

Teaching Resources on the Sustainable Management of Critical Raw Materials

Trainer's Manual for Responsible Sourcing / Certification

March 2020

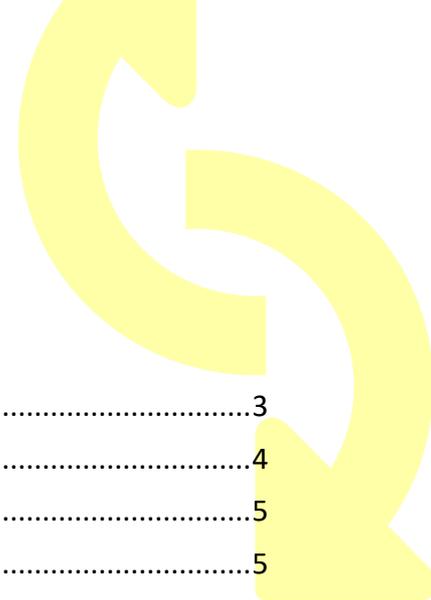


Table of Contents

1	Context and Introduction to Training.....	3
1.1	Training Materials List.....	4
1.2	Timetable	5
1.3	Key Messages.....	5
1.4	Learning Objectives.....	5
1.5	Additional Reading.....	6
2	Slides and Notes	7
3	Exercises	24
4	Assessment Questions	26
5	Acknowledgements and Authors	28
6	Citation	29
7	Disclaimer	29



1 Context and Introduction to Training

This booklet is supplementing the teaching materials and the set of further supporting booklets that have been developed to support teachers in conducting training courses related to the sustainable management of critical raw materials.

SusCritMat aims to educate people from Master's student level up, both in industry and academia about important aspects of sustainable critical raw materials. In a novel concept, it introduces courses on these complex and interdisciplinary topics in a modular structure, adaptable to a variety of different formats and accessible to both students and managers in industry. These courses will develop new skills, which will help participants to better understand the impact and role of critical raw materials in the whole value chain; enabling them to identify and mitigate risks. Understanding the bigger picture and the interconnected nature of global business and society is increasingly necessary to and valued by industry.

SusCritMat is an EU-funded project that brings together the technical and pedagogical expertise of leading educational institutions and business partners. It uses and creates teaching materials which can be combined into different course formats.

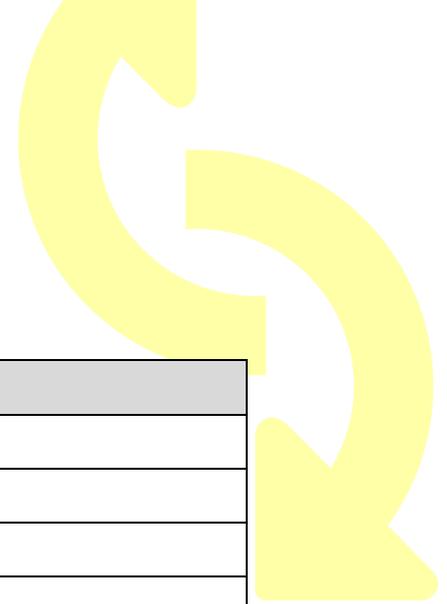
This training kit presents the key messages related with the sustainable management of critical raw materials in three major sections:

- Introduction to criticality (including criticality assessment, global resource supply chains, geopolitical factors, and economics of metals)
- Analysis of criticality (including material flows, scenario planning, and life cycle assessment)
- Solutions (including responsible sourcing, circularity indicators, circular product design, and good practice examples)

In particular, the solutions part will be in the focus. The intention is to underline the possibilities that are available to approach and implement a circular economy for critical raw materials and the products bearing these. Doing so the concrete actions, i.e. the things that can be done, are highlighted, instead of only mentioning all sorts of associated problems or barriers in the context of CRMs.

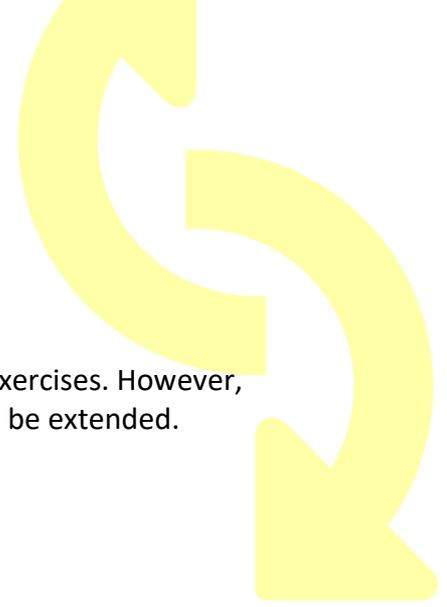
The overall goal of the Summer School for Educators is to qualify the participants to teach the topics themselves. Therefore, the school does not only provide an introduction and improved insight into selected thematic issues, but to also deliver a set of teaching materials "ready-to-use".

- Learning targets that will be reached after having taught the courses
- Presentations on the specific topics including also notes on how to present the slides and key messages.
- Group work exercises including the task or question to work on, if applicable further reading on the methodology and the solutions in case of tasks requiring calculations.
- Assessment questions and the correct answers for each specific topic.
- Additional reading for each topic.



1.1 Training Materials List

Basics
Critical Resources for Emerging Technologies
Criticality
Supply Chain Resilience
Supply Risk Factors
Circularity
Circular Economy
Characterizing the Urban Mine
Circular Business Models
Waste Management and Recycling Potential
Closing Loops on Product Level
Governance
Geopolitical Aspects
Metals & CRM Scenarios
Restricted Substances Legislation
Impact on Society and the Environment
Sustainability Assessment
Responsible Mining
Responsible Sourcing / Certification
Environmental Aspects
Sustainable Materials Usage
CRM and Sustainable Development
Tools
MFA - Material Flow Management
Good Use of Data
LCA – Life Cycle Assessment
Process Models based on LCA



1.2 Timetable

The timetable contains a recommended timing for the lecture and exercises. However, depending on the pre-existing knowledge or group size the time can be extended.

- Responsible sourcing: 40 minutes
- Group work exercise: 30 minutes
- Live quiz: 10 minutes
- Discussion on quiz results: 10 minutes

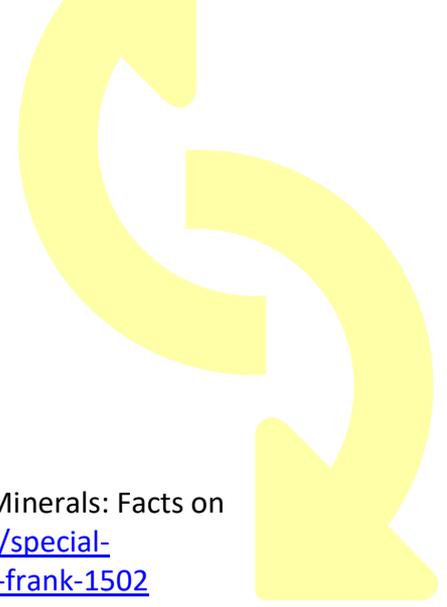
1.3 Key Messages

- Certification has as purpose to connect sellers and buyers of materials. Sellers can diversify their product by providing additional information and buyers are able to identify under which circumstances a product has been sourced
- A certification scheme is built up by the program governance, a standard, and an accreditation procedure (i.e. a third-party audit)
- US and EU regulations regarding conflict minerals (tin, tantalum, tungsten, and gold) require chain of custody and conformance with due diligence standards
- Implementation of certification programs could lead to improved conditions for local miners and guaranteed sources of income. Downstream users benefit from compliance with regulations and decreased reputational and supply risks
- Potential damaging consequences of conflict mineral legislation are a decreased metal demand from certain regions, leading to lacking incomes locally, and a shift from illegal trading from metals to other types of commodities
- Certification has the potential to mitigate raw material criticality, as it might lead to increased transparency regarding the supply of minor metals. Certification also has the potential to protect against reputational risk. Furthermore, certification might pose a risk on companies, due to market or government requirements that must be fulfilled before materials can be used or sold.

