

Conflict metals,

conflict minerals



VÉDEGYLET

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Published by Védegylet Egyesület in 2017  
1192 Budapest, Esze Tamás 32.  
publisher: Györgyi Újszászi chief executive  
phone: +361 237 6020  
[www.vedegylet.hu](http://www.vedegylet.hu)

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„Time for Change: Promoting Sustainable consumption and production of raw materials in the context of EYD 2015 and beyond” (DCI-NSAED/2014/352-275)



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# Introduction

In what follows we will explain why gold, niobium, tin, tantalum and tungsten are called conflict metals and their raw materials conflict minerals. But first let us take a look at the metals!

## CONFLICT METALS

### GOLD

The chemical symbol of gold is Au (from the Latin Aurum, which means gold).

It is the 79th element in the periodic table of elements.

Noble metal: it is generally very unreactive and it does not form compounds easily.

Non-ferrous metal: it is not grey, like other metals, but yellowish.

Heavy metal: its density is  $19 \text{ g/cm}^3$ , i.e. twice as much as iron.

### TANTALUM

The chemical name of tantalum is Tantalum, its chemical symbol is Ta.

It is the 73rd element in the periodic table of elements.

It is a light grey transition metal.

Etymology:

In Greek mythology Tantalus was punished for his sins (for stealing food and drink from the gods for his friends) and was doomed to suffer from eternal hunger and thirst. (He was destined to stand in water but whenever he bent down to drink from it, it would drain away. There was a fruit tree above him but when he reached up to pick fruits, the branches would lift up out of his reach.) That is why we call the constant frustration "tantalizing". The discoverer of tantalum named it so because he found that the metal's oxide was incapable of "quenching its thirst" (meaning that it does not react with acids).

### NIOBIUM

The chemical name of niobium is Niobium, its chemical symbol is Nb.

It is the 41st element in the periodical table of elements.

It is a light grey, transition metal.

Etymology:

This name was discovered on one of the pieces in the mineral collection of the British Museum. The mineral originated from America, more specifically from the area around the town Columbia (which was named after Christopher Columbus). That is why the discoverer of the element named it columbium. Later on another researcher extracted a new metal from a tantalite mineral and named it niobium. (In Greek mythology Niobe was the daughter of Tantalus.) Still later thorough examination found that these two elements are the same. Although the official name of the element is niobium, in English speaking territories the word columbium often occurs in the names of minerals.

## **Tin**

The chemical name of tin is Stannum, its chemical symbol is Sn.

It is the 50th element in the periodical table of elements.

It is a silver-white, malleable metal.

Etymology: The words tin and lead probably have the same root and the concepts of these two metals were also confused for a long time. The Latin stannum originally meant "lead containing silver".

## **Tungsten**

The chemical name of tungsten is wolfram, its chemical symbol is W.

It is the 74th element in the periodic table of elements.

It is a glittering, grey, transition metal.

Its melting point is extremely high: 3422 °C.

Heavy metal: its density is about the same as that of gold: 19 g/cm<sup>3</sup>.

Etymology:

Wolfram is called tungsten in some (English and French speaking) countries but in Germany (and in Hungary as well) it is called wolfram. The meaning of tung sten in Swedish is "heavy metal" and comes from the fact that the density of the wolframite mineral (of which the metal is produced) is 7,5 g/cm<sup>3</sup>, i.e. it is as dense as iron.

The etymology of the word wolfram is a little more complicated. The meaning of the German word Wolfrahm is "wolf soot" or "wolf cream" and refers to the curses used by the German miners who tried to produce tin in the furnace but found that the small amount of wolfram contamination in the ore swiped the tin into the foamy sludge, just as the wolf snatches the sheep, thus significantly reducing the efficiency of tin production.

## USES OF THE METALS

### **Gold**

Gold is a noble metal, its nice, yellowish colour does not change neither in air or water, nor when treated with household detergents. In addition, compared to many other metals only relatively little of it can be found. It is an outstandingly valuable metal because of these two features.

In old times coins were made of gold alloy, later, however, gold increasingly came to be the value basis of money.

Gold is an important material for jewellery making today but the medieval Inca empire already had an elaborate goldworking tradition as well.

It is a little known fact that gold is used as an electrical conductor. Its conductivity is very good, although not as good as that of silver or copper. It is used as a conductor in very delicate places, as it does not oxidize and its surface does not change, therefore the electric connection it establishes is safer than in the case of silver or copper. That is why electronic devices contain gold.

## **Tantalum**

One of the areas where tantalum is used is the electronic industry. Some tantalum alloys are indispensable for the manufacturing of mobile phones, laptops, tablets, mp3 players, etc.. Given the exponential growth in the use of gizmos, the demand for tantalum is sharply increasing.

Another area where tantalum is used is the production of tissue-friendly, medical implants. Alloys with tantalum can be found in hip- and bone replacements and tooth implants.

## **Niobium**

Niobium is similar to tantalum in physical-chemical respect and is just as important a component in the manufacturing of electronic devices (e.g. mobile phones) as tantalum. Another interesting area where niobium is used is the manufacturing of special magnets. Niobium-titanium-tin alloys are perfect raw materials for superconducting magnets. These magnets are indispensable as spare parts for the electron accelerators used in nuclear physics; for instance, the LHC (Large Hadron Collider) at CERN, Switzerland, could not operate without niobium either.

## **Tin**

Tin is traditionally used for making solder, i.e. an alloy of tin and lead combined in half-half, although solder can be made of different components as well, depending on the function. Another important area where tin is used is the production of white tin. White tin is a thin sheet of steel coated with tin. The coating of steel (i.e. iron alloy) is carried out by electrolysis or by its immersion in melted tin. White tin is most well-known for its use for cans.

