GLOBAL MICA MINING

AND THE IMPACT ON CHILDREN'S RIGHTS

SOMO
Stichting Onderzoek Multinationale Ondernemingen
Centre for Research on Multinational Corporations

terre des hommes
stops child exploitation

COLOPHON

Authors:
Irene Schipper and Roberta Cowan (SOMO)
Co-review committee at Terre des Hommes:
Aysel Sabahoglu and Tirza Voss
Layout: Newton21
Photography: © Oscar Timmers, February 2016

This report was made on assignment of Terre des Hommes.

PUBLISHED BY:
Stichting Onderzoek Multinationale Ondernemingen (SOMO)
Centre for Research on Multinational Corporations

Sarphatistraat 30
1018 GL Amsterdam
The Netherlands
Tel: + 31 (20) 6391291
Fax: + 31 (20) 6391321
E-mail: info@somo.nl
Website: www.somo.nl

COMMISSIONED BY:
Terre des Hommes Netherlands
Zoutmanstraat 42-44
2518 GS Den Haag
The Netherlands
Tel: +31 (70) 310 5000
E-mail: info@tdh.nl
Website: www.tdh.nl

The Centre for Research on Multinational Corporations (SOMO) is an independent, not-for-profit research and network organisation working on social, ecological and economic issues related to sustainable development. Since 1973, the organisation investigates multinational corporations and the consequences of their activities for people and the environment around the world.

Terre des Hommes Netherlands prevents child exploitation, removes children from exploitative situations and ensures children can develop in a safe environment. Terre des Hommes works towards a world where all children have a decent life and can grow up to be independent adults. A world in which children are no longer exploited. Terre des Hommes will continue its work until this is accomplished.

GLOBAL MICA MINING

AND THE IMPACT ON CHILDREN'S RIGHTS

MARCH 2018

CONTENTS

FIGURES AND TABLES IN THE REPORT

List of figures

List of tables

ACRONYMS

AIAG	Automotive Industry Action Group
ASM	Artisanal and small-scale mining
BGS	British Geological Survey
CAGR	Compound Annual Growth Rate
CAS Code	Chemical Abstract Service Code
CSR	Corporate Social Responsibility
EICC	Electronic Industry Citizenship Coalition
EU	European Union
HS Codes	Harmonised System Codes
ILO	International Labour Organisation
NGO	Non-Governmental Organisation
OEC	Observatory of Economic Complexity
OECD	Organisation for Economic Co-operation and Development
PCB	Printed Circuit Board
RBA	Responsible Business Alliance
RMI	Responsible Minerals Initiative
SER	Social Economic Council (the Netherlands)
SOMO	Stichting Onderzoek Multinationale Ondernemingen (Centre for Research on Multinational Corporations)
SDGs	Sustainable Development Goals
UN	United Nations
UNCRC	UN Convention on the Rights of the Child
USGS	United States Geological Survey
UNGP	UN Guiding Principles on Business and Human Rights
TDH	Terre des Hommes
TMR	Transparency Market Research

PREFACE

ABOUT TERRE DES HOMMES

Terre des Hommes Netherlands (hereinafter Terre des Hommes) is an international non-governmental organisation that works to create a world free of child exploitation. Since 1965 it has protected children from exploitation, violence, child labour, trafficking, sexual exploitation, poverty and malnutrition.

The target groups of Terre des Hommes are children at risk of exploitation and children who are the victims of exploitation. Children at risk are vulnerable children who are marginalised socially, economically, physically or culturally and, as such, easily become victims of exploitation. Child exploitation involves serious violations of the rights of the child. Terre des Hommes' definition covers the worst forms of child labour, child trafficking, sexual exploitation, child abuse and violations of the sexual health and reproductive rights of a child.

Terre des Hommes uses evidence-based strategies to promote, prevent, protect and prosecute within the context of children's rights. Guided by the UN Convention on the Rights of the Child (UNCRC), Terre des Hommes researches, documents, and takes action to expose and confront violations of children's rights. Its '5 Ps' approach – partnership, promotion, prevention, protection and prosecution – is multi-faceted and holistic. A prerequisite for Terre des Hommes' work is that it works together with local partners, and programmes are developed in cooperation with grassroots organisations that understand the local context and know what works best in a given situation.

Terre des Hommes supports the implementation of its programmes through technical guidance and advocacy to achieve long-term impact and societal change. Terre des Hommes is involved in strategic multi-stakeholder partnerships with the private sector to end child labour in global value chains. By promoting children's rights through advocacy and by raising policy awareness, it calls upon authorities and legislators to step up to comply with their responsibilities.

CHILD LABOUR IN INDIA

Terre des Hommes has a long-standing presence in India. With nearly every fifth child in the world living there, the country is home to the largest number of children on the planet. In total, this means that there are about 430 million Indian children, and among these an estimated forty per cent live in difficult circumstances. India has a low rate of child immunisation coverage, and in remote areas child protection systems are lacking and children are usually not registered at birth.

In 2015, alarmed by the prevalence of child labour specifically in Jharkand and Bihar, Terre des Hommes commissioned SOMO to conduct research into the violations of children's rights in the mica mines in these provinces. The objective of this first research was threefold: 1) to determine the current magnitude of child labour in the mica belt in Jharkhand and Bihar; 2) to provide insight into the main companies involved in the mica supply chain, with a special focus on Dutch companies, as well as the due diligence conducted by these companies; and 3) to look into pending initiatives to eradicate child labour.