1.4 Learning Objectives

This session will provide learners the ability to...

- Explain of the purpose of certification for suppliers and users of materials
- Apply the theoretical structure of certification schemes and terminology
- Explain the current status of the certification of conflict minerals
- Discuss the potential positive and negative effects of certification
- Critically reflect on the mitigation potential of certification of critical materials



1.5 Additional Reading

Recommended reading:

- Enough Project (2017). Progress and Challenges on Conflict Minerals: Facts on Dodd-Frank 1502. Retrieved from <https://enoughproject.org/special-topics/progress-and-challenges-conflict-minerals-facts-dodd-frank-1502>

This page provides information about the Dodd-Frank act and its implementation.

- OECD Due Diligence Guidance: <http://www.oecd.org/daf/inv/mne/mining.htm>

Reference document for the application of due diligence. Following this guidance is often the requirement of certification schemes.

- Responsible Minerals Initiative: <http://www.responsiblemineralsinitiative.org/>

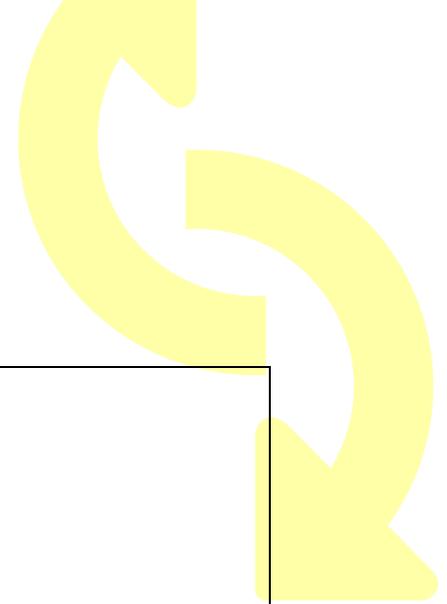
Latest news on certification schemes for metals.

- Tegera, A., Laudati, A., Leinweber, A., & Radley, B. (2014). An Open Letter. Retrieved from <https://ethuin.files.wordpress.com/2014/09/09092014-open-letter-final-and-list.pdf>

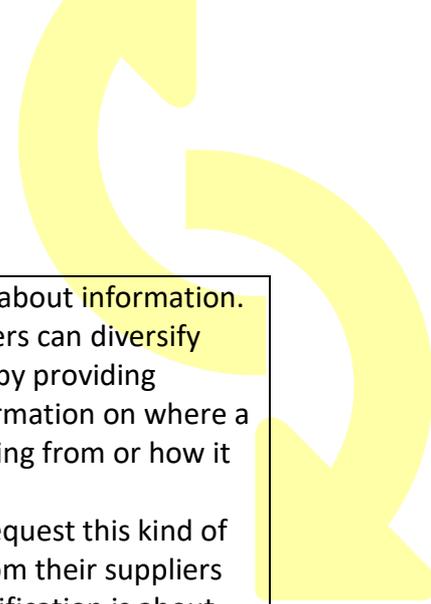
Critical notes from experts with regard to conflict-mineral regulations.

References used in the course:

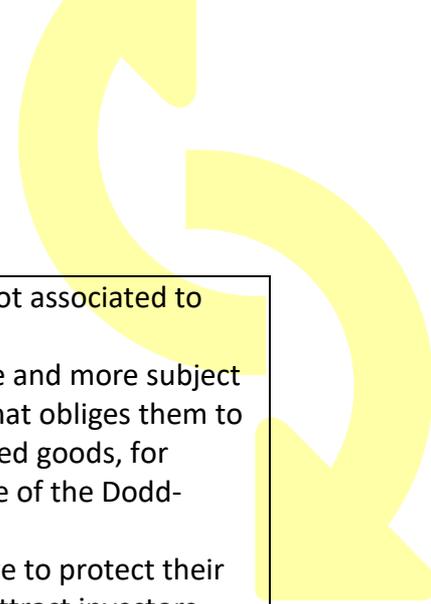
- Carlsson, C., & Johansson, H. (2013). *Private standards: leveling the playing field for global competition in the food supply chain?* Lund, Sweden.
- Loconto, A., & Busch, L. (2010). Standards, techno-economic networks, and playing fields: Performing the global market economy. *Review of International Political Economy*, 17(3), 507–536. doi:10.1080/09692290903319870
- Young, S. B. (2015). Responsible sourcing of metals: certification approaches for conflict minerals and conflict-free metals. *The International Journal of Life Cycle Assessment*. doi:10.1007/s11367-015-0932-5
- Young, S. B., Dias, G., & Author, C. (2011). Conflict-free minerals supply-chain to electronics, 2011.
- Young, S. B., Dias, G., & Zhe, Y. (2013). Challenges in Sustainability Certification of Metals. *Proc. International Symposium on Sustainable Systems and Technologies (ISSST)*, 1(2013), 7. doi:10.6084/m9.figshare.956306



<p style="text-align: right;">SusMat Crit</p> <p>RESPONSIBLE SOURCING: A SUPPLY-CHAIN MANAGEMENT APPROACH TO CRITICAL MATERIALS</p> <p> <small> Prof. Steven B Young, University of Waterloo, Canada steveny@uwaterloo.ca Prof. Guido Schickmann, University of Bordeaux, France GUIDO.SCHICKMANN@U-BORDEAUX.FR Dr. Delwende Schmitt, University of Bordeaux, France DELWENDE.SCHMITT@U-BORDEAUX.FR </small> </p> <p><small> This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation </small></p>	
<p>Agenda</p> <ul style="list-style-type: none"> • Introduction • Terminology, theory and structure of certification • Example for critical materials <ul style="list-style-type: none"> • Conflict minerals (Sn, W, Ta, Au) • Potentials of certification for critical materials • Summary <p><small> This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation </small> <small>© Steven Young</small></p>	
<p>Introduction</p> <p>Why certify?</p> <p><small> This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation </small> <small>© Steven Young</small></p>	
<p>“Certification”?</p> <ul style="list-style-type: none"> • On what products do you see certifications? • What attributes are certified? • Who operates the certification?  <p><small> This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation </small> <small>© Steven Young</small></p>	
 <p><small> This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation </small> <small>© Steven Young</small></p>	<p>Certification on biotic resources is well-known. Here, we will focus on metals.</p>



