Reason: you didn't adapt to the market and sustainable development !

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Chose one option:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)
- You invest in even better equipment (50.000 €)
  (you hope that this will calm local community)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 10

Reason: lack of communication with the local community!

In Europe protests and resistance have been an inseparable part of mining and industry activity in recent years. **The most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 340.000 €

1. New design 200.000 € ✓
2. Purchase of RM 400.000 € ✓
3. Alternative RM 0 € ✗
4. Monthly costs 200.000 € ✓
5. Resistance 10.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Since you haven't invested into alternative raw materials, you only have one option to save your company. Fortunately, you have invested into new design, so you have **enough time to find a new supplier** in Europe. However, this was very difficult because prices and demands for this raw material increased rapidly so this transition cost you a lot of money (300.000 €).

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. But because you haven't invested in alternative raw materials you don't know if you can make batteries out of secondary raw materials. You need to invest 100.000 € into **research about application possibilities** for secondary raw materials and 50.000 € into new production equipment for recycling.

BUDGET = 40.000 €

1	New design 200.000 €	✓
2	Purchase of RM 400.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	Riots 300.000 €	✓
8	Recycling ? €	

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

(you can't invest because your budget is too low…)

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

11

Reason: you didn't adapt to the market and sustainable development, because you ran out of budget!

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Since you haven't invested into alternative raw materials, you only have one option to save your company. Fortunately, you have invested into new design, so you have **enough time to find a new supplier** in Europe. However, this was very difficult because prices and demands for this raw material increased rapidly so this transition cost you a lot of money (300.000 €). You reached the limit of your budget…

Your company didn't succeed.

12

Reason: you spent to much budget on new equipment and didn't invest into alternative raw materials, so you ran out of budget when riots breaks out in South America!

TRY AGAIN

Great, you have bought raw materials so now **you can start production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

BUDGET = 300.000 €

1. New design 200.000 € ✓
2. Purchase of RM 500.000 € ✓
3. Alternative RM ? €
4. Monthly costs ? €
5. ? ? €
6. First sale ? €
7. ? ? €
8. Recycling ? €

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

You reached the limit - 50.000 € and you also have another problem; people near your factory start to complain about noise and pollution of water. Because you are already in minus with your budget you can't do anything.

Your company didn't succeed.

13

Reason: you run out of budget. In business, you can't afford all the best in the beginning, even if it would be the best way to reach sustainable goals. You must develop according to your abilities and budget.

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Chose one option:

- <u>You do nothing</u>
  (you know that environmental and health impact does not exceed standards)
- <u>You make a conference for nearby community (10.000 €)</u>
  (you talk to people and show them all the security requirements you meet)
- <u>You invest in even better equipment</u> (50.000 €)
  (you hope that this will calm local community)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 14

Reason: lack of communication with the local community!

In Europe protests and resistance have been an inseparable part of mining and industry activity in recent years. **The most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

NEXT

One of the mines in Europe from where you get raw materials **failed in communication with the local community** and was **temporarily closed** due to investigation. Fortunately, you have invested in a new design, so you have enough raw materials in the warehouse to continue production for a few more months.

Because you have experience in communication with the local community you want **to support and help this mine** in communication. You **raise a big campaign for the general public** in which you make people aware of how important are raw materials and that we mine them in Europe (better conditions, good legislation, better development…). You pay 100.000 € for the campaign.

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. But because you haven't invested in alternative raw materials you don't know if you can make batteries out of secondary raw materials. You need to invest 100.000 € into **research about application possibilities** for secondary raw materials and 50.000 € into new production equipment for recycling.

BUDGET = 140.000 €

1	New design 200.000 €	✓
2	Purchase of RM 500.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	Campaign 100.000 €	✓
8	Recycling ? €	

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES

NO

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

You have **successfully adapted** to the market and sustainable development. In the following weeks, the prices of primary mineral resources rose sharply, but since you now also use a share of secondary mineral resources for your production, this does not affect you as much. Sales go very well and soon you have enough budget for an expansion.