The research revealed that mica mining is an important source of income for hundreds of villages in Jharkhand and Bihar. The mining entails more than collecting pieces of mica from the ground. Explosives and/or air-compressed hammers are often used to crush rocks, and dangerous underground holes are dug to access mica of a better quality. With the exception of two mines in Bihar, all mining in Jharkhand and Bihar was illegal. After India's central government implemented its Forest Conservation Act in 1980, mining licenses in the area were not renewed.

The initial research report from 2016 showed that approximately 300 villages in the states of Jharkand and Bihar – which are home to the world's largest mica mining area and account for an estimated 25 per cent of total global production – are involved in illegal artisanal small-scale mining (ASM).

The villages are often located in remote areas, and children may either work after school or not attend school at all. The report concluded that there were no initiatives at that time to provide a living wage for the labourers involved with mica mining and processing. The research showed that mica is used in paints and cosmetics, but also mentions its use in cars, electronics and construction. The number of children involved in mica mining in Jharkand and Bihar was estimated to total up to 22,000. Field research following these results counted at least 22,000 children in an area that did not even cover half of the mica belt. The research also showed that no company could certify that child labour was not involved in the mica used in their end products.

The report created much awareness on the plight of children in Jharkand and Bihar, both within India and in the global market. As a result, Terre des Hommes is now implementing a social empowerment programme to eradicate child labour in Jharkand and Bihar. It is also involved in the Responsible Mica Initiative multi-stakeholder partnership, which aims to eradicate child labour and implement fair and sustainable mica collection, processing and sourcing in India.

THE POSITION OF TERRE DES HOMMES ON CHILD LABOUR

Terre des Hommes believes that all of the worst forms of child labour should be abolished, and that no child should be involved in hazardous and exploitative forms of labour, as defined in the International Labour Organisation (ILO) Convention 182 on the Worst Forms of Child Labour.

Pursuant to the UNCRC, a child is defined as every person below the age of 18. Child labour refers to all kinds of labour that jeopardise a child's physical, mental, educational or social development. Hazardous child labour is prohibited for all children, in line with Convention 182. Child labour used for dangerous activities – such as work with toxic and dangerous substances in mining, as well as prostitution and bonded labour – should be immediately eliminated.

Harmful social norms, the violation of labourers' rights, poor law enforcement, and poor educational policies remain the key underlying causes for the prevalence of child labour. Countries with a well-educated work force, effective social policies, and low levels of poverty tend to have less child labour. The countries with the highest proportion of working children tend to be the least developed countries. The key to eradicating child labour is therefore a holistic approach: covering poverty reduction, social protection, quality education and law enforcement; taking into account all social and cultural factors; and ensuring ownership by the government.

International Labour Organisation Conventions 138 and 182
The two main conventions focusing specifically on child labour – on the minimum age for admission to employment (No. 138, 1973), and on the worst forms of child labour (No. 182, 1999) – were developed by the International Labour Organisation.

Convention 138 sets the age at which children can legally be employed or otherwise work. The minimum age for work should not be below the age for finishing compulsory schooling, and in any case should not be under 15[1]. Hazardous work should not be done by anyone under the age of 18.

Convention 182 on the Worst Forms of Child Labour commits its members to take immediate action to eliminate the worst forms of child labour within their states. These involve children being enslaved, forcibly recruited, prostituted, trafficked, forced into illegal activities, or exposed to work that is considered "hazardous work".

1 There are possible exceptions for developing countries to set the minimum age at 14.

Child labour refers to children working in contravention of the ILO standards contained in Conventions 138 and 182. It refers to work that is either dangerous or harmful to children (or both), and work that interferes with or completely disrupts school attendance and schooling in general[2]. This covers all children below 12 years of age working in any economic activities; those between 12 and 14 years of age engaged in more than light work; and all children engaged in the worst forms of child labour.

As specified in the *ILO Declaration on Fundamental Principles and Rights at Work (1998)*, ILO Conventions No. 138 and 182 on child labour are considered to be "core", fundamental conventions. Under the ILO Declaration, even the member states that have not yet ratified these conventions should respect, promote, and realise the principles stated within them.

This means that all member states are required to prevent the involvement of children in dangerous situations; to remove children presently working in the worst forms of child labour; to ensure access to education instead of child labour; to identify and reach out to at-risk groups; and to take the special situation of girls into account.[3]

Of all forms of hazardous work, mining is by far the most mortally dangerous sector for children, with an average fatality rate of 32 per 100,000 children between the ages of 5 and 17. By way of comparison, fatality rates in agriculture and construction are respectively 16.8 and 15 children per 100,000. Mining in itself is hazardous work, making it a worst form of child labour.[4]

UN Convention on the Rights of the Child and General Comment No. 16. With regard to child labour, the UNCRC states that members must recognise a child's right to be protected from economic exploitation. The convention obliges states to take legislative, administrative, social and educational measures to ensure that these requirements are implemented.