<p>Objective of supply-chain certification</p> <ul style="list-style-type: none"> • Certification connects a buyer to seller with information • The seller is providing valuable information with their product <ul style="list-style-type: none"> • Tracks forward along the supply-chain • The buyer is seeking reliable information on the source and production practices <ul style="list-style-type: none"> • Traces backward along the supply-chain  <p><small>© Steven Young</small></p>	<ul style="list-style-type: none"> - Certification is about information. - Product suppliers can diversify their products by providing additional information on where a product is coming from or how it was made - Buyers often request this kind of information from their suppliers - Therefore, certification is about tracking and tracing. We track a product along its supply chain or we trace back where the product is coming from.
<p>Reasons for certification of minerals</p> <ul style="list-style-type: none"> • Seller upstream: Producers of minerals and metals <ul style="list-style-type: none"> • Want to demonstrate sustainable development practices, including environmental, social and economic • Special concerns regarding informal mining sector, "artisanal" mining • Buyer downstream: Manufacturers <ul style="list-style-type: none"> • Customers need assurance that products and materials are responsible • Government regulations, including reporting on due diligence and for procurement • Investors are more and more including social responsibility and transparency requirements of corporations  <p><small>© Steven Young</small></p>	<ul style="list-style-type: none"> • Certification is very important for sellers that would like to demonstrate the sustainability of their production. • When we talk about sustainability, this can refer to environmental aspects, but also to social or economic issues. • This is especially relevant for Artisanal and Small Scale mines: ASMs. • ASM often takes place in remote regions and often uses hand labour. • There is often little control on health and safety of employers and there are large environmental problems. • Sometimes these mines are even involved with illegal practices or civil war. • Therefore, if a small scale mine does apply good practices, it is in their interest to demonstrate this by certification. • On the other hand we have the downstream product manufacturers: the OEMs • Consumers are often aware of upstream sustainability issues and demand assurance of companies



	<p>that they are not associated to such practices.</p> <ul style="list-style-type: none"> • OEMs are more and more subject to regulation that obliges them to buy only certified goods, for example in case of the Dodd-Frank act. • Companies have to protect their reputation to attract investors
<p style="text-align: right;">SusMat Crit</p> <p style="text-align: center;">Terminology, theory and structure of certification</p> <p><small>© Fraunhofer IPA, EIT, This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	
<p>Government regulations vs voluntary standards</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Government regulation uses standards</p> <ul style="list-style-type: none"> • May be written into law, as a requirement to build or sell <ul style="list-style-type: none"> • Building electrical safety standards • Appliances and electronics • Sports equipment, baby or children's devices • Often based on international standards <ul style="list-style-type: none"> • International Electrotechnical Committee (IEC) • International Organization for Standardization (ISO) </div> <div style="width: 45%;"> <p>Voluntary standards</p> <ul style="list-style-type: none"> • Operate in the market place <ul style="list-style-type: none"> • Buyer-beware • Competitive with other standards and certifications • May be international consensus standards (like those from ISO, IEC) • But more and more "private standards" <ul style="list-style-type: none"> • Multistakeholder groups (e.g., Forest Stewardship Council) • Business-lead initiatives (e.g., Responsible Care – Chemical industry) • Private company (e.g., Ford, Ikea) • Voluntary but necessary to do business </div> </div> <p><small>© Fraunhofer IPA, EIT, This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	<ul style="list-style-type: none"> • There is an important difference between certification as such and governmental regulations • Governmental regulations can formulate minimal requirements that a product must fulfil before a product can be sold • These requirements are often based on public standards, such as IEC standards (requirements for cables and electronic devices) or ISO • Certification is voluntary. Standards can be public or private, developed together with industries. • Rather than making the government responsible for the quality of a product, buyers become responsible for the evaluation of the significance of the certificate • Certification enables a company to differentiate its product from other alternatives on the market, and provide competitive advantage

	<p>Although certification is not obligatory, it can become a requirement to be able to compete with other, certified, products</p>
<p>Standards</p> <p>Standards can be defined as "explicitly formulated and explicitly decided rules"</p>  <p> <ul style="list-style-type: none"> • Creating • Updating • Maintaining </p> <p> <small>Lascombs, A., & Busch, L. (2010). Standards, techno-economic networks, and playing fields: Performing the global market economy. <i>Review of International Political Economy</i>, 27(3), 507-536.</small> </p> <p> <small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small> </p> <p>© Steven Young</p>	<ul style="list-style-type: none"> • A standard contains explicitly formulated and explicitly decided rules • Standards are developed by standard development organisations, who are responsible for creating, updating, and maintaining the standard.
<p>Public vs private standards</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Public standards</p> <ul style="list-style-type: none"> • Usually are based on international standards (ISO, IEC, etc) • ISO and most national standards are public standards • Comply with World Trade Organization (WTO) rules <ul style="list-style-type: none"> • Avoid Technical Barriers to Trade (TBT) under WTO • Often used directly by government (e.g., in regulation) • Or may be voluntary <ul style="list-style-type: none"> • E.g., ISO 9001, ISO 14001 </div> <div style="width: 45%;"> <p>Private standards</p> <ul style="list-style-type: none"> • Voluntary, market driven • Growing rapidly in different industries <ul style="list-style-type: none"> • Food, forestry, fisheries, cotton, etc. • Developed by non-government <ul style="list-style-type: none"> • Business-lead groups (e.g., electronics sector, fishery industry) • Multi-stakeholder groups (e.g., NGO, industry and government) • Also occur inside private corporations • Often collaborations of business and civil society • Private standards cross international boundaries, without WTO rules </div> </div> <p> <small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small> </p> <p>© Steven Young</p>	<ul style="list-style-type: none"> • Public standards often form the basis for governmental regulations • These standards can be national, such as standards developed by the British Standards Institute or AFNOR in France. • They are often based on international standards, such as ISO and the International Electrotechnical Commission • Public standards have to comply with World Trade Organization rules. • This means that they cannot set up any barriers to trade, for example by favoring the production from a specific country. • Private standards are voluntary and driven by markets • They are often developed by multi-stakeholder groups, including stakeholders from industry, NGOs, and the civil society. • Examples of private standards are Fairtrade and the Forest Stewardship Council • Private standards don't have to follow WTO rules, and are therefore quicker to develop.

	<ul style="list-style-type: none"> • They often respond to short-term needs from the market.
<p>Standards</p> <p>The process for initial standards development is important for credibility, participation and stakeholder support</p> <ul style="list-style-type: none"> • Management system requirements • Performance requirements • Geography of activities <p>Good standards balance rigour with doability</p> <p>Producers Supply-chain actors</p> <p>Labelling</p> <p>Standard</p> <p>Product</p> <p>Seller</p> <p>Buyer</p> <p>Program objectives Environmental Social Economic</p> <p>• Determined via a "fair" process</p> <p>• Science and e based</p> <p><small>Carlsson, C. & Johansson, B. (2013). Private standards: leveling the playing field for global competition in the food supply chain? Appl Food Economics Centre, Lund, Sweden.</small></p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p> <p><small>© Steven Young</small></p>	<ul style="list-style-type: none"> • Public standards often form the basis for governmental regulations • These standards can be national, such as standards developed by the British Standards Institute or AFNOR in France. • They are often based on international standards, such as ISO and the International Electrotechnical Commission • Public standards have to comply with World Trade Organization rules. • This means that they cannot set up any barriers to trade, for example by favoring the production from a specific country. • Private standards are voluntary and driven by markets • They are often developed by multi-stakeholder groups, including stakeholders from industry, NGOs, and the civil society. • Examples of private standards are Fairtrade and the Forest Stewardship Council • Private standards don't have to follow WTO rules, and are therefore quicker to develop. • They often respond to short-term needs from the market.