Although white tin had already been produced centuries ago, people did not know what to use it for. It was only in 1810 that a creative Englishman developed the technology for manufacturing cans and since then white tin has been very important in the canning economy.

## **Tungsten**

The two notable features of tungsten are its high melting point and great density, which are why they are used. In lighting technology it is used in the filament of light bulbs. Filaments have been made since the early 1800s of a variety of materials: carbon, metals or even a special kind of ceramic. Finally tungsten came to prominence in this domain, as it can be heated to a very high temperature and still it will not melt, which greatly improves the efficiency of light emission and colour composition. The first light bulb with wolfram filament was produced at the notable electronics company Egysült Izzó és Villamossági Rt. in Budapest, Hungary, under the brand name Tungram.

Tungsten-carbide is an alloy, which has become an important raw material of tools for extreme usage because of its hardness, rivalling that of diamond, and because it does not lose its hardness even if heated to a very high temperature.

Tungsten's "heaviness" makes it a suitable raw material for certain sports equipment, e.g. the tip of darts is made of a wolfram alloy because it makes the dart heavier, which makes it easier to get a precise shot. The head of trendy gold clubs also contains tungsten for the same reason as the darts: it makes the club heavier even with the size remaining equal, thus a club with the same length can have a greater strike force.

Tungsten is important in military technology for two reasons. The material of armour-piercing shells is a special tungsten steel. Since it is lighter than ordinary steel, it will have a greater crush force even with the same muzzle velocity. In addition, it does not melt in the course of impact. (The impact of the kinetic energy of the bullet partly transforms into thermal energy, which means that the target object's material is heated up as well.)

## ORES

### **Gold**

Given that gold is a noble metal, it does not (or hardly ever) forms compounds and it can be found in its elemental (native) form. Therefore it has no ore but it can be found in nuggets, or as grains in locations of rocky composition.

### **Tantalum and niobium**

These two metals almost always occur together. Their most important minerals are columbite and tantalite, their chemical composition is  $(\text{Fe,Mn,Mg})(\text{Nb,Ta})\text{O}$ . These minerals are called coltan, after the blending of the two names. (Let us note that the other name of niobium, columbium, is used here.)

### **Tin**

The most important mineral of tin is cassiterite ( $\text{SnO}_2$ ), which comes from the Greek name of tin.

### **Tungsten**

Tungsten's most important mineral is wolframite:  $((\text{Fe,Mn})\text{WO}_4)$ .

## WHY ARE THEY CALLED "CONFLICT MINERALS"?

These metals and minerals are called "conflict minerals" because their consumers (i.e. those who demand them) live in the developed world, while the mineral deposits are located mainly in poor, underdeveloped and – often contradicting their names – undemocratic countries.

Among these poor but resource-rich countries some Central African states stand out, especially the Democratic Republic of the Congo, the sad "protagonist" of the story of conflict minerals. (The country was formerly known as Zaire, and should not be confused with the neighbouring Republic of the Congo). The mines, in which all of the above-mentioned minerals (gold, tantalum, niobium, tin and tungsten) are located mostly in the Eastern part of the country.



Although in 2006 democratic elections were held in the country – assisted by UN and EU peacekeepers – the government does not entirely hold the power. In various parts of the country armed gangs control power locally. These gangs maintain their dominance and buy their weapons from the income of “their” mines and from the illegal trade of the extracted minerals; this also allows them to continue their unceasing fight against everyone for their own political and economic interests. Unfortunately a large part of the mines are in the property of these gangs.

The local population is entirely at the mercy of the armed groups. Forced labour, gunfights, raping women and the humiliation of people have become virtually permanent. The conditions in the gang-operated mines, in which adults and children are forced to work, are inconceivable by European standards. These workers are essentially slaves and they are forced to work by being held at a gunpoint or other forms of violence and threats.

It is in the interest of the gangs to extract the raw materials as quickly and as cheaply as possible. Quickness is important because they can find themselves confronted by a stronger gang any time. The low costs of the extraction are achieved by the use of child labour. One third to one half of the workers in the mines are children. Some of them are not even seven years old and each day they have to work over ten hours without stopping, while they hardly get anything to eat or drink, their injuries are left unattended and get no shelter from the burning sun. Workers, including child labourers, are controlled by the uniformed gang members. Those who sit down to rest or collapse from fatigue or illness are often simply shot.

A regretful consequence of the fierce struggle for possessing the “conflict minerals” is that millions have become homeless and refugees in the Democratic Republic of the Congo and in the neighbouring states.

We should also point out that the unsystematic, forced and unprofessional metal mining have severe environmental and health-related consequences. For instance, the waste from the mines, containing heavy metals, contaminate the soil of the surrounding areas. People who had previously earned a living by growing vegetables are now in an untenable situation, as they can no longer produce vegetables that are suitable for human consumption.

The extreme deforestation, carried out in order to open surface mines, destroys animals’ habitats and shelters, thus making way for the poachers. In addition, this area is the habitat of one of the most endangered species, the eastern lowland gorilla. Its extinction is facilitated by the aggressive scale of mining.

#### MORAL CONFLICT

It is evident that a compassionate person has difficulty resolving the moral conflict arising from the notion that the diamond glittering in his/her jewels (or its extraction) implies the shedding of blood, or that his/her mobile phone, indispensable in daily life, was manufactured at the cost of the outrageous exploitation of hundreds of thousands of people and the slavery of children.

It would be good to be certain that at least our phone is “clean”. For this we would need to know the origin of the coltan that was used for the manufacturing of the phone. However, it has been shown that more than half of the coltan used in the world has a shady origin, so there is a 50% chance that by simply using our mobile phones we are unwillingly responsible for illegal mining in Central Africa, as well as the related humanitarian and ecological problems.