The UNCRC acknowledges that although businesses can be essential drivers for societies and economies in achieving children's rights, they can also have a negative impact. The UNCRC Committee's General Comment No. 16 complements the UN Guiding Principles on Business and Human Rights. The General Comment has a number of aims: to provide states with guidance on how they should ensure that the activities and operations of businesses do not adversely impact the rights of children; to create an enabling and supportive environment for businesses to respect children's rights; and to ensure access to effective remedies for children whose rights have been infringed upon by a company acting as a private party or as a state agent. The General Comment encourages businesses to conduct their due diligence, and to identify, prevent and mitigate their impact on children's rights across their business relationships and within global operations. Where there is a high risk of child rights' violations by companies, due to the nature of their operations or their operating contexts, states should require a stricter process of due diligence and an effective monitoring system.[5]

TERRE DES HOMMES' CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS

On 25 September 2015, heads of state from 193 countries launched the Post-2015 Development Agenda, adopting 17 Sustainable Development Goals (SDGs) and 169 specific related targets to be implemented worldwide by 2030. Targets 8.7 and 16.2 directly focus on eliminating the worst forms of child labour by 2025:

Goal 8.7: Take immediate action and effective measures to eradicate forced labour, end modern slavery and human trafficking, secure the prohibition and elimination of the worst forms of child labour, including the recruitment and use of child soldiers, and end child labour in all its forms by 2025; and

Goal 16.2: End abuse, exploitation, trafficking, and all forms of violence against and torture of children.

The ILO estimates that 152 million children are victims of child labour, with almost half of them (73 million) working in hazardous situations. Children are in high demand because they work for low wages, or even for

2 ILO, What is child labour, http://www.ilo.org/ipec/facts/lang--en/index.htm
3 ILO Convention 182 http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO:12100:P12100_INSTRUMENT_ID:312327
4 OECD, Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains, 2017, https://mneguidelines.oecd.org/Practical-actions-for-worst-forms-of-child-labour-mining-sector.pdf, (February, 2017)
5 General Comment No.16, 2013

free, and are easy to influence and control. However, they are also more vulnerable and face high risks of abuse, violent acts, and other violations of their fundamental rights. In the majority of these cases, and regardless of the type of exploitation they endure, children have no access to basic services guaranteeing the fulfilment of their fundamental rights (schooling, social services, healthcare, sanitation, recreation centres, and psychosocial support). All too often, the sole aim of legislators is to prohibit child labour, without taking into account individual situations and the root causes of this phenomenon, and above all without offering alternative income-generating possibilities to the families concerned.

Terre des Hommes chooses dialogue between the private and public sectors as the necessary intervention to address the root causes of child labour. To enable progress towards the Sustainable Development Goals, and as an integral part of a genuine policy of social responsibility in formal and informal enterprises, we seek to confront the private sector with our findings and encourage businesses to use their leverage to achieve social impact.

RATIONALE FOR A GLOBAL SCOPING STUDY

The first study investigated mica mining in only two states in India. Confronted with questions from key players in mica value chains and global players in various industries, Terre des Hommes commissioned a second study to respond to questions about the presence, magnitude, and risk of child labour and other human rights violations in the extraction of mica on a global scale. A global scoping study was needed in order to address some of the 'risk avoidance' tendencies within the industries. With this new research, Terre des Hommes wants to raise awareness on the risk of child rights violations in the mica mining industry. Together with key stakeholders from the corporate sector and the government, Terre des Hommes wants to create safer, better paid livelihoods for vulnerable mica communities. This research supports Terre des Hommes in determining the right strategies. It gives a better understanding of the global risks; identifies the potential leverage of different industries and companies; and indicates the feasibility of using synthetic mica as an alternative to natural mica.

Terre des Hommes would like to thank Irene Schipper and Roberta Cowan at SOMO for their relentless efforts to trace mica in global value chains. This report is the work of SOMO, supported by Terre des Hommes staff members Aysel Sabahoglu and Tirza Voss. The findings will guide Terre des Hommes in its programming, advocacy and future research.

Terre des Hommes Netherlands, 2018

1. EXECUTIVE SUMMARY

Children are suffering in the depths of illegal mica mines in India. Research in 2016 uncovered the death of seven children in a period of just two months. Abrasions, broken bones and lung disease are part of the daily existence of child mica miners.

The first mica investigations of SOMO and Terre des Hommes in 2015 estimated that up to 22,000 children were involved in mica mining in the Indian states of Jharkhand and Bihar. This was a clear indication that industries and companies using mica sourced from India are directly contributing to the worst forms of child labour.

Many companies source their mica from India, due to the vast amount of high-quality mica available in the country. However, India it is not the only country where mica is mined, nor the only one where children work in mica mines.

Mica is used to make products like cosmetics and paints shimmer. But its other extraordinary qualities – including perfect cleavage, flexibility, elasticity, chemical inertness, infusibility, low thermal and electrical conductivity, and high dielectric strength – explain the wide use of the mineral across many sectors. Mica is particularly essential for the electronics industry.

In the context of the Responsible Mica Initiative and dialogues between Terre des Hommes and companies across diverse industries, questions were raised about the risks of child labour and other human rights violations in mica extraction. These questions referred to states beyond Jharkhand and Bihar in India, but also to mica mining outside the country. The outcome was this global scoping study on mica mining and the possible impacts on children's rights, which aims to address these queries.