Congratulations, you have established a good company that strives for a sustainable development and a circular economy.

Your company has succeeded!

15

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

16

Reason: you didn't adapt to the market and sustainable development !

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 150.000 €

1. New design 200.000 € ✓
2. Purchase of RM 500.000 € ✓
3. Alternative RM 0 € ✗
4. Monthly costs 200.000 € ✓
5. Resistance 100.000 € ✓
6. First sale 150.000 € ✓
7. ? ? € ☐
8. Recycling ? € ☐

NEXT

One of the mines in Europe from where you get raw materials **failed in communication with the local community** and was **temporarily closed** due to investigation. Fortunately, you have invested in a new design, so you have enough raw materials in the warehouse to continue production for a few more months.

Because you have experience in communication with the local community you want **to support and help this mine** in communication. You **raise a big campaign for the general public** in which you make people aware of how important are raw materials and that we mine them in Europe (better conditions, good legislation, better development…). You pay 100.000 € for the campaign.

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because of the new design, your product is already **easier to recycle**. But because you haven't invested in alternative raw materials you don't know if you can make batteries out of secondary raw materials. You need to invest 100.000 € into **research about application possibilities** for secondary raw materials and 50.000 € into new **production equipment** for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

BUDGET = 50.000 €

1	New design 200.000 €	✓
2	Purchase of RM 500.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 100.000 €	✓
6	First sale 150.000 €	✓
7	Campaign 100.000 €	✓
8	Recycling ? €	

Do you want to invest in the research and new production equipment?

YES NO

(you can't invest because your budget is too low...)

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

17

Reason: you didn't adapt to the market and sustainable development, because you ran out of budget! You invested to much budget into new equipment.

TRY AGAIN

Now you **have to buy raw materials**. Because you haven't invested in the new design, you will have to buy more minerals.

You have to examine different suppliers. Think about **possible risks** in some countries. The prices already **include the transport costs**. You have to decide at what price and from where you will import most of raw materials:

- Buy the most expensive raw materials (600.000 €)
  (they are mined in Europe)
- Buy the raw materials at an average price (500.000 €)
  (they are mined in South America)
- Buy the raw materials at the best price (400.000 €)
  (they are mined in Africa)

Great, you have bought the raw materials and now **you can start production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Since your budget is getting smaller, your **options are limited**. Chose one:

- <u>You do nothing</u>
  (you know that environmental and health impact does not exceed standards)
- <u>You make a conference for nearby community (10.000 €)</u>
  (you talk to people and show them all the security requirements you meet)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 18

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. The **most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 390.000 €

1	New design 0 €	✗
2	Purchase of RM 400.000 €	✓
3	Alternative RM 150.000 €	✓
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Since you haven't invested in the new design, you only have one option to save your company. Fortunately, you have invested in alternative raw materials, so you can **replace this raw material with an alternative raw material**. But you need to **do this substitution fast** because you quickly running out of raw materials. This will cost you (300.000 €).

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Your experts for alternative raw materials tell you that your product **can be made partly from recycled materials**. But because you haven't invested in new design you can't recycle your batteries. You need to invest 100.000 € into **research about recycling possibilities** for your product and 50.000 in new production equipment for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

(you can't invest because your budget is too low...)

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

19

Reason: you didn't adapt to the market and to sustainable development goals!

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Chose one option:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)
- You invest in even better equipment (50.000 €)
  (you hope that this will calm local community)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 20

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. **The most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 540.000 €

1	New design 0 €	✗
2	Purchase of RM 400.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Prices and demands for this raw material increased rapidly. Since you haven't invested nether in the new design or in alternative raw materials, **you don't have time to find a new supplier** and you **can't replace** this raw material with alternative raw material. Your budget is too small for fast action.

Your company didn't succeed.

21

Reason: you didn't adapt to the sustainable development goals! You bought raw materials in a risky country and did not insure your company with other investments.

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 450.000 €

1	New design 0 €	✗
2	Purchase of RM 400.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 100.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

You get most of your raw materials from Africa.

