

Appendix 1 - Awareness-raising, environmental and social impacts

This document contains information about ethical, social and environmental (past and present) issues related to countries which have the main minerals reserves of critical raw materials in the world, such as: Democratic Republic of Congo, Rwanda, China, India, Australia or Persian Gulf. Only a handful of the concerns are going to be highlighted, some that have occurred in the past (to prevent from repeating again) and others that are existing now-a-days. Consequently, in this scientific (and social) field (as in others), there are serious problems that affect all, especially related to the choices we make in our daily lives.

PETROL (“Black Gold”)

The most well-known problem is the oil dispute. This raw material, despite it is not a critical raw material, has been the main cause of the current international geopolitical conflict.

Petroleum is the most widely produced product in the industry worldwide, and also, in industrialized countries, petrol is vital for their well development and also their simply existence now-a-days. Due to this dependency of petrol on most countries (there are important strategies that involve petrol), due to the concentration of petrol resources in few countries and because the corruption, clandestine operations and military operations are sometimes part of “negotiations”; there have been important conflicts (in practically all the continents), between several countries and within some countries their selves, in the past and the present century [1][2]. Some general examples: conflict in the Niger Delta, war in Sudan, South China Sea, Persian Gulf, Egypt and Israel, Iraq or US-Iran-Israel. Also, it must be mentioned that petroleum industry has given rises to severe environmental impacts (soil, water and air pollution, climate change) [3]. Nowadays, it must be said that, despite there is much more control over conflicts and corruption, the petrol still has this harmful power, as it can be used as a “economical weapon” because it finances military and terrorist activities (for example, ISIS using oil revenue [4]).

“BLOOD DIAMONDS”

Trade of diamonds has involved, in the past, uncontrolled violations of human rights, as well as armed conflicts, wars, etc. It started in the 1990’s in Sierra Leone and then it spread to others countries in Africa such as, Angola, Democratic Republic of Congo. Meanwhile the enterprises that bought these diamonds, were selling them in some developed countries [5]. Therefore, the commercial chain was completed. People that bought those diamonds were supporting all that damage and conflicts without knowing it (that was the key; people did not know the real source of what they were buying). The solutions, although significant, including the Kimberley Process Certification Scheme signed in 2000, have not yet been definitive.

COLTAN (Tantalum), CASSITERITE (Tin), WOLFRAMITE (Tungsten), GOLD

Conflict minerals are those, whose systematic exploitation and trade in a context of conflict contribute to, benefit from or result in the commission of serious violations of human rights, violations of international humanitarian law or violations amounting to crimes under international law [6]. The four most commonly mined conflict minerals (known as 3TGs) are cassiterite (for tin), wolframite (for tungsten), coltan (columbite-tantalite, for tantalum) and gold ore, which are extracted, mainly, from the eastern Congo [7]. These minerals go through many intermediates before reaching the consumer from well-known companies. These minerals are used in many fields such as in electronic devices (laptops, smartphones, game consoles), automotive industry or jewelry [8][9].

Due to increasing business process outsourcing and globally dispersed production facilities, social problems and human rights violations are no longer only intra-organizationally rooted, but also occur in companies' supply chains.

Therefore, initiatives like the Dodd-Frank Wall Street Reform and Consumer Protection Act or the OECD (Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas) demand the supply chain managers to verify purchased goods as "conflict-free" or implement measures to better manage any inability to do so [10]. However, the mere transfer of responsibilities upstream in the supply chain apparently will not stop the trade with conflict minerals, notably due to two reasons [6]:

- On one hand, globalization has created governance gaps in a sense that companies are able to infringe human rights without being sanctioned by independent third parties. Consequently, there is a non-allocation of responsibility that makes the problem of human rights abuses and social conflicts within dispersed supply chains very likely to endure.
- On the other hand, conflict minerals usually originate from globally diverse deposits and are difficult to track within components and manufactured products. This is the case because these minerals are mostly mixed with minerals of different origin and added to metal alloys. As a result, although the share of these minerals in single end products is negligible, they are prevalent in numerous products and commodities [6].

Hence, there are many organizations and celebrities currently working to find solutions and raise awareness of conflict minerals, such as: Save the Congo, The Enough Project, Partnership Africa Canada, The Conflict Free Tin Initiative, Solutions for Hope, FairPhone, and more.

LITHIUM ("White Oil" or "White Gold")

Lithium has been used as a lubricant in aircraft engines and to produce nuclear weapons, but also in medicine, air purification, in telescope lenses and so. Nowadays, the major use of lithium is found in batteries use in electric vehicles, smartphones, laptop computers and more electric and electronic devices and engines. Therefore, there has been an enormous increase of lithium demand. However, more than half of Li reserves on the planet lay on the "lithium triangle", formed by Chile, Argentina and Bolivia. In

addition, there are other countries which have an important production of lithium, such as Portugal and Australia. But the problem affects to all of them. Less than 5 % of lithium-ion batteries are currently recycled, and therefore, there are millions of tons of lithium batteries disposed of, causing a huge environmental and economic impact [11][12]. There must be researches and investments in this sector to mend the situation, but the impact will still be there until a proper solution is found.

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