Conformity assessment

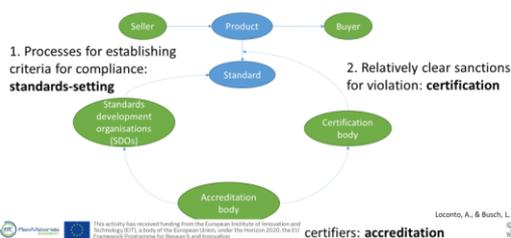
- “measures taken by manufacturers, their customers, regulatory authorities, and independent, third parties to assess conformity to standards” (National Research Council, 1995, p. 65).
- There are three options to conformity assessment to formal standards (ISO, 1970)
 1. Testing – physical and lab-based
 2. Inspection – comprehensive checking
 3. **Certification – based on independent auditing**



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- The process of identifying whether a product follows a standard is called a conformity assessment.
- There are three levels of conformity assessment.
- A seller of a product can test whether its products follows certain requirements and can communicate this in the form of a warranty
- Buyers or other stakeholders with an interest in the product can check whether the product follows certain standards
- But if a product is actually certified, the conformity assessment is done by a third party certifier. He checks whether the standard is followed by means of an audit.
- Auditors go to the stakeholder and they try to find evidence whether or not the stakeholders practices are conform to the standard.
- They can also obtain documentation or conduct interviews to get this type of information.

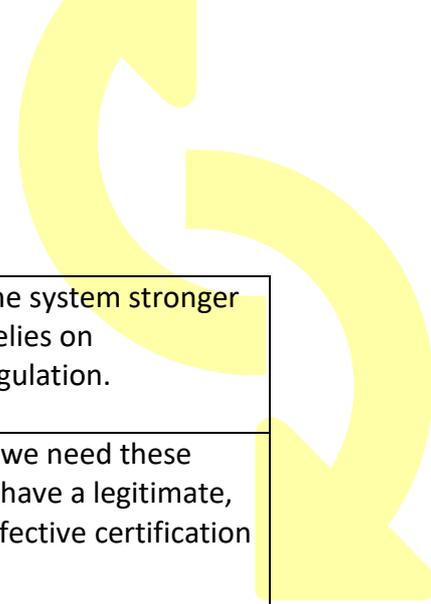
Academics describe conformity assessment in three parts



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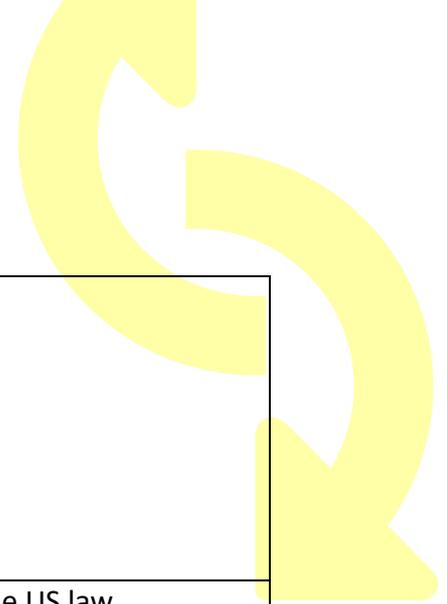
- Now we have a procedure to develop a standard and to conduct certification.
- However, the standard developers and the certification bodies should be granted the authority to operate.
- This authority is provided by an accreditation body.

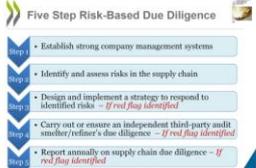
<p>Tripartite Standards Regime</p> <p>1. Processes for establishing criteria for compliance: standards-setting</p> <p>2. Relatively clear sanctions for violation: certification</p> <p>Standards development organisations (SDOs)</p> <p>Tripartite standards regime</p> <p>Certification body</p> <p>Accreditation body</p> <p>Loconto, A., & Busch, L. (2010)</p> <p>© Steven Young</p>	<p>This construction, which is called the tripartite standards regime, allows for a solid certification program.</p>
<p>Tripartite Standards Regime</p> <p>Certification</p> <p>Standards</p> <p>Tripartite standards regime</p> <p>Accreditation</p> <p>Avoid variation on certification practices, give authority to certify</p> <ul style="list-style-type: none"> - National Accreditation Bodies <p>Give authority to develop a standard</p> <ul style="list-style-type: none"> - Government (e.g. ISO) - NGO - Industry associations <p>© Steven Young</p>	<ul style="list-style-type: none"> • An accreditation body provides standard developers the authority to develop a standard. • This accreditation can be done by government agencies, NGOs, or industry associations. • Certification bodies are provided the authority to certify by national accreditation bodies. • This accreditation avoids that every certification body follows their own rules, so this is a rather standardized process. • To harmonize in turn the procedures of the national accreditation bodies, these are organized in an International Accreditation Forum
<p>Tripartite Standards Regime</p> <p>Certification</p> <p>Standards</p> <p>Tripartite standards regime</p> <p>Governance</p> <p>Avoid variation on certification practices, give authority to certify</p> <ul style="list-style-type: none"> - National Accreditation Bodies <p>Give authority to develop a standard</p> <ul style="list-style-type: none"> - Government (e.g. ISO) - NGO - Industry associations <p>© Steven Young</p>	<ul style="list-style-type: none"> • The certification program is managed by an accreditation mechanism that provides credibility to certifiers and standard developers, so this can be called the governance of the certification program. The governance of the program is organized by the program owners. • The program owners are not only public parties, but also private actors. • Therefore, the certification program is automatically integrated in the product market,



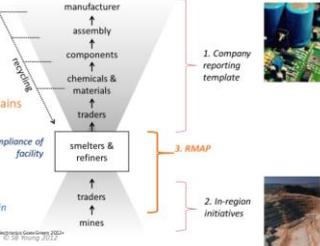
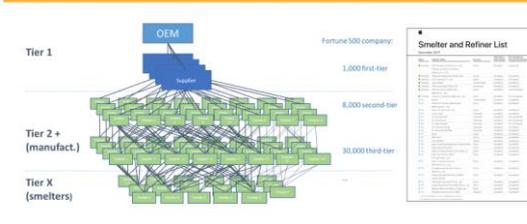
	<p>which makes the system stronger than if it only relies on government regulation.</p>
<p>Tripartite Standards Regime</p> <p>Source: Young 2015</p>	<ul style="list-style-type: none"> To summarize, we need these three pillars to have a legitimate, efficient and effective certification scheme.
<p>SusMat Crit</p> <p>Example for critical materials</p> <p>Conflict minerals (Sn, W, Ta, Au)</p>	
<p>European Critical Materials (EC 2017)</p> <p>“3TG” tin tantalum tungsten gold</p> <p>© Steven Young</p>	<ul style="list-style-type: none"> It appears that not all the conflict minerals are actually critical according to the European Commission However, this is dependent on the criticality method, not all methods identify the same materials as critical. For example, following the criticality assessment developed by a consultancy in England (Oakdene Hollins), gold is critical
<p>“Conflict minerals”</p> <p>Since late 1990s >3 million dead displaced</p> <p>Eastern DRC Minerals financing humanitarian crisis Civil war and militias Forced labor Gender and sexual violence</p> <p>Regulation/Government response</p> <ul style="list-style-type: none"> US Congress, Dodd-Frank Wall Street Reform and Consumer Protection Act, Title XVI, 2010 U.S. Securities and Exchange Commission, 17 CFR Parts 239 and 249, Release No. 34-63547, RIN 3235-A064, Conflict Minerals, 2012 January 1, 2021 EU – the Conflict Minerals Regulation It aims to help stem the trade in four minerals – tin, tantalum, tungsten and gold – which sometimes finance armed conflict or are mined using forced labour. China’s Due Diligence Guidelines for Responsible Mineral Supply Chains since 2015 <p>© Steven Young</p>	<ul style="list-style-type: none"> When we talk about conflict minerals, we mostly refer to minerals that are mined in the eastern Democratic republic of Congo and surrounding regions, like Rwanda. In these regions, mines are very isolated. Some studies showed that armed groups are present at more than 50% of the mining sites. The armed groups force the local population to work in the