There have been attempts to cut back the black market by introducing regulations and directives. An American law (the Dodd-Frank law), for instance, would oblige companies to indicate if they are using raw materials from the Democratic Republic of the Congo. This would to some extent push the armed gangs out of the trade. The majority of companies agree, at least in principle, with the regulation but frequently indicate the difficulties of its implementation. It is doubtful that it would be possible to track down the origin of all the spare parts of a product. Let us not forget that a large company produces tens of thousands of products, which require raw materials and spare parts from at least just as many suppliers. Therefore the task is tremendous.

We have to address the question of conflict minerals within the EU as well because European industry uses over ten kinds of raw materials (including tantalum, niobium and tungsten), the origin of which is unclear, partly because of the circumstances related to the mines. The fact that some of the black and brown coals, found in Hungary, contain a significant amount of tantalum and niobium does not offer a sound solution. If we these coals were used for two purposes (first as a source of tantalum, as well as a source of energy), then we could maybe mitigate the problems and the conflicts – including the moral conflicts as well.

András Victor, retired college professor, honorary president of Hungarian Society for  
Environmental Education (MKNE)

# Exercises





## Where is it?

Topic:	The geographical location of the Democratic Republic of the Congo
Goal:	To improve topographical knowldge
Recommended age group:	10-16 years of age
Duration:	20 '
Tools, preparation	Make enough copies of the <i>Worksheet</i>

One of the main characters, or maybe the protagonist, of the story of conflict minerals is the Democratic Republic of the Congo. (Which should not be confused with the neighbouring Republic of the Congo). The mines with the sources of metals so important for the industry, especially the electronic industry, are located in the Eastern part of the country. These metals include tantalum, niobium, tin and tungsten. There are also gold mines in these regions.

The country is mired in political chaos, the government or its armed forces are unable to take full control of the country. Armed gangs are out of control. These gangs sustain themselves from "their" mines and from the illegal trade of the extracted ores.

Conditions in the mines, controlled by the gangs, are atrocious especially by European standards. The workers, adults and children, are practically slaves, as they are forced to work by being held at gunpoint and other forms of violence and threats.

### Activity:

This chapter focuses on this problem, let us learn more about the geographic location of the Democratic Republic of the Congo.

You could of course find the answers to the questions below by using your smart phone. But this would be no fun. We suggest that you try to answer the questions on your own first and check the answers on the internet only after you finished answering them. If you do not have a smart phone, then you can find the correct answers on page ... of this book.

Answers:

1.)



- 2.) Yes, but a short one only.
- 3.) The Equator traverses the country.
- 4.) Because that is where mountains are located.
- 5.) Kinshasa
- 6.) 9
- 7.) Congo, Central African Republic, South Sudan, Uganda, Burundi, Tanzania, Zambia, Angola.

If you would like to test your ability to orientate on the map, then we suggest using the following website: [www.geoquizzes.com/hu](http://www.geoquizzes.com/hu)

Here you can play as much as you would like to. You can see how many mistakes you make when you try to locate with the click of your mouse the location of the settlements prompted by the site. Have fun playing it!

# Worksheet

1.) Draw the approximate outlines of the Democratic Republic of the Congo in the blind map of Africa! It is not so much the outlines that matter so much s where in AFrica it is located in.



2.) Does the country have a seaside?  
.....

3.) Where is it located in relation to the Equator?  
.....

4.) Why are the notable mines located in the Eastern part of the country?  
.....

5.) What is the capital of the country?  
.....

6.) How many neighbouring countries is it surrounded by?  
.....

7.) Can you name some of them?  
.....  
.....

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.....

7.) Can you name some of them?  
.....  
.....



## Children's lives in Congo

Topic:	Child labour in the mines
Goal:	Promoting social and human rights
Recommended age group:	10-18 years of age
Duration:	30'
Tools, preparation:	1 photo for each age group (about a child working in a mine)

The Democratic Republic of the Congo is extremely rich in resources, notably the ores that tantalum, niobium, tin, wolfram and gold are extracted from. Tantalum and niobium are important for the electronic industry (e.g. for the manufacturing of mobile phones), tin is used in the canning industry, as most of the cans are made of white tin, i.e. a tin-coated steel plate. Tungsten is important in lighting technology, as light bulb filaments are made of tungsten. In addition, tungsten is used in the manufacturing of trendy golf clubs.

The majority of ore mines in Congo are run by gangs that employ armed guards to protect their "property" from the state army and from other gangs. They finance their army from the sale of minerals. It is in their interest to extract the raw materials from the mines as quickly and as cheaply as possible. Speed is important, as a stronger gang could confront them any day. The costs of mining are kept low by employing child slaves. One third of the workers in the surface mines are children. Some of them are not even seven years old and carry out 10-12 hours of heavy work each day without stopping, while hardly getting anything to eat or drink, their injuries remain unattended to and have no shelter from the burning sun. These child labourers are controlled by bandits with machine guns ("soldiers"). Those who sit down to rest or collapse from fatigue or illness are often simply shot.

In the picture below you can see a Congolese child. He may be around 10-11 years old. From dawn to dusk he shovels heavy rocks (ores). He cannot read or write. How could he if he does not go to school? He does not know how to play, as he does not have anything to play with and every night he collapses into his bed – provided he survives until then.

### Activity

- Look at the picture!
- Try to put yourselves into the shoes of the child in the picture!
- A volunteer should try to tell others about the child based on the following for instance:
  - How does he spend his days?
  - What does he usually get to eat and drink?
  - When was the last time he played and what?
  - Do you think he has been hurt and humiliated?
  - What about his parents and siblings?
  - What would he be doing if he lived in Hungary?
  - What kind of thoughts might he have while working?
  - What does he feel?
  - What kind of desires does he have?
  - What would he be doing if he did not have to work as a slave?