There are a lot of **illegal recovery of raw materials in Africa with abysmal working conditions,** child and women **underpaid labor** and with very **big impact on the environment and health** of the population.

One of such mines is **discovered and therefore closed**. This is also one of the mines from which you get one of your raw materials.

Prices and demands for this raw material increased rapidly. Since you haven't invested nether in the new design or in alternative raw materials, **you don't have time to find a new supplier** and you **can't replace** this raw material with alternative raw material. Your budget is too small for fast action.

Your company didn't succeed. 22

Reason: you didn't adapt to the sustainable development goals! You bought raw materials in a risky country and did not reinsure your company with other investments.

TRY AGAIN

Great, you have bought raw materials so now **you can start your production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

BUDGET = 500.000 €

1	New design 0 €	✗
2	Purchase of RM 500.000 €	✓
3	Alternative RM ? €	
4	Monthly costs ? €	
5	? ? €	
6	First sale ? €	
7	? ? €	
8	Recycling ? €	

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Since your budget is getting smaller, your **options are limited**. Chose one:

- <u>You do nothing</u>
  (you know that environmental and health impact does not exceed standards)
- <u>You make a conference for nearby community (10.000 €)</u>
  (you talk to people and show them all the security requirements you meet)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 23

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. The **most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 290.000 €

1	New design 0 €	✗
2	Purchase of RM 500.000 €	✓
3	Alternative RM 150.000 €	✓
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Prices and demands for this raw material **increased rapidly**. Since you haven't invested in the new design, you only have one option to save your company. Fortunately, you have invested in alternative raw materials, so you can **replace this raw material with an alternative raw material**. The shortage is gradual, so you have enough time for **substitution**. This will cost you (150.000 €).

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Your experts for alternative raw materials tell you that your product **can be made partly from recycled materials**. But because you haven't invested in new design you can't recycle your batteries. You need to invest 100.000 € into **research about recycling possibilities** for your product and 50.000 in new production equipment for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

You have **successfully adapted** to the market and sustainable development. In the following weeks, the prices of primary mineral resources rose sharply, but since you now also use a share of secondary mineral resources for your production, this does not affect you as much. Sales go very well and soon you have enough budget for an expansion.

Congratulations, you have established a good company that strives for a sustainable development and a circular economy.

Your company has succeeded!

24

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed. 25

Reason: you didn't adapt to the market and sustainable development !

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Chose one option:

- You do nothing
  (you know that environmental and health impact does not exceed standards)
- You make a conference for nearby community (10.000 €)
  (you talk to people and show them all the security requirements you meet)
- You invest in even better equipment (50.000 €)
  (you hope that this will calm local community)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 26

Reason: lack of communication with the local community!

In Europe protests and resistance have been an inseparable part of mining and industry activity in recent years. **The most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 440.000 €

1	New design 0 €	✗
2	Purchase of RM 500.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Prices and demands for this raw material increased rapidly. Since you haven't invested nether in the new design or in alternative raw materials, **you don't have time to find a new supplier** and you **can't replace** this raw material with alternative raw material. Your budget is too small for fast action.

Your company didn't succeed.

27

Reason: you didn't adapt to the sustainable development goals! You bought raw materials in a risky country and did not insure your company with other investments.

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 350.000 €

1	New design 0 €	✗
2	Purchase of RM 500.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 100.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

In South America, the **political situation is not as stable** as in Europe. **Riots break out** in the country from where you get one of your raw materials. You start to notice problems with transport, raw materials become more expensive and over time your delivery becomes quite difficult. You realize that you will have to change something otherwise you will **run out of stock of this raw material**.

Prices and demands for this raw material increased rapidly. Since you haven't invested nether in the new design or in alternative raw materials, **you don't have time to find a new supplier** and you **can't replace** this raw material with alternative raw material. Your budget is too small for fast action.

Your company didn't succeed.

28

Reason: you didn't adapt to the sustainable development goals! You bought raw materials in a risky country and did not insure your company with other investments.