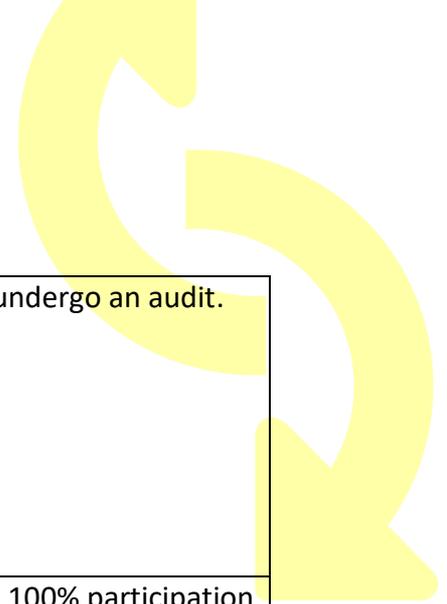
	<p>mines by intimidating them with violence and sexual violence. They also force children to work. The financial revenues from mining in this regions are used to buy weapons that keep the wars ongoing.</p> <ul style="list-style-type: none"> • In 2010 the United States developed a law with regard to conflict minerals • They defined conflict minerals as the ores of tantalum, tin, and tungsten, gold, or their derivatives • This law is part of the Dodd-Frank Wall Street Reform and Consumer protection act of 2010. After the financial crisis in 2007 and 2008, the government installed this law in order to protect consumers against risky practices of banks. You could say that investments in minerals from conflict regions can be considered risky practices. • In 2017 the European Commission adopted a similar law, which will become effective in 2021. • This year they prepare affected companies already by publishing guidelines • In China, there is not really legislation related to conflict minerals • However, Chinese companies are affected by the US and European legislations due to international trade, so it is rather the downstream companies that put this requirement. • Therefore, the Chinese Chamber of Commerce has also developed due diligence guidelines
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<h3>Conflict mineral regulations</h3> <ul style="list-style-type: none"> • Since 2012 • Companies publicly listed in the United States must submit an annual report on 3TG originating from the DRC or the nine adjoining countries, and the associated due diligence efforts.   <p><small>The activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	
<h3>US "Conflict Minerals" Act requirements</h3> <ul style="list-style-type: none"> • Chain of custody <ul style="list-style-type: none"> • Implementation of documentation practices that enable the traceability of a material and the identification of the country of origin • Due diligence <ul style="list-style-type: none"> • Implementation of policy, procedures, and practices to demonstrate that a company does the best that it can do to identify risks, mitigate high risks, and report on its results • OECD Due Diligence Guidance (3rd edition, 2016) for Responsible Supply Chains of Minerals from "Conflict-Affected and High-Risk Areas" • Third-party audit on country of origin and processing facilities  <p><small>The activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<ul style="list-style-type: none"> • According to the US law, manufacturers in the US should identify where the metals that they use originate from. Therefore, they have to apply chain of custody, which enables to trace the metal within the supply chain up to the source. • If minerals appear to come from conflict regions, they have to apply due diligence. • This means that they have to develop a plan and proactively ensure that the minerals do not contribute to armed conflicts. • Companies can still continue sourcing from conflict regions, but they have to be strongly involved with the mines to be sure that no harm is associated to their sourcing. • Companies can use the OECD Due Diligence Guidance to comply to the law. • The law also states that the manufacturers should conduct third party audits to assess the country of origin.
<h3>OECD "Due diligence management system"</h3> <ul style="list-style-type: none"> • Modeled after ISO 9000, 14001, 19011 ...   <p><small>The activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<p>In practice, the implementation of due diligence represents the implementation of a strong management system that allows to identify high risks in the supply chain and actively engage in strategies to decrease these risks.</p>

<p>Potential conflict-affected and high-risk areas</p>  <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation.</small></p>	<ul style="list-style-type: none"> • While Dodd-Frank act focuses on the DRC and surrounding countries, the OECD guideline refers to “conflict-affected and high-risk areas”, that comprise a wider geographical range
<p>OECD refers to “conflict-affected and high-risk areas”</p> <ul style="list-style-type: none"> • Issues of “risk” <ul style="list-style-type: none"> • Violent conflict <ul style="list-style-type: none"> • War, civil war, violent outbreaks • Human rights <ul style="list-style-type: none"> • Forced labour, child labour, etc. • Weak governance <ul style="list-style-type: none"> • Financial crimes like bribery and money laundering • Financing of terrorism • Present supply disruption and reputational risks to corporations <ul style="list-style-type: none"> • Growing scope of responsible sourcing <ul style="list-style-type: none"> • Risk issues are growing • More regions around the world • Growing list of materials - beyond original minerals (Sn, Ta, W, Au) <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation.</small></p>	<p>Minerals sourced from “high-risk” areas could become critical as the sources of risk could contribute to a supply disruption or could pose reputational risks to companies.</p>
<p>Growing list of high-risk materials</p> <ul style="list-style-type: none"> • Auto industry has recently identified 35 raw materials of concern  <p>Source: Neils Angel, BMW, January 2019</p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation.</small></p>	
<p>Business response: issue of Corporate Social Responsibility</p>  <p>Responsible Minerals Initiative >350 companies (2017)</p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation.</small></p>	<ul style="list-style-type: none"> • Even before the installment of the Dodd Frank act, consumers became aware of these problems due to efforts of NGOs. • This forced OEMs to implement policies as part of their CSR to actively look into their supply chains, in order to protect their reputation. • The Responsible Minerals Initiative started in 2008 and has now more than 350 member companies. For these companies it is very useful to engage in certification schemes, because it makes it easier to comply to the Dodd-Frank Act. • The main program that was initiated by the Responsible Minerals Initiative is the Responsible minerals assurance