# Designing posters and fliers

Topic:	Designing posters and fliers
Target:	To highlight the core of a topic, visual representation, practice communication
Recommended age group:	10-18 years of age
Duration:	30' + 30'
Tools, preparation:	One A/3 size sheet and several A/4 size sheets for each small group

## Poster

Design a poster that draws attention to the topic of conflict minerals and provides information about the most important problems!

If you have the design, then prepare a sketch at least in A/3 (i.e. approximately half the size of the real poster but proportionately reduced)! What we mean by a sketch is that you write and place all the texts on the poster, indicate what colours the poster will have, and sketch out the pictures that you will put on the different parts of the sheet.

When designing the poster, do not forget that a good poster

- catches attention,
- focuses on the core of the issue,
- gives information but not in a school-book or textbook way,
- uses different highlights within the text to differentiate different parts,
- contains pictures and texts in a good proportion,
- uses the colours aptly,
- uses pictures that are eye-catching.

## Flier

Design a poster that draws attention to the topic of conflict minerals and provides information about the most important problems!

If you have the design, then prepare a sketch at least in A/3 (i.e. approximately half the size of the real poster but proportionately reduced)! What we mean by a sketch is that you write and place all the texts on the poster, indicate what colours the poster will have, and sketch out the pictures that you will put on the different parts of the sheet.

When designing the poster, do not forget that a good flier

- provocatively draws attention,
- contains only as much text as it is possible to skim through within 10-15 seconds,
- uses texts that are brief but clear and easy to understand,
- uses sentences that are brief and slogan-like,
- preferably contains graphic (i.e. drawn) figure(s) only,
- can be understood even if its size is small,
- conveys a clear message.



# Cluster-image or mind-map

Topic:	Every action has consequences and those have consequences too
Goal:	to improve systems thinking
Recommended age group:	10-18 years of age
Duration:	30'
Tools, preparation:	one A/2 size sheet for each group (e.g. wrapping paper)

One favourite slogan of the environmentalists goes like this: "You cannot do only one!" What they mean by this is that whatever we do will have consequences and those will have further consequences and so on... The world is an incredibly huge network of endless, interrelated strings. It is a wonderful tangle that is full of casual links.

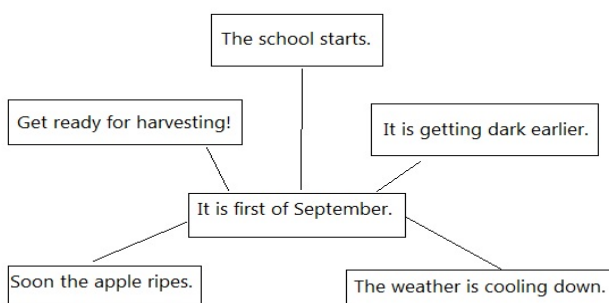
The following game models this thought.

1. Form small groups of 4-5.
2. Think of a decision, a change, or an innovation that can be put in a simple sentence!
3. The small groups should take a large sheet of paper (A/2 size, i.e. 60x40cm). (Ideally some wrapping paper.)
4. Write down the selected decision, change, innovation in the middle of the sheet!
5. Think about the primary consequences of the change in question.
6. Write down these consequences around the central topic.
7. Discuss what the further consequences may be of the primary consequence and write them down around their causes!
8. Continue with listing the consequences as long as there is time and more space on the paper.
9. The small groups should present the conclusions from the cluster-image!

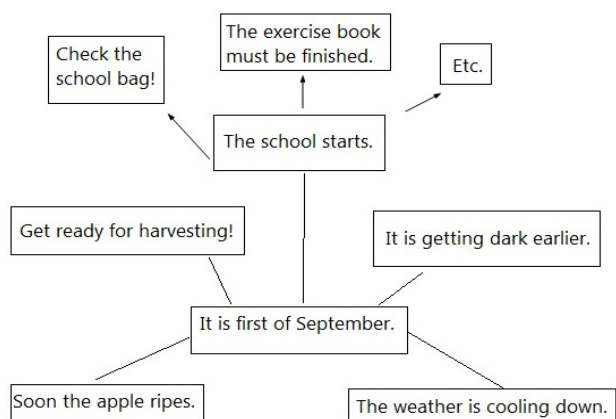
Below you can see a demonstration of how this cluster image is prepared.

**Step1:** Write down the selected topic in the middle of the sheet. It is first of September.

**Step2:** Brainstorm together and write down the primary consequences!



**Step3:** Start writing down the consequences of the primary consequences (i.e. the secondary consequences) around them and so on...



# Cluster-image or mind-map

Some ideas for starting:

- It is discovered that a special and relatively cheap aluminium-alloy is a good substitute for tantalum.
- The use of white tin in the canning industry is banned in the developed world for health reasons.
- The UN passes a resolution on banning trade with Congo for political reasons.
- A new and powerful armed gang appears in the given mine.
- The army of the democratic government defeats the gang "owning" the mine.
- Etc.

When discussing the cluster-images it is very important to frequently highlight that it may be difficult to foresee the far-reaching consequences of interfering in a situation, as the interrelationship between the primary consequences is so complicated that the end result of some action may be the exact opposite of the intended one.

This is why problems should not be simplified and limited to one aspect.

If for instance – led by a sense of justice – we decide to boycott the product of a particular company because we discovered that it uses child labour, then in case of a successful boycott the company may end up dismissing some of its employees who will thus end up in the street, i.e. it may happen that the victims of our action will be exactly those whom we sought to defend from exploitation.

A mind-map can be made with a computer. There are free softwares for this on the internet. It is worth learning how to use some of these!



## Put the pieces together!

Topic:	the human rights issues of the gold mines usurped by armed gangs
Goal:	to make children realize what powerlessness means
Recommended age group:	10-18 year of age
Duration:	60'
Tools, preparation:	Put together 6 small packages, each containing 6 stickers of different colours. (The packages should be uniform.) Use the same 6 colours to mark 6 tables and have 6-6 children sit around them. Print the following 12 cards on separate cardboard sheets!