TRY AGAIN

Great, you have bought raw materials so now **you can start production.**

When buying raw materials, you have learned that some are hard to get or are very expensive. You can invest part of your budget (150.000 €) in research for **alternative raw materials.**

If you want to know more about the alternative raw materials click **LEARN MORE** button.

LEARN MORE

BUDGET = 400.000 €

1	New design 0 €	✗
2	Purchase of RM 600.000 €	✓
3	Alternative RM ? €	
4	Monthly costs ? €	
5	? ? €	
6	First sale ? €	
7	? ? €	
8	Recycling ? €	

Do you want to invest into alternative raw materials?

YES

NO

ALTERNATIVE RAW MATERIALS

Scientists are looking for raw materials that can effectively replace the existing raw materials used in product.

Alternative raw materials can bring:

- **Cheaper or more available** raw materials.
- **Substitution** of critical or toxic raw materials.
- More **efficient** raw materials.
- More **recyclable** raw materials.
- Substitution by raw materials extracted with better and more **environmentally friendly extraction** methods.

BACK TO DECISION

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

People near your factory **start to complain about noise and pollution of water.**

In the EU, environmental and health **protection legislation is very good** and has made great progress in recent years. A company cannot operate if it does not meet all standards and greatly reduces the impact on the environment and health. But because of the **bad experience** from the past, when the legislation was not so good, because of the **rare accidents** and the **lack of awareness**, people are still worried.

Since your budget is getting smaller, your **options are limited**. Chose one:

- <u>You do nothing</u>
  (you know that environmental and health impact does not exceed standards)
- <u>You make a conference for nearby community (10.000 €)</u>
  (you talk to people and show them all the security requirements you meet)

Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 29

Reason: lack of communication with the local community!

In Europe, protests and resistance have been an inseparable part of mining and industry activity in recent years. The **most important thing for good collaboration is communication** between the company, local authorities, and the community because if it is missing, conflicts arise.

TRY AGAIN

By organizing a conference you calm the people down. At the conference, you show the local community your results about achieving standards and you **answer all of their questions**. You have learned that **communication with the local community is very important** and that together you can reach an agreement. The community now also sees the good things that your company brings, for example **jobs and new investments**.

This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 190.000 €

1	New design 0 €	✗
2	Purchase of RM 600.000 €	✓
3	Alternative RM 150.000 €	✓
4	Monthly costs 200.000 €	✓
5	Resistance 10.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

One of the mines in Europe from where you get raw materials **failed in communication with the local community** and was **temporarily closed** due to investigation.

Fortunately, you have invested in the alternative raw materials, so you **can substitute this raw material with alternative raw material.** This cost you only 50.000 €.

Also, you want to prevent that events like this happen in the future. Because you have experience in communication with local community, you **raise a campaign for the general public.** With it you want to raise the awareness of how important are raw materials and that we mine them in Europe (better conditions, good legislation, better development…). You pay 30.000 € for the campaign.

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Your experts for alternative raw materials tell you that your product **can be made partly from recycled materials**. But because you haven't invested in new design you can't recycle your batteries. You need to invest 100.000 € into **research about recycling possibilities** for your product and 50.000 in new production equipment for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

RECYCLING

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Recycling can:

- **Protect environment**, because production from primary resources often comes with large environmental footprints.
- **Keep raw material in the production chain** and so reduce the need for mining and extraction.
- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

You have **successfully adapted** to the market and sustainable development. In the following weeks, the prices of primary mineral resources rose sharply, but since you now also use a share of secondary mineral resources for your production, this does not affect you as much. Sales go very well and soon you have enough budget for an expansion.

Congratulations, you have established a good company that strives for a sustainable development and a circular economy.

Your company has succeeded!

30

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

31

Reason: you didn't adapt to the market and sustainable development !

TRY AGAIN

The first month of production has passed and you can start to sell your product, so you start to look for **potential buyers**.

For one month of production you **need to pay costs,** (production energy, payments for workers…) around 200.000 €.

Your budget quickly reduces, so it is time to make some profit. But the problems have only just begun….