	<p>process (formerly Conflict free smelter program).</p>
<p>Responsible Minerals Assurance Process (RMAP)</p> <ul style="list-style-type: none"> 2008 Governance <ul style="list-style-type: none"> End-users: electronics and other manufacturing industries Scope <ul style="list-style-type: none"> Since 2010: Ta, W, Sn, Au (3TG) Added in 2018: Co <p>Criteria</p> <ul style="list-style-type: none"> Since 2010: Smelters/refineries "conflict-free" Added in 2018: high-risk issues like human rights, illegal finances, and forced labour  <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<ul style="list-style-type: none"> The program owners of the responsible minerals assurance process are the end-users of the metals. The electronics and other manufacturing industries. Since 2010 the program covered the conflict minerals, but in 2018 expanded to Cobalt and Mica, which are both associated with child labor. Also in 2018, the performance criteria are expanded from "conflict-free" to also covering human rights, illegal finances and forced labour.
<p>Responsible Minerals Assurance Process (RMAP)</p>  <p>Part of a broader response</p> <ol style="list-style-type: none"> Manufacturers look at supply-chains In-region initiatives Certification of smelters <p>Why smelters/refiners?</p> <ul style="list-style-type: none"> Limited in number Bottleneck/pinch-point Control responsibility in supply chain Includes mining and recycling <p><small>Young, S. & Zhou, G. (2012). Conflict-Free Minerals Supply Chains. In: Electronics Greening 2012. IEEE, pp. 3-16. doi:10.1109/EGC.2012.6240101</small></p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<ul style="list-style-type: none"> Coming from mines, minerals go to smelters and refiners and finally to Original Equipment Manufacturers. Recycled metals are sent back to the smelters.
<p>1. Manufacturers examine supply-chains</p>  <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<p>Each supplier has to fill in a template with the inputs and outputs of their metals.</p>
<p>2. In region initiatives</p> <p>"Bag-and-tag" traceability from mines to smelters</p>  <p><small>Images: Intel, ITSC</small></p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation</small></p>	<p>In the second level, within the region, miners put the minerals in bags and tag these to inform the downstream supply-chain actors.</p>



3. Certification of smelter and refiners



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Smelters and refiners undergo an audit.

Tungsten processors (smelters) – APRIL 2015



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- There is almost 100% participation of tungsten processors to the program.
- There are no tungsten processors in the conflict region. However, every smelter has to identify that they don't source from mines that contribute to conflict, which makes this certification scheme a global issue.

Responsible Minerals Initiative – April 2019

Smelters implementing responsible sourcing standards & auditing (N=362 identified)

RESPONSIBLE MINERALS ASSURANCE PROCESS INDICATORS

This table shows the number of smelters and refiners currently active in the Responsible Minerals Assurance Process, and refiners.

	Tantalum TA ²⁺	Tin SN ²⁺	Wolfram W ²⁺	Gold AU ²⁺	Cobalt CO ²⁺
Active	1	3	3	4	3
Conformant	40	76	40	101	5
Sample	41	88	50	108	27

Smelters and refiners currently active in the Responsible Minerals Assurance Process, and number of RMAP-conformant smelters and refiners (Source: Responsible Minerals Initiative, 2019)

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RMAP results – for conflict minerals

Outcomes of Conflict-free sourcing

- High level of participation by smelters
 - Certification now market expectation
- >70% of tin, tantalum, and tungsten mines assessed are conflict-free
- Gold smuggling continues from DRC

Conclusion:

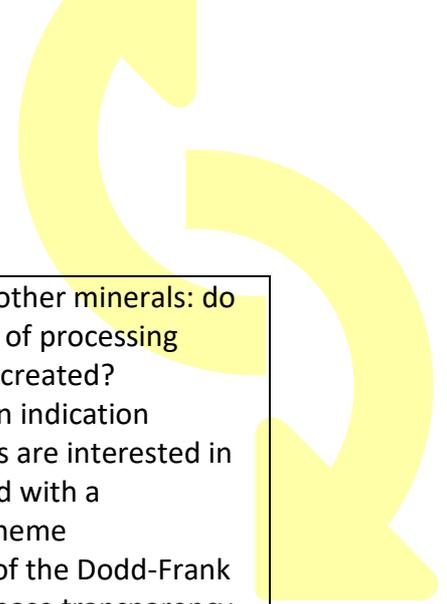
- Certification has benefited downstream manufacturers with compliance, reputation and risk-reduction benefits
- Some communities and miners have benefited in-region

Unintended and damaging consequences

- Buyers stopped trading with Congo altogether (temporarily)
- Cost of bag-and-tag schemes on poor miners
- Armed groups change activities: charcoal, forestry

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- For the conflict-free smelters we already discussed that there is a high level of participation by smelters.
- Also a high production share of the conflict minerals were identified as “conflict free”.
- However, this is not the case for gold.
- Gold has a high price already at the mine, 80% of the final value
- Unlike for other metals, a large share of the revenue goes directly to the mine



	<ul style="list-style-type: none"> • Extrapolate to other minerals: do they need a lot of processing before value is created? • This could be an indication whether miners are interested in getting engaged with a certification scheme • While the aim of the Dodd-Frank Act was to increase transparency about sourcing from conflict regions, companies try to comply by stopping trading with these regions altogether. This includes trade with mines that are not financing armed groups. • This is a pity, because continuing trade while applying due diligence could actually improve the situation in the mines due to the improved connections with the mines and repeating auditing procedures. Regular audits are more important for the mine than the claim “being 100% conflict-free”. • The fact that “conflict-free” is now a market requirement excludes and isolates the overwhelming majority of mining communities from legal access to international markets, which is economically damaging for the local population.
 <p>Potential for critical materials</p>	

How can certification mitigate criticality?



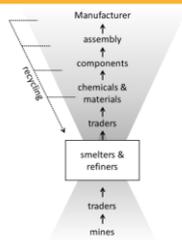
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- There are a lot of different ways to assess the criticality of metals.
- Almost every method aims to assess supply risks, but the indicators to measure this can differ.
- The most important factor is the question: critical to whom? Criticality is always defined from the perspective of a specific stakeholder. We say that materials are critical for Europe, for the US, for a certain economy, for specific technologies...
- Therefore, we want to know, can the stakeholder protect himself by certification?

Are critical materials appropriate for certification?

- Opportunity:
- Critical materials are characterized by a limited number of producers
 - Fewer actors to engage
- Challenge:
- Market transparency is limited
 - What should be certified?



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- Critical materials have some properties that make them good candidates for certification.
- For example, materials are often critical because they are produced by a limited number of producers, which could be indicated by a high HHI index.
- This means that there are fewer actors to engage in a certification process. This is a benefit, as we saw in the conflict-free smelter program where the smelters form the bottleneck of the supply chain.
- On the other hand, market transparency is often limited.
- However, one of the purposes of certification is to increase transparency. Increasing awareness on the origin of raw materials can inform the supply chain actors about potential risks.
- Certification is also about reaching certain objectives. As criticality can be measured by such a broad range of indicators, what objectives should be certified?