The following game requires participants to put in order 12 steps of a story. The steps are on 12 separate cards.

### 1.

Children should be arranged into small groups in a way that the number of small groups equals the number of children in one group. It is easiest if there are 36 children (in this case there should be 6 small groups consisting of 6 children), or 25 (5x5), or 16 (4x4). If the number of participants is different, then the children should form as many "inseparable pairs" as would be necessary to have a square number if these pairs are counted as one. (These pairs should stay together until the end of the game.)

Let us look at the case of forming 6 groups consisting of 6 children in each group. Organisationally this may be done so that 6-6 children will sit around 6 tables. After this each of the six tables should be marked with the selected 6 colours (using, for instance, an object of the given colour). Then each table is given a small package containing labels of 6 different colours (the selected 6 colours) and every child gets one of these labels. At each table (regardless the "colour of the table") there are "children of every colour".

In this case the tables receive 2-2 of the 12 cardboard cards of the story.

It goes without saying that in the case of the 5x5 set-up only five colours should be selected and the 12 cards should be distributed across the tables as 3+3+2+2+2. If we have a 4x4 allocation, then we should use 4 colours and each table receives 3 cards.

### 2.

Each child goes over to the table that has the same colour as the one he/she received. So this time all the "reds" sit together around a table, all the "blues" are around another one, etc.

### 3.

Distribute the cardboard cards (they should be mixed and random) among the tables!

### 4.

The children's task is to try to interpret the cards that they received. They have 5 minutes for this. They should try to figure out who said the sentence to whom and when (at the beginning of the story or at the end, etc.). Also it is very important that they try to remember the content of the cards.

### 5.

Children are asked to go back to their original table. Since theoretically there is someone in each group who knows one part of the story, they try to piece the story together.

### 6.

With the help of the facilitator they interpret and put in order the different parts of the story.

## Put the pieces together!

The story goes like this:

The chief of the armed gang, controlling the gold mine, wants a worker, who is still in good shape, to join the gang. The worker, whose 12-year-old son is also slaving away in the mine, is promised a better life. The man is hesitant, as he knows the tide may turn at any moment. In the evening the worker talks to his son about the issue. The boy confronts him with the fact that if he becomes an armed guard he may have to shoot him, i.e. his own son, in case he can no longer continue the exhausting work or if he tries to flee. The mother joins the conversation, arguing that if they have more money, then they would be able to eat more and buy medication, and thus it would be easier for the boy to carry out the work. The father asks his son to wake his mother up to the fact that those guys are all scoundrels.

The following day both the gang leader and the father see that the boy is very weak. The gangster points to the boy's condition as another argument for convincing the father.

## Cardboard cards (in the correct order)

The armed gang is forcing the father and his 12-year-old son work in the same gold mine.	The armed gang is forcing the father and his 12-year-old son work in the same gold mine.
- Hey you! Listen! You will get a lot of money if you join us, I swear!	- Hey you! Listen! You will get a lot of money if you join us, I swear!
- Thank you but I have to think this over. How could I be the enemy of my own son?	- Thank you but I have to think this over. How could I be the enemy of my own son?
- The scar-faced chief told me today that he would take me among the guards.	- The scar-faced chief told me today that he would take me among the guards.
- Oh! But then you would have to shoot me if I stopped for a rest because I no longer had the strength to work!	- Oh! But then you would have to shoot me if I stopped for a rest because I no longer had the strength to work!
- You would have the strength to work, as we would have more money, you could eat more, we could buy medication, and you would be stronger.	- You would have the strength to work, as we would have more money, you could eat more, we could buy medication, and you would be stronger.
- Explain to your mother that the tide may turn at any moment and I could be executed randomly.	- Explain to your mother that the tide may turn at any moment and I could be executed randomly.
- Don't be naive, Mom! You shouldn't believe a word they say! Their promise is fleeting and goes with the wind.	- Don't be naive, Mom! You shouldn't believe a word they say! Their promise is fleeting and goes with the wind.
- Go on and work or you'll die! You aren't working hard enough! But I made an offer to your father yesterday.	- Go on and work or you'll die! You aren't working hard enough! But I made an offer to your father yesterday.
- The kid needs to eat more. He won't survive much longer if he has to go on like this. Doesn't this convince you?	- The kid needs to eat more. He won't survive much longer if he has to go on like this. Doesn't this convince you?
- Of course I can see it! Of course I worry about him! Still give me another day to think it through!	- Of course I can see it! Of course I worry about him! Still give me another day to think it through!
- I see you are staggering from hunger and fatigue. Should I then say yes?	- I see you are staggering from hunger and fatigue. Should I then say yes?



## Situations and solutions

Topic:	possible approaches to environmental problems
Goal:	to help children put themselves into different situations. To practice debating and convincing
Recommended age group:	12-18 years of age
Duration:	30'
Tools, preparation:	print the following "Possible situations" - and similar situations formulated by the facilitator - on separate cards

In this game you will be asked to try to place yourselves into the shoes of the characters in some imaginary (but still very realistic) situations and try to imagine and act out the outcomes of the situation (you may think of alternative versions of the outcomes as well). It is recommended that you try to come up with real solutions as outcomes but in some cases the outcome may be a total or partial failure as well.

1. The small groups draw cards that briefly outline a situation that is related to conflict minerals.
2. Participants discuss the situation in their small groups.
3. They interpret the natures and mindsets of the characters.
4. They formulate the main sentences and movements in the situation.
5. The groups decide who should impersonate which character.
6. Each group presents the situation to the others.
7. Participants analyse and assess together the "performances" both from the point of view of content and the "dramatic performance" as well. (Try to highlight the positive points!)
8. They brainstorm together about possible better or alternative solutions.