NEXT

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Chose one option:

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  (you know that environmental and health impact does not exceed standards)
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  (you talk to people and show them all the security requirements you meet)
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Lack of communication with the community makes people **even more suspicious**. They collect enough signatures to launch a large-scale investigation and a lawsuit against your company. During this time, your factory **can't operate**, so you are forced to stop your production. You never recover again even though you prove that you met all environmental standards.

Your company didn't succeed. 32

Reason: lack of communication with the local community!

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This incident does not disturb your production and you can continue.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

NEXT

One of the mines in Europe from where you get raw materials **failed in communication with the local community** and was **temporarily closed** due to investigation.

Since you haven't invested nether in the new design or in alternative raw materials, you have a **big problem**. You running out of raw materials fast and you can't replace this raw material with alternative raw material. But because this is European mine, it temporarily closure doesn't affect global price and demand for this raw material. You can **quickly find another supplier** within your budget capabilities. This cost you 180.000 €.

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because you haven't invested in a new design or alternative raw materials, you **can now invest in research** (150.000 €) on how to recycle your product and how to use the secondary raw materials. Also, you will need new production equipment (50.000 €) for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

RECYCLING

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Your company has succeeded!

33

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

34

Reason: you didn't adapt to the market and to sustainable development goals!

TRY AGAIN

The new equipment makes **even less noise.** You also buy the **best filters for water on the market**.

But you didn't do anything to communicate with people. **Lack of communication** with the community makes people even more suspicious. They collect enough signatures to launch a large-scale investigation in which experts found out that you met all environmental standards. Due to the investigation, production lagged for a few days, and this costs you 50.000 €.

You learned your lesson; **communication with the local community is very important**. You can continue with your work.

NEXT

You finally found your **first buyer who bought batteries** for a special electrical car.

Your budget increases for 150.000 €.

BUDGET = 250.000 €

1	New design 0 €	✗
2	Purchase of RM 600.000 €	✓
3	Alternative RM 0 €	✗
4	Monthly costs 200.000 €	✓
5	Resistance 100.000 €	✓
6	First sale 150.000 €	✓
7	? ? €	
8	Recycling ? €	

NEXT

One of the mines in Europe from where you get raw materials **failed in communication with the local community** and was **temporarily closed** due to investigation.

Since you haven't invested nether in the new design or in alternative raw materials, you have a **big problem**. You running out of raw materials fast and you can't replace this raw material with alternative raw material. But because this is European mine, it temporarily closure doesn't affect global price and demand for this raw material. You can **quickly find another supplier** within your budget capabilities. This cost you 180.000 €.

NEXT

Sustainable development and circular economy are our future. An important pillar to achieve these objectives is **recycling and thus extraction of secondary raw materials**. There is strong legislation around the disposal of batteries, so batteries are already widely collected, and this makes it easier for recycling.

Because you haven't invested in a new design or alternative raw materials, you **can now invest in research** (150.000 €) on how to recycle your product and how to use the secondary raw materials. Also, you will need new production equipment (50.000 €) for recycling.

If you want to know more about the recycling of raw materials click **LEARN MORE** button.

LEARN MORE

Do you want to invest in the research and new production equipment?

YES NO

(you can't invest because your budget is too low...)

RECYCLING

Recycling is the process of **converting waste materials into new materials**. Across the globe, primary raw material sources are depleting, while the amounts of industrial waste and end-of-life-products are rapidly increasing. These waste contain valuable secondary raw materials that can be extracted to meet the growing demands from global industrial production and consumption.

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- In some cases **lower the price for raw materials**, as recycled raw material is cheaper.
- Realize sustainable development with **minimal amount of waste**.
- **Replace depleting primary raw materials** sources.

BACK TO DECISION

There was a **severe shortage of primary minerals** in the next weeks, prices rose, and you were no longer able to buy enough raw materials for your production. You also failed to sell enough batteries to invest in secondary raw materials, as green technology became a hit, and batteries made from recycled minerals sold better.

Your company didn't succeed.

35

Reason: you didn't adapt to the market and sustainable development, because you ran out of budget! You invested to much budget into new equipment.

TRY AGAIN