RESEARCH OBJECTIVES AND METHODOLOGY

The main objectives of this study are to map mica production globally, and to identify direct or indirect links to child labour or any other relevant children's rights violations.

The study looks at both supply and demand in the global mica market. Since demand drives production, the research identifies the industries – including the electronics and automotive sectors – that are the most significant users of mica. The report also tries to examine the status of risk-based due diligence processes for mica among different industries. Labour conditions, as well as production, export and import statistics around mica mining in the fifteen largest non-western and five largest western mica-producing countries are investigated.

THE RESEARCH FINDINGS

BASIC FACTS

Once mined, crude mica becomes either sheet mica or scrap mica. Sheet mica is the basis for all sheet mica products, as well as built-up mica and fabricated mica, which are all used mainly by the electronics industry. Scrap mica is the basis of mica flakes, mica powder and mica paper.

Scrap mica is used mainly by the paints and coatings, construction and cosmetics industries. The electronics industry also uses mica powder as filler and mica flakes for mica paper, mica tape, mica tubes and other flexible mica products. In these last products, mica is combined with binding products such as silicone and used for insulation in electronics and electrical products.

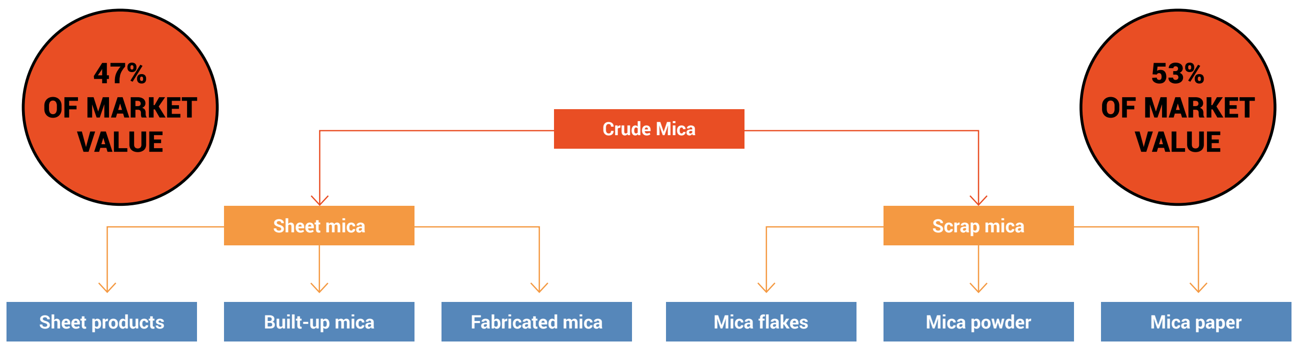
THE GLOBAL MINING MARKET

The market consists of two types of mica: natural mica and synthetic mica. According to a commercial market analysis, natural mica accounts for 90 per cent of the total mica market and the remaining 10 per cent is synthetic mica. The market share for synthetic mica is not expected to grow by more than two per cent over the coming ten years, which means that natural mica will not be replaced by synthetic mica in any significant or market-changing way. Currently, almost all synthetic mica production is for the cosmetics industry, and a smaller portion is used for pearlescent pigments in paints. The total market for natural mica is expected to continue to grow due to increasing demand by the main end-user industries.

INDUSTRIES DRIVING THE DEMAND FOR MICA

In terms of value, the electronics industry was the biggest purchaser of mica in 2015 (26 per cent), followed by paints and coatings (24 per cent), construction (20 per cent) and cosmetics (18 per cent).

This report shows that the electronics industry uses far more mica than was previously understood, and that the awareness of where mica is found in electronics is very low, even among industry players and their supply chain experts. In this report, the electronics industry is defined in the broadest sense and includes the production of electronic products (e.g. consumer electronics) as well as electrical products and electronics for other industries.



Source: Gunpatroy Pvt. Ltd,[6] adapted by SOMO.

6 Website Gunpatroy Pvt. Ltd, About mica, http://www.grmica.com/About_Mica.php#aa, (December 2017).

Any electronic device – including for example computers, printers, televisions, stereos, digital clocks, remote controllers, gaming devices, and microwave ovens – has components that have been identified in this research as containing some form of mica. Typical electronics components that may contain mica include capacitors, resistors and transistors, all of which can be mounted on printed circuit boards (PCBs). Other widely-used electronics components identified as possibly containing mica include semiconductor systems, various high-voltage and lithium batteries, sensors, displays, LEDs, adaptors, card sockets, DRAM, encoders, keypads, power modules, SSDs, and wires, cables and computer housing.

It was also revealed that the automotive industry uses significantly more mica than was previously understood, and that mica is not only to be found in car paints and coatings. Mica in used in cars for components and parts that cross many different automotive systems and processes – electrical, electronic and mechanical – and also functions as a lubricant and filler. Given the number of car parts that can contain mica (one company identified 15,000 possibilities), the total use of mica in one car is substantial. Given that 88 million new cars were sold in 2016 alone, the overall use of mica by the automotive sector is enormous.