## Possible situations

Two people (a more dominant person and a more subdued one) try to persuade a third person who is convinced that he/she has nothing to do with children in Congo and is not willing to think about these "conflicts".

A passionate human rights activist talks to two company leaders and suggests that they should indicate on their products the fact that they were made with raw materials originating from Congo. One company head refuses the idea, the other is willing to accept it but is still uncertain for a variety of reasons.

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Three farmers are having a conversation. They live close to a gold mine "owned" by an armed gang. They discuss the uncertainty that their families live in and the possible solutions that they could apply.

A person, slaving away in an ore mine, is talking to his son who is visiting his parents. The son is educated and now serves as the official soldier of the state. They hold one another responsible for failing to change the situation in connection with the ore mines.

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## True or false?

Topic:	conflict minerals
Goal:	playful practice
Recommended age group:	10-14 years of age
Duration:	10-20'
Tools, preparation:	3 ropes (of about 6 metres long). It is recommended for the facilitator to keep the prints of possible statements at hand, as well as similar statements formulated by him/her.

1. Form two ideally uniform teams! One should be the TRUE team, the other one the FALSE.
2. Place a rope on the ground!
3. The two teams should face each other from the two sides of the rope, one step behind it.
4. Put another rope 5 metres behind each team. This will be the shelter.
5. The facilitator reads a statements loudly and clearly. If the statement is true, then members of the TRUE team start chasing the members of the FALSE team and try to catch them before they can reach the shelter. If the statement is false, then it is the other way round.
6. Those members who have been caught join the other team.

Since participants often end up in the other team, therefore uncertainty relate to decisions is mitigated if the "true" direction is marked with a visible green arrow (and maybe the "false" direction with a red one).

The facilitator should refrain from intervening even if participants are uncertain and there is a confusion. Once the confusion is cleared he/she can tell participants what the right solution was.

It is key that the statements are correct and accurate and are appropriate for the participants' age. For instance, the statement "The sun rises in the East" is not a good statement because it can be true and false at the same time, depending on the context.

Some examples of the statements:

(Below we are only listing true statements but any true statement can be transformed into false.)

- Coltan is the name of a mineral containing tantalum.
- Gold is a very good conductor.
- Tantalum has a medical use as well.
- White tin contains iron.
- Tungsten is used in the arms industry.
- Gold does not occur as an ore.
- Niobium and tantalum occur together in ores.
- The Democratic Republic of the Congo is located on the Equator.
- Tungsten is very dense.
- The waste from the tantalum mines is harmful for the soil.
- The eastern lowland gorilla is on the brink of extinction.

*(A game after Joseph Cornell)*



# Gold - the symbol of wealth

Topic:	gold mining and the use of gold
Goal:	to highlight injustices in connection with gold
Recommended age group:	13-18 years of age
Duration:	100'
Tools, preparation:	Sufficient number of copies of the Countries of the world (blind map) and the World Happiness Report

Gold has always been a symbol of wealth, richness and power since the ancient Egyptian empire or even longer, because of its radiance, scarcity and endurance. We know that after the discovery of America boats were transporting from there enormous amounts of golden objects. Someone calculated that if the Europeans had not looted the large amount of American gold they did but borrowed it instead, then all the money in the world would not be sufficient for them to pay the interest, even if only a moderate level of interest rate had been applied.

We also know that the majority of gold mines employ poor, desperate and helpless people who work in unhealthy working conditions only for a pittance. There is therefore a stark contrast between the living conditions of those who work in gold mines and those who wear gold. The situation is then far from fair, quite the contrary!

A legtöbb aranyat tartalmazó bányák a világon az alábbiak:

Argentina	Australia
South Africa	Dominican Republic
Ghana	Mongolia
Russia	Papua New Guinea
Papua: Indonesia	Peru
USA (Nevada)	Uzbekistan

(It is an interesting fact that despite the above China is extracting the largest amount of gold per year.)

Some of the most famous jewellery companies: Winston, Van Cleef, Graff, Tiffany, Piaget, Cartier, Chopard, Bulgari and Mikimoto

They have shops in the following place, just to name a few: London, New York, Beverly Hills, Las Vegas, Dallas, Honolulu, Chicago, Geneva, Milan, Shanghai, Paris, Houston, etc.

## Activity:

1. Based on the list above, mark the large gold mines on the world map attached!
2. Discuss the living and working conditions of the gold miners working in these mines!
3. Use the same map to mark the locations where the wealthy can buy and wear these jewels!
4. Find the countries that you marked on the map on the Happiness Index list!
5. Compare the roles of the countries in question with respect to gold mining and gold jewellery, as well as their values in the happiness index.