<p>Current and emerging initiatives – relevant to critical materials</p> <ul style="list-style-type: none"> Responsible Minerals Initiative <ul style="list-style-type: none"> Conflict minerals Aluminium Stewardship Initiative Global Battery Alliance Drive Sustainability <ul style="list-style-type: none"> Automotive – assessed 37 materials Responsible Steel <p>   </p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	<p>Environmental, social, economic, management of geopolitical risks?</p> <ul style="list-style-type: none"> Initially, conflict minerals focused on tin, tantalum, tungsten, and gold The Responsible Minerals Initiative already added cobalt Additional stakeholders and industry association examine their risks and supply chain, which increases the list further For example, the Global Battery Alliance is concerned about lithium and cobalt Drive Sustainability focuses on all types of metals and minerals that go into automobiles The aluminium and steel industries use a great amount of critical raw materials, such as magnesium, silicon, lithium, yttrium, and other CRMs as alloys in aluminium products The steel industry uses tungsten, vanadium, molybdenum, niobium, and other CRMs, for example for alloys for tools, aerospace, etc.
<p>Steel sector is BIG</p> <ul style="list-style-type: none"> 93% of all metal produced annually For steel alloys and coatings <ul style="list-style-type: none"> 20% of tin and tungsten 60% of nickel and zinc 75% of chromium 85% of manganese and vanadium molybdenum, niobium, ... <p>   </p> <p><small>Source: Responsible Steel 2019. © Steven Young</small></p>	<ul style="list-style-type: none"> Steel is really, really big – but this is also a massive opportunity. There aren't that many sites where steel is made, perhaps a few thousand. If the biggest 500 sites were engaged, you would probably be hitting 80% of the market. And if you solve the issue for steel, you solve it for 20 other metals and minerals in the steel supply chain. Data on other metals from OECD (STEELMAKING RAW MATERIALS: MARKET AND POLICY DEVELOPMENTS, 2012) Steel production is about 93% of total annual production of all metals (US Geological Survey

	<p>Mineral Commodity Summaries 2016) based on 2015 global data. About 1,600,000 thousand metric tonnes raw steel produced per year. The next biggest metal by volume produced is aluminium, at 58,300 thousand metric tonnes (3%).</p>
<p style="text-align: right;">SusMat Crit</p> <p style="text-align: center;">Conclusions</p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	<p>In the graph, orange reflects indicators that are included in criticality studies for companies. The graph shows that environmental and social problems or regulations is relatively often included in company-oriented criticality studies, which demonstrates the relevance of administrative risks (certification programs and additional costs) or reputational risks.</p>
<p style="text-align: center;">Conclusions</p> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> • Certification is about <ul style="list-style-type: none"> • Taking responsibility • Increasing transparency • Improving management performance • Tripartite Standard Regime • Certification outcomes <ul style="list-style-type: none"> • Benefits downstream buyers <ul style="list-style-type: none"> • Reputation, regulation, investors • Less certain benefits on-the-ground • Potential for critical materials <ul style="list-style-type: none"> • Increase transparency • Due diligence could decrease downstream risks <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	
<p style="text-align: center;">References</p> <ul style="list-style-type: none"> • Carlsson, C., & Johanson, H. (2013). <i>Private standards: leveling the playing field for global competition in the food supply chain?</i> Lund, Sweden. • Locoito, A., & Busch, L. (2010). <i>Standards, techno-economic networks, and playing fields: Performing the global market economy. Review of International Political Economy, 17</i>(1), 507–536. doi:10.1080/09692290903138870 • Enough Project (2017). <i>Progress and Challenges on Conflict Minerals: Facts on Dodd-Frank 1502</i>. Retrieved from https://enoughproject.org/special-topics/progress-and-challenges-conflict-minerals-facts-dodd-frank-1502 • Tegera, A., Laudati, A., Lemwber, A., & Radley, B. (2014). <i>An Open Letter</i>. Retrieved from https://ethun.files.wordpress.com/2014/09/09092014-open-letter-final-and-rit.pdf • Young, S. B. (2015). <i>Responsible sourcing of metals: certification approaches for conflict minerals and conflict-free metals</i>. <i>The International Journal of Life Cycle Assessment, 10</i>(10), 11367–11367. doi:10.1007/s11367-015-0932-5 • Young, S. B., Dias, G., & Author, C. (2011). <i>Conflict-free minerals supply-chain to electronics, 2011</i>. • Young, S. B., Dias, G., & Zhu, Y. (2013). <i>Challenges in Sustainability Certification of Metals</i>. <i>Proc. International Symposium on Sustainable Systems and Technologies (ISSST), 1</i>(2013), 7. doi:10.6084/m9.figshare.956306 • Responsible Minerals Initiative: http://www.responsiblemineralsinitiative.org/ • OECD Due Diligence Guidance: http://www.oecd.org/daf/inv/mining/mining.htm <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation. © Steven Young</small></p>	
<p style="text-align: center;">RESPONSIBLE SOURCING: A SUPPLY-CHAIN MANAGEMENT APPROACH TO CRITICAL MATERIALS</p> <p style="text-align: right;">SusMat Crit</p> <p><small>PROF. STEVEN B. YOUNG, UNIVERSITY OF WATERLOO, CANADA SB.YOUNG@UWATERLOO.CA</small> <small>PROF. GUIDO SONNEMANN UNIVERSITY OF BOURGOGNE, FRANCE GUIDO.SONNEMANN@UNIVERSITE-BOURGOGNE.FR</small> <small>DR DEWENDEK SCHNEIDER UNIVERSITY OF BOURGOGNE, FRANCE DEWENDEK.SCHNEIDER@UNIVERSITE-BOURGOGNE.FR</small></p> <p><small>This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation.</small></p>	

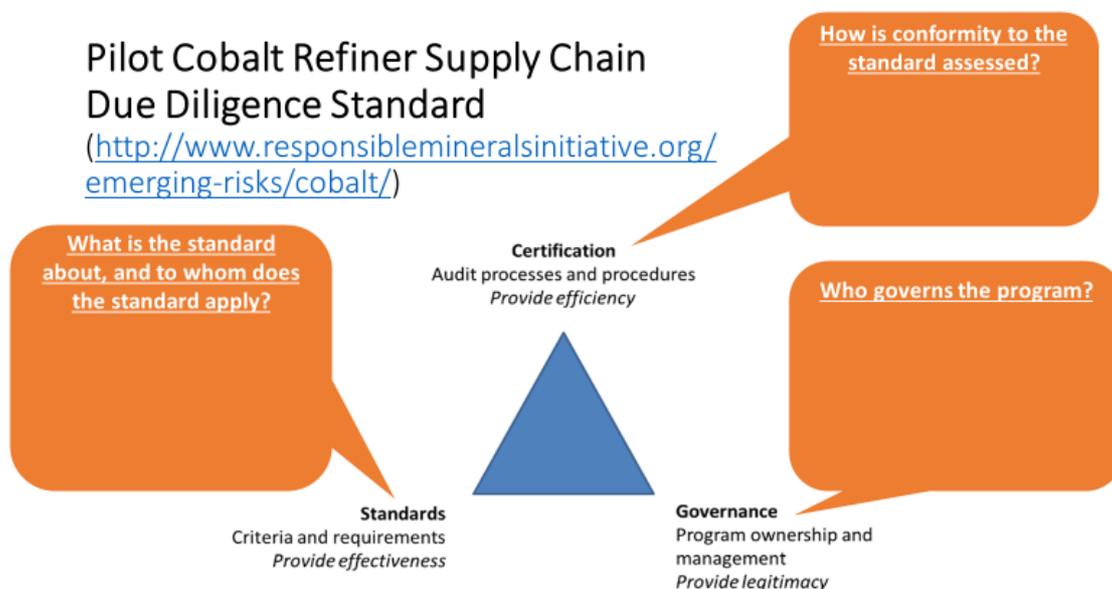
3 Exercises

Questions:

Group assignment: What are the potential benefits and risks of the certification of Cobalt?