MAIN RISKS ATTACHED TO MICA MINING

Sheet mining is a labour-intensive process, and is predominantly carried out by the very poor and vulnerable in low-wage countries. Miners must travel deep down into narrow mining shafts, and the work is arduous and dangerous. A significant part of the work is done by hand, using hammers and pry bars. Sheet miners are paid less than a living wage, are unprotected, and are easily exploited. They often work in remote areas where health and education is not available, and their children may also work to contribute to the family wage. This research concludes that non-western countries with substantial sheet mica production are high-risk countries when it comes to possible negative impacts on children's rights.

When scrap mica is recovered as by-product of sheet mining – which is the case in India and likely in all other countries with a substantial amount of sheet mica production – the above-mentioned risks for sheet mining must also be taken into account. In these countries, the mining of sheet mica and the mining of scrap mica are interdependent. Companies that solely use ground mica are therefore not safeguarded from child labour in their supply chains.

The red flag countries in the context of sheet mining and scrap mica as a by-product of sheet mining are Madagascar, India, China, Brazil and Sri Lanka. The most important end-markets for sheet mica include the electronics and automotive industries.

Other important red flags appear when analysing the discrepancies between production and trade figures for mica, including export and import statistics. Mica export figures that exceed official mica production figures provide a strong indication of illegal mining. Although legal mines do not necessarily guarantee good or fair working conditions and a living wage, they are at any rate subject to inspections, regulations and certifications. If mining is illegal, the risks related to working conditions, health and safety, pollution, abuse (including sexual abuse), security, exploitation and displacement are all likely to increase, as are the negative impacts on children's rights and the risks of child labour. Most of the mica mines in India are illegal. Other countries suspected of operating illegal mica mines include Madagascar, Malaysia, Pakistan, Sri Lanka and South Africa.

The research concludes that Madagascar has become increasingly important as an exporter of mica. The country is the fourth-largest mica exporter worldwide, and has been the largest global exporter of sheet mica since 2015. Madagascar's state is weak, the political context is fragile, and violence and corruption are commonplace. Weak governments with no oversight or authority over illegal mica mines increase the risk that children's rights will be violated.