# World Happiness Report - 2016

1. Denmark (7.526)	41. Kuwait (6.239)	83. China (5.245)	121. Armenia (4.360)
2. Switzerland (7.509)	42. Bahrain (6.218)	84. Bhutan (5.196)	122. Kenya (4.356)
3. Iceland (7.501)	43. Trinidad&Tobago 6.168)	85. Kyrgyzstan (5.185)	123. Ukraine (4.324)
4. Norway (7.498)	44. Venezuela (6.084)	86. Serbia (5.177)	124. Ghana (4.276)
5. Finland (7.413)	45. Slovakia (6.078)	87. Bosnia-Herzeg. (5.163)	125. Congo (Kinshasa)(4.272)
6. Canada (7.404)	46. El Salvador (6.068)	88. Montenegro (5.161)	126. Georgia (4.252)
7. Netherlands (7.339)	47. Malaysia (6.005)	89. Dominican Repub. (5.155)	127. Congo (4.236)
8. New Zealand (7.334)	48. Nicaragua (5.992)	90. Morocco (5.151)	128. Senegal (4.219)
9. Australia (7.313)	49. Uzbekistan (5.987)	91. Hungary(5.145)	129. Bulgaria (4.217)
10. Sweden (7.291)	50. Italy (5.977)	92. Pakistan (5.132)	130. Mauritania (4.201)
11. Israel (7.267)	51. Ecuador (5.976)	93. Lebanon (5.129)	131. Zimbabwe (4.193)
12. Austria (7.119)	52. Belize (5.956)	94. Portugal (5.123)	132. Malawi (4.156)
13. United States (7.104)	53. Japan (5.921)	95. Macedonia (5.121)	133. Sudan (4.139)
14. Costa Rica (7.087)	54. Kazakhstan (5.919)	96. Vietnam (5.061)	134. Gabon (4.121)
15. Puerto Rico (7.039)	55. Moldova (5.897)	97. Somaliland region (5.057)	135. Mali (4.073)
16. Germany (6.994)	56. Russia (5.856)	98. Tunisia (5.045)	136. Haiti (4.028)
17. Brazil (6.952)	57. Poland (5.835)	99. Greece (5.033)	137. Botswana (3.974)
18. Belgium (6.929)	58. Soth Korea (5.835)	100. Tajikistan (4.996)	138. Comoros (3.956)
19. Ireland (6.907)	59. Bolivia (5.822)	101. Mongolia (4.907)	139. Ivory Coast (3.916)
20. Luxembourg (6.871)	60. Lithuania (5.813)	102. Laos (4.876)	140. Cambodia (3.907)
21. Mexico (6.778)	61. Belarus (5.802)	103. Nigeria (4.875)	141. Angola (3.866)
22. Singapore (6.739)	62. North Cyprus (5.771)	104. Honduras (4.871)	142. Niger (3.856)
23. United Kingdom (6.725)	63. Slovenia (5.768)	105. Iran (4.813)	143. South Sudan (3.832)
24. Chile (6.705)	64. Peru (5.743)	106. Zambia (4.795)	144. Chad (3.763)
25. Panama (6.701)	65. Turkmenistan (5.658)	107. Nepal (4.793)	145. Burkina Faso (3.739)
26. Argentina (6.650)	66. Mauritius (5.648)	108. Palestin. Territor.(4.754)	146. Uganda (3.739)
27. Czech Republic (6.596)	67. Libya (5.615)	109. Albania (4.655)	147. Yemen (3.724)
28. Unit. Arab Emir. (6.573)	68. Latvia (5.560)	110. Bangladesh (4.643)	148. Madagascar (3.695)
29. Uruguay (6.545)	69. Cyprus (5.546)	111. Sierra Leone (4.635)	149. Tanzania (3.666)
30. Malta (6.488)	70. Paraguay (5.538)	112. Iraq (4.575)	150. Liberia (3.622 Guinea (3.607)
31. Colombia (6.481)	71. Romania (5.528)	113. Namibia (4.574)	151. Rwanda (3.515)
32. France (6.478)	72. Estonia (5.517)	114. Cameroon (4.513)	152. Benin (3.484)
33. Thailand (6.474)	73. Jamaica (5.510)	115. Ethiopia (4.508)	153. Afghanistan (3.360)
34. Saudi Arabia (6.379)	74. Croatia (5.488)	116. South Africa (4.459)	154. Togo (3.303)
35. Taiwan (6.379)	75. Hong Kong (5.458)	117. Sri Lanka (4.415)	155. Syria (3.069)
36. Qatar (6.375)	76. Somalia (5.440)	118. India (4.404)	156. Burundi (2.905)
37. Spain (6.361)	77. Kosovo (5.401)	119. Myanmar (4.395)	
38. Algeria (6.355)	78. Turkey (5.389)	120. Egypt (4.362)	
39. Guatemala (6.324)	79. Indonesia (5.314)		
40. Suriname (6.269)	80. Jordan (5.303)		
	81. Azerbaijan (5.291)		
	82. Philippines (5.279)		

# Countries of the World (blind map)





## How much gold do we throw out?

Topic:	the absurdity of the disposing culture
Goal:	to recognise that waste can be a valuable raw material
Recommended age group:	14-18 years of age
Duration:	20'
Tools, preparation:	make enough copies of the <i>Worksheet</i>

The use of mobile phones is spreading in Hungary as well. The proportion of the population, including pupils and older people, who use mobile phones, and smart phones in particular, is increasing. Some use them for work, others in daily life. With time, however, mobile phones tend to stop working, or users upgrade to new ones, therefore many devices end up in the waste.

In addition to the disposed mobile phones, there is a great number of computers, laptops, tablets, etc., which are also thrown out. Handling electronic waste is an increasing problem globally. It is so not only because it is more and more difficult to find a suitable waste disposal site for the huge amount of waste but also because electronic gizmos contain some metals which, once ending up in nature, are harmful or hazardous for health.

The disposal of gizmos, however, has an economic aspect as well. Mobile phones and computers contain a lot of spare parts made of valuable metals and it is a waste if those end up in the garbage. Mobile phones, for instance, contain gold. Although one device does not contain much of it but since the production of mobile phones, and consequently their disposal, have become massive, thus the amount of gold they contain altogether cannot be neglected.

The question therefore is how much gold do we, Hungarians throw out by disposing of our old mobile phones

# Worksheet

## FACTS

- As many as about two million mobile phones are disposed of annually
- The weight of a mobile phone is 150g on average
- From one ton of disposed mobile phones about 270grams of gold can be obtained.
- The price level of gold is defined in ounces (= 31g). This year the price of one ounce is 1350USD.

1.) How much gold do we throw out then? .....

2.) If you are curious to know, then you can calculate the approximate amount of gold in the mobile phone that you use: .....