1. Learn about the **Pilot Cobalt Refiner Supply Chain Due Diligence Standard** (<http://www.responsiblemineralsinitiative.org/emerging-risks/cobalt/>)
 - a) Who governs the program?
 - b) What is the standard about, and to whom does the standard apply?
 - c) How is conformity to the standard assessed?
2. Discuss the potential risks and benefits of the implementation of the standard
 - a) From the perspective of downstream companies
 - b) From the perspective of the miners

Answering template question 1:





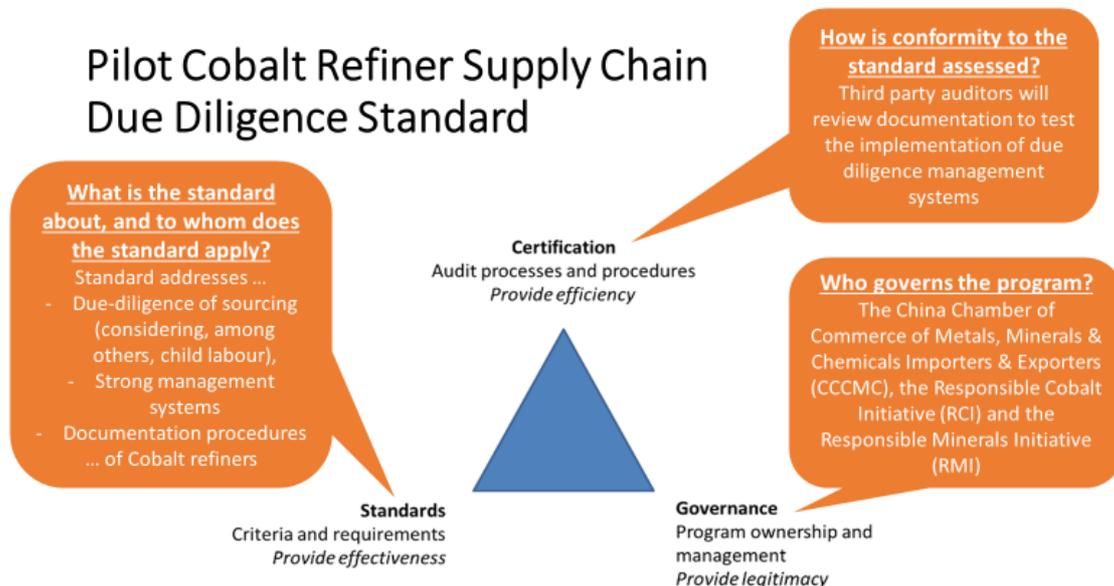
Answering template question 2:

What are the *potential* benefits and risks of the certification of Cobalt?

	Downstream company	Miner/metal processor
Risks		
Benefits		

Example answers question 1:

Pilot Cobalt Refiner Supply Chain Due Diligence Standard





Example answers question 2:

What are the *potential* benefits and risks of the certification of Cobalt?

	Downstream company	Miner/metal processor
Risks	<ul style="list-style-type: none"> - Bad reputation if not part of the certification program - Expensive program - Response: stop using cobalt (Tesla) 	<ul style="list-style-type: none"> - Increased costs for miners and refiners due to expensive program - Decreased demand from downstream companies - Loss of family revenue provided by children
Benefits	<ul style="list-style-type: none"> - Increased transparency of supply chain - Confidence to source from DRC if supply chain is "child-labour free" 	<ul style="list-style-type: none"> - Engagement of downstream companies could help improve the situation at the mines (Fairphone) - Contracts with downstream companies could guarantee income (Apple) - Maintain market access and continue to trade - Increase sales due to confidence of buyers - Additional activities of companies in region (e.g. education) (Apple)

4 Assessment Questions

What is the purpose of all certification schemes?

Answer 1: Guarantee consumers that a product is sustainable

Answer 2: Ensure a stable supply of a material

Answer 3: Help certified companies to reach a monopoly position

Answer 4: Provide additional information from product suppliers to their buyers (correct)

Who performs the conformity assessment in a certification program?

Answer 2: The seller of the product

Answer 1: A third-party accredited certification body (correct)

Answer 3: The government

Answer 4: The developer of the standard

With which term can the country of origin of a material be guaranteed?

Answer 1: Due diligence

Answer 2: Certification

Answer 3: Accreditation

Answer 4: Chain of custody (correct)



What does the Dodd-Frank act imply?

Answer 1: All US-based companies should report on their sourcing of tin, tantalum, tungsten, and gold from conflict regions as well as their due diligence efforts (correct)

Answer 2: US-based companies are not permitted to source tin, tantalum, tungsten, or gold from conflict-affected regions

Answer 3: US-based companies that use tin, tantalum, tungsten, or gold must join social development projects in the DRC

Answer 4: US-based companies are not allowed to use tin, tantalum, tungsten, or gold in their products

What is “Due Diligence”?

Answer 1: Implementation of policy, procedures, and practices to demonstrate that a company actively avoids the use of certain materials in their value chain

Answer 2: A mentioning on a company’s website that they are aware of potential risks in their value chain

Answer 3: Implementation of policy, procedures, and practices to demonstrate that a company does the best that it can do to identify risks, mitigate high risks, and report on its results (correct)

Answer 4: Provisioning of a list of all the materials that are used by a company’s products

What are potential drawbacks of certification for the local population in supplying countries?

Answer 1: Improved working circumstances

Answer 2: Increased costs, decreased demand from consumers, loss of family income (correct)

Answer 3: Decreased biodiversity

Answer 4: Increased confidence from downstream buyers

What are potential drawbacks of certification for OEMs that use raw materials?

Answer 1: Certification prohibits companies to source from the DRC

Answer 2: Certification schemes often contribute to a bad reputation

Answer 3: Additional administrative burden and costs if certification becomes a market requirement (correct)

Answer 4: Certification increases the criticality of raw materials

For which type of critical raw materials (CRMs) does certification NOT have the potential to mitigate criticality?

Answer 1: CRMs that are only sourced from one single country (correct)

Answer 2: CRMs for which mining has high environmental impacts

Answer 3: CRMs that are mined with child labour

Answer 4: CRMs that are mostly produced as by-products, for which we have little data on reserves and production statistics



How can certification mitigate criticality for companies?

Answer 1: Increased political stability of mining countries

Answer 2: Decreased raw material scarcity due to increased production levels

Answer 3: Increased diversification of suppliers

Answer 4: Reduced reputational risk and supply risk due to lower environmental/social problems in the value chain (correct)

Why does certification of steel and aluminium contribute to the responsible sourcing of CRMs?

Answer 1: Steel and aluminium are critical, so they should be targeted for certification

Answer 2: CRMs are often used in bulk metals to form alloys, and their value chain is therefore likely to be covered by the certification schemes (correct)

Answer 3: CRMs are always by-products of iron and bauxite

Answer 4: Steel and aluminium can substitute CRMs, and should therefore have sustainable value chains

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Steven Young from the University of Waterloo and Dieuwertje Schrijvers from University of Bordeaux prepared the teaching material for Session VII.

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