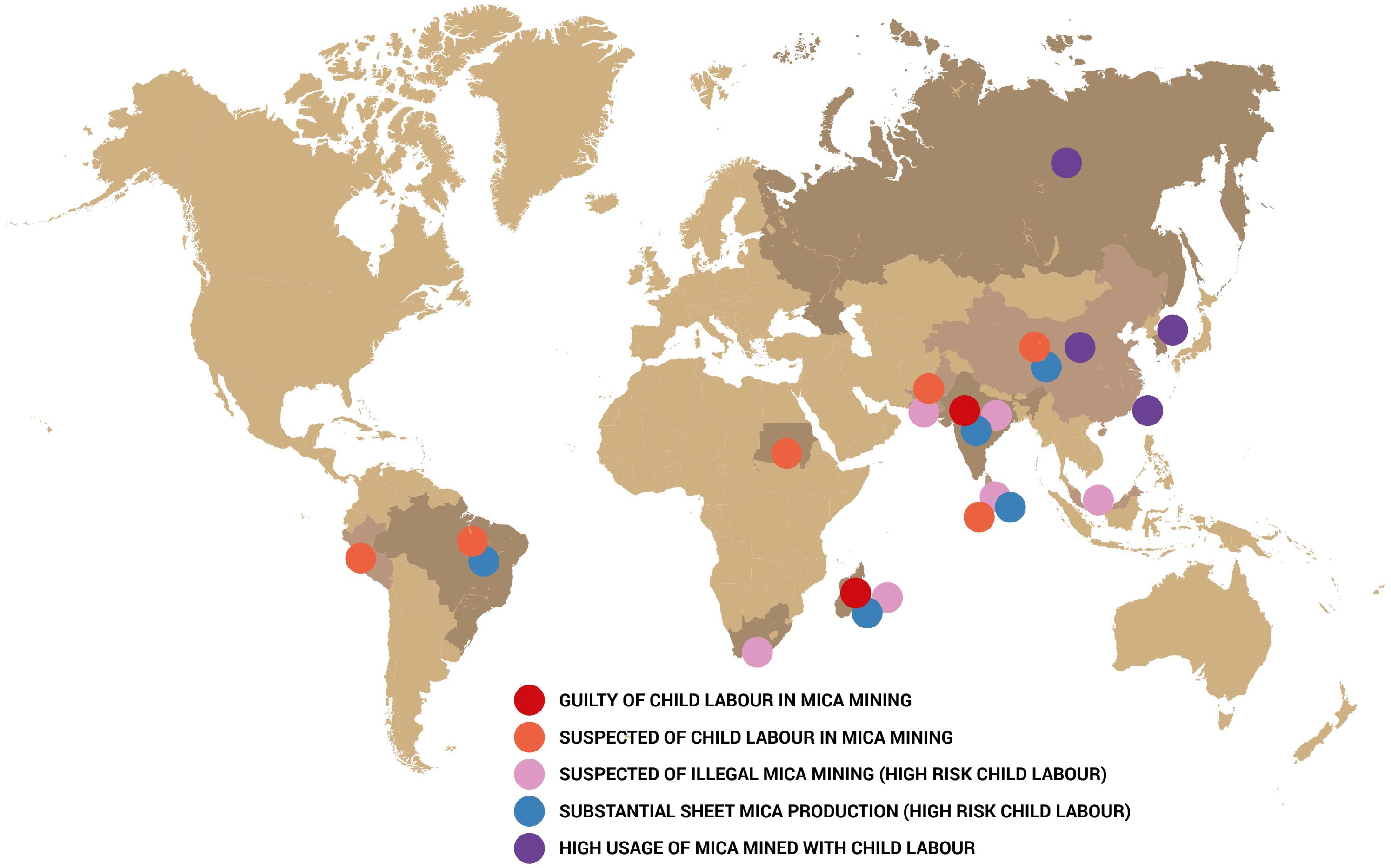
INDICATORS FOR HIGH-RISK COUNTRIES

In total, five indicators (or 'risk categories') were used to classify countries by their risk levels related to children's rights violations within the context of mica mining. The presence of sheet mica mining and the existence of illegal mining are two of the five indicators used to assess risks to children. Two other indicators are reports of child labour and the 'suspected' use of child labour in mica mining. Child labour is suspected in countries when there is evidence of other child labour in mining or mining-related activities in the country, regardless of what is being mined. For example, gold and mica are found in the same region in Peru, and the use of child labour for gold mining in that country is widely reported. The same can be said about child labour in Brazilian talc mines, which are in the same region as the country's mica deposits. In Pakistan, it is reported that children produce bricks and mine coal, salt and gemstones. Children also work in the gem mines in Sri Lanka, while child labour in Chinese gold mines is a documented problem.

The countries that have a reported use of child labour in mica mining are India and Madagascar. In addition to Jharkhand and Bihar, children are also reportedly working in mica mines in Rajasthan and possibly also in Andhra Pradesh (as illegal sheet mica mining also takes place there). This however needs further investigation.

The fifth indicator for high-risk countries is having high levels of mica imports from countries where children's rights are negatively affected in the mining process, in particular Madagascar and India. These importing countries are 'lynchpins' between mica produced with child labour and the global market. The lynchpin countries identified in this report are China, South Korea, Taiwan and Russia. Companies sourcing mica, or products containing mica, from these countries risk using mica mined by children in their supply chains.

MICA PRODUCING COUNTRIES CLASSIFIED BY RISK



The research shows that India, Madagascar, China, Sri Lanka, Pakistan and Brazil are the countries most at risk of violating children's rights in the context of mica mining, scoring on at least two and sometimes three indicators.

Moderate-risk countries (scoring positive on one indicator) include South Africa and Malaysia for being suspected of illegal mica mining, and South Korea, Taiwan and Russia for being lynchpin countries. Iran, Peru and Sudan were included in this research as mica-producing countries; however, current export levels in these countries are very low or non-existent. It is possible that these countries may expand mica mining in the future, and in that case should be investigated as they are potential high-risk countries due to the presence of child labour in mining activities.

RECOMMENDATIONS FOR COMPANIES

This report shows that the electronics and automobile industries use significant amounts of both sheet and scrap mica, far more than previously understood and in many different components. Other industries that use substantial amounts of mica are the paints and coatings, construction, cosmetics, plastics and ink, oil well drilling and rubber industries.

This report concludes that companies in these industries are at high risk of being involved in the worst forms of child labour in their supply chains related to mica mining. These companies should not tolerate, profit from, contribute to, assist with or facilitate the violation of children's rights in the course of doing business. Moreover, they should commit to eradicating the worst forms of child labour in mica mining from their supply chains, both upstream and downstream.

A risk-based due diligence approach, according to the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, implies that the efforts of companies to (i) identify, (ii) prevent or mitigate, and (iii) account for actual and potential adverse impacts should be proportional to the risks and severity of the (potential) impacts. In the case of mica, the risks of contributing to the worst forms of child labour are high, and the impacts of child labour are severe and irremediable.

To date, the due diligence efforts in the electronics and automotive sectors are very recent and are still in the exploratory stage. In general, companies have not yet decided whether or not it is worthwhile to start a due diligence trajectory specifically for mica. Some front runners in these sectors have started initial sensing research on the application of mica in their products. The countries of origin of the mica in their products have so far not been identified, and it can therefore be concluded that a risk assessment has not yet taken place. It is recommended that the companies in the above-mentioned sectors scale up their due diligence efforts concerning mica in their supply chains, regardless of the volumes used. The leading standard in this respect is the OECD guide *"Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains"* (2017). Companies should first and foremost identify the countries of origin of the mica they are using for their products.

Companies should refrain from the tendency of risk avoidance. They should choose to use their leverage, rather than simply leaving a high-risk situation, opting out by using synthetic mica, or circumventing risk countries. When companies believe that they have little leverage because they are not sourcing directly or because the application of mica is performed several tiers away, it is recommended that they engage in strategic multi-stakeholder partnerships with civil society organisations working to end child labour in the global value chain of mica. It is also recommended that companies engage in social empowerment programmes that address the root causes of child labour.

RECOMMENDATIONS FOR NGOS

NGO strategies to make end-users accountable for contributing to the worst forms of child labour when using mica in their products were initially focused on cosmetics companies and the pearlescent pigment producers supplying the cosmetics industry. This research shows that it is equally important to focus on other sectors. The development of strategies towards the electronics and automotive sectors, which make massive use of this essential mineral in their products, is also recommended. These sectors are also the main buyers of sheet mica, which carries high risks in relation to human rights impacts. Other major end markets that should be targeted include the paints and coatings, construction, plastics and ink, oil well drilling and rubber industries.