Another interesting fact: Disposed mobile phones can be considered a richer source of gold than the rocks in the gold mines. It is because only a small part of the extracted rock is gold, the rest is thrown onto the waste tip, which is probably not used for anything. The average gold content of the rock extracted in the gold mines is 5g/1000kg.

3.) How many times is a mobile phone a richer source of gold than a gold mine?.....

---

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3.) How many times is a mobile phone a richer source of gold than a gold mine?.....



## About the name of tungsten

Topic:	famous Hungarians and products related to tungsten
Goal:	to improve knowledge related to cultural history
Recommended age group:	10-18 year of age
Duration:	15'
Tools, preparation:	appropriate number of copies of the Worksheet

In some (English and French speaking) countries wolfram is called tungsten but in German speaking areas (and in Hungary) it is called wolfram. The Swedish expression tung sten means "heavy stone" and it comes from the fact that the density of the wolframite mineral is  $7,5 \text{ g/cm}^3$ , i.e. it is as heavy as metal. The origin of the word wolfram is more complicated. In German it means wolf soot and is thought to refer to the curses of German miners who tried to produce tin in the furnace but found that the wolfram contamination the tin into the foamy sludge, just as the wolf takes the sheep, thus significantly reducing the efficiency of tin production.

# Exercises

(Completing the exercise requires browsing on the internet!)

---

Name one product of the Hungarian industry, which contains both names of the element wolfram!

.....

Imre Bródy was working in the factory that manufactured the above product and contributed greatly to its global fame. What did he use to fill the product's glass ball with?

.....

Zoltán Bay, the world famous physicist, also worked in this factory. He was the first one, even before the Americans, to use the radar to measure the distance between the Earth and the Moon. It is thanks to him that the most modern principle of defining the meter (as a measurement of distance unit) is the so-called

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# Cyanide pollution in the river Tisza

(Domino game)

Topic:	the cyanide and heavy metal pollution affecting the river Tisza, originating from the gold mine in Romania, in 2000
Goal:	to make participants aware of an environmental disaster
Recommended age group:	10-16 year of age
Duration:	40'
Tools, preparation:	copy as many of the <i>Worksheet and domino card</i> sheet as needed (one for each small group). Scissors for cutting up the domino cards.

The Romanian-Australian joint-venture gold mining company, Aurul, was extracting gold from the quarries of the mines located in Baia Mare (Nagybánya in Hungarian) in Romania, using cyanide in the process. Everyone knows that cyanide compounds are extremely poisonous, therefore the process of cyanide extraction is extremely hazardous; this technology is nevertheless used in many places. A short explanation for this is that gold, as a noble metal, hardly forms compounds and potassium-gold-cyanide  $K[Au(CN)_2]$  is practically the only water-soluble gold-compound.

The situation was exacerbated by the fact that – because of the company's careless frugality – the company did not have an emergency response plan, therefore they did not even make an attempt to mitigate the damage caused. In the wake of the accident there were two 40-kilometer-long cyanide plumes floating in the river Tisza for two weeks.

Aurul was keeping the wastewater, containing cyanide, near a village called Zazár in a huge, open-air container, indeed an artificial pond, which was surrounded by a dam. On the night of 30 January 2000, the dam burst and some 100 thousand  $m^3$  of wastewater with a high concentration of cyanide and (also poisonous) heavy metals was discharged into the Zazár stream, and from there into the river Lápos, then on to the river Someş/Szamos (which enters Hungary near the town of Csenger) and consequently to the river Tisza.

The concentration of the pollutants was 180 times as much as the permitted value in Lápos, 135 times more at the Szamos/Somes estuary, 34 times more at the Tisza lake and even in Szeged the value was 15 times higher than what is permitted. The cyanide concentration was over the threshold in the segment of the Danube river even where it flows along the border between Romania and Bulgaria.

In the autumn of 2000 the Hungarian state sued Aurul, or its successor company Transgold, but as Transgold went bankrupt and ceased to exist, there was no longer any entity to sue. The compensation process thus halted.

As a consequence of the poisonous pollutants as much as 1241 tons of fish was killed and there was a danger that the stock of other animals (mayflies, shells and water birds, etc.) would be damaged as well. Fortunately Tisza regenerated sooner than expected and within a few years the majority of the fauna returned, despite the high heavy metal concentration in the sludge on the riverbed.

Exercise:

After giving a thorough explanation and discussion of the story it is recommended to introduce the domino game to repeat and consolidate the information.

It is not a competition, so there is no winner in this game.

The game can be played individually or in small groups as well

# Worksheet and domino cards

- Cut out the domino cards. **Attention! Do not cut along the thin lines! They are used only to separate the two sides of the domino.**
- Choose a domino randomly and place it in the middle of the table.
- Pair it with another one (by placing another domino either on the right or on the left hand side of the original). **Pairing in this case is not the same as in the ordinary domino game, where two dominos are paired with the same number of dots. Here you should pair the dominos with the matching content.**
- If after the fourth or fifth domino the children continue the line perpendicularly, then those at the two ends of the line might as well close the circle.

15 times as much as threshold value	100 000 m <sup>3</sup> cyanide waste water	the court case was stopped	1241 tons	Lápos river
	Tisza lake	Transgold shot down	34 times as much as the limit value	potassium-gold-cyanide
crosses the border	autumn of 2000	massive fish mortality	Zazár village	water-soluble gold compound
	Szeged	dump	cyanide plum	for two weeks
Transgold	sludge on the riverbed	bursting of the dam	January 2000	legal action for damages
	mayfly stock	high concentration of heavy metal	Baia Mare/Nagybánya	extraction of gold from rocks
cyanide compounds	gold	severe injury	Romanian-Australian joint venture	Baia Mare/Nagybánya
	successor of Aurul	noble metal	Somes/Szamos river	Aurul