It is also recommended that NGOs broaden their targets for the inclusion of countries in responsible mica sourcing initiatives. More research needs to be done on the countries classified as a high-risk in relation to children's rights violations. The priorities include Madagascar, China, Brazil and Sri Lanka, followed by Pakistan, South Africa and Malaysia.

An extensive investigation should be carried out in order to assess political volatility, corruption, conflict and violence in Madagascar, and to ascertain if any mica sourced there is traded illegally to finance conflict and violence. Should this be the case, NGOs should initiate advocacy efforts in order to have mica identified as a conflict mineral.

GLOSSARY

There are many different terms used to describe mica. Geologists, companies, trade experts and market analysts use different definitions to suit their specific needs. For clarity, please find definitions below. Note that this report refers to scrap mica and sheet mica, which are both extracted from what is termed crude mica.

THE FLOWCHART SHOWS THE MOST IMPORTANT TERMS EXPLAINED IN THE GLOSSARY.

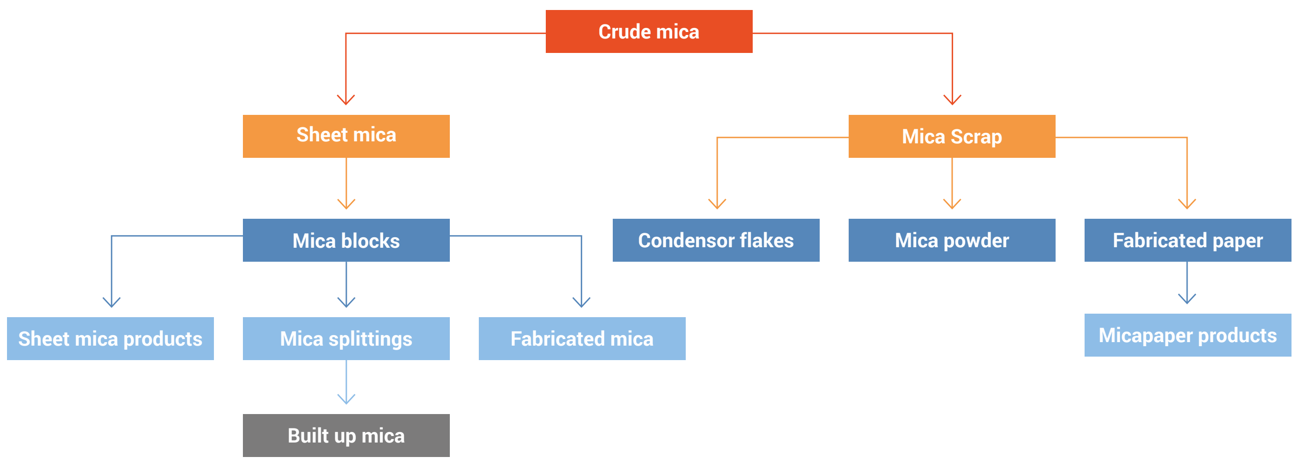


Figure 1: Flowchart of mica production *Source: Gunpatroy Pvt. Ltd, adapted by SOMO.*

Built-up mica A laminate product made from mica blocks or splittings that are layered with other products and glued together. Also called micanite products.

Crude mica Ordinary mica crystals as they come out of a mine, in the form of rough 'books' or lumps of irregular shape, size and thickness. Also called raw mica.

Fabricated mica Pieces of sheet mica that are cut and punched according to required specifications with a simple machine.

Ground mica A collective term for mica flakes and mica powder.

Mica flakes The result when scrap mica is processed into flakes by crushing. Mica flakes are sold in different sizes, indicated in meshes.

Mica paper The result when scrap mica is pulped after crushing with various binders and pressed into paper-like sheets.

Mica powder The result when scrap mica is processed into powder by grinding. Size differences of the mica powder are connected to the grinding method: whether dry ground (APS 1.2 mm to 150 µm), wet ground (APS 90 to 45 µm) or micronised (APS ‹53 µm).

Mica splittings Mica splittings consist of sheets split from mica blocks. The combined thickness of the sheets does not exceed 0.30 mm. They are chiefly used in the manufacture of built-up mica products.

Natural mica A silicate mineral that occurs in igneous, sedimentary and metamorphic rocks. Although there are 37 different types of natural mica, only muscovite and phlogopite have any real commercial value.

Scrap mica Scrap mica is a by-product of the mining, trimming and fabricating of sheet mica. It can also be recovered as a by-product or co-product of feldspar, quartz and kaolin beneficiations.

Sheet mica The larger mica crystals that are characterised by highly perfect cleavage, so that they readily separate into very thin and more or less elastic sheets. Sheet mica is cut by hand from mica blocks or crude mica.

Synthetic mica This mica is made artificially. The result is fluorine-containing mica with characteristics of muscovite or phlogopite.

2. INTRODUCTION

2.1. BACKGROUND OF THE STUDY

The harsh daily reality for thousands of Indian children working in mines that supply mica – used to make shampoo and cosmetics shimmer and car paint sparkle in the sun – was the focus of the children's rights campaign Stop child labour in mica mines launched by Terre des Hommes in 2016.

But mica does much more than make consumer products look and feel more luxurious. Mica's electrical, physical and chemical properties make it one of nature's most useful and widely used minerals across many sectors. It turns out that mica is essential for the electronics industry, and can be found in virtually any electronic or electrical device.

Following the campaign and the publication of the *Beauty and a Beast: Child labour in India for sparkling cars and cosmetics report*,[7] Terre des Hommes started a dialogue with numerous companies across different sectors. One of the results was the establishment of the Responsible Mica Initiative in January 2017. The Responsible Mica Initiative is a 'do tank', an action-oriented think tank, which aims to eradicate child labour and unacceptable working conditions in the Indian mica supply chain within the next five years by joining forces across industries and sectors.[8] The Indian States of Jharkhand and Bihar – the focus of the initial Terre des Hommes report – are the priority zones in addressing these issues within the Responsible Mica Initiative.

In the context of these events, stakeholders raised questions about the risks of child labour and other human rights violations connected to the extraction of mica beyond Jharkhand and Bihar. In order to be able to respond, as well as to address the 'risk avoidance' tendencies within the industries, Terre des Hommes decided that a global scoping study on mica was required.

2.2 .THE RESEARCH OBJECTIVES

The main objective of this study is to map global mica production and to identify direct or indirect links to child labour, or any other relevant children's rights violations, within the context of mica mining worldwide. The study aims to classify the main mica-producing countries according to the risk of violations of children's rights.

Another objective of this study is to analyse the global mica market in terms of supply and demand. There is currently no oversight regarding the supply of mica to different industries; for example what forms or grades of mica are traded, and in what volumes.

Since demand drives production, another objective of the study is to analyse specific uses by some of the industries that are significant users of mica, including the electronics and automotive industries. The research aims to show where mica is found in their products, and what volumes are used by different industries. Finally, the research will address the consequences of the use of mica by the industries in question regarding their obligations for risk-based due diligence in the realm of human rights, and will record the state of affairs in efforts towards due diligence by the front runners.

2.3. RESEARCH METHODOLOGY

The methodology in this research covered different phases in order to accomplish the different research objectives. These phases were:

- Mapping global production and the risks to children. This included identifying the countries and the risks, and categorising the countries by risk.
- Analysing the global mica market. This included presenting the market shares of natural versus synthetic mica, and ground mica versus sheet mica.
- Analysing the demand for mica by different industries, and researching how mica is used in products (especially in cars and electronics).
- Analysing the risk-based human rights due diligence obligations for companies using mica in their products.

The methodology used in these different phases is described in more detail below.

2.3.1. MAPPING GLOBAL PRODUCTION AND RISKS TO CHILDREN

Twenty of the main mica-producing countries worldwide were selected for this analysis, in consultation with Terre des Hommes. The selection has a strong focus on non-western countries, since it was assumed that the possible impacts of child rights violations are highest in these countries. The inclusion of the top five western countries makes it possible to put the production volumes and the characteristics of mica mining into a global context. The selected countries were identified through the United States Geological Survey (USGS) annual mica mining report as the world's top mica-producing countries, and were further analysed individually.

The individual country analyses cover the following questions:

- What are the details of the mica mining? What are the production, export and import data for mica?
- Who are the key industry players?
- What are the human rights risks related to mica mining in this country?
- What are the human rights risks and the possible impact on children in this context? (excluding the western countries)
- Are there reported children's rights violations and/or reports of child labour (excluding the western countries)?
- Are there initiatives in this country to stop child labour (excluding the western countries)?
- What did the UN Committee on the Rights of the Child report on this country?

Each country profile ends with a brief analysis of the most important points revealed in the research, as well an indication of red flags and outstanding questions. The red flags identified in the country profiles served as a basis for the selection of risk indicators for possible children's rights violations. The country profiles can be found in a separate Annex to this report.

Following the collection of the country data, similarities between some of the countries became apparent. For example, mica export figures exceeded production figures in certain countries. This situation, namely when a country exports more mica than it officially produces, indicates not only that the government does not account for a significant portion of the mica mined, but that it is mined illegally and sold on the black market.

The five risk categories included in this investigation are those countries 'guilty' of child labour in mica mining; those countries 'suspected' of child labour in mica mining; those countries 'suspected' of illegal mica mining; those countries that mine substantial amounts of sheet mica; and those countries that import large amounts of mica mined with child labour (which means that they are using mica from countries 'guilty' of using child labour).

Each mica-producing country is subsequently scored based on these categories.The analysis found in

	SELECTION OF THE 20 MAJOR MICA-PRODUCING COUNTRIES
Non-western countries (15)	Argentina, Brazil, China, India (other regions), Iran, Madagascar, Malaysia, Pakistan, Peru, Russia, South Africa, South Korea, Sri Lanka, Sudan and Taiwan.
Western countries (5)	Canada, Finland, France, Spain and the United States.

7 SOMO/Terre des Hommes, "Beauty and a Beast", May 2016, https://www.somo.nl/beauty-and-a-beast/, (20 January 2018).
8 Responsible Mica Initiative, http://www.responsible-mica-initiative.com/index.html

Chapter 10 explains which countries have high or moderate risk with respect to sourcing mica.

At the outset of this research, it was not assumed that other mica-mining countries would necessarily face the same or similar issues as those uncovered in India. It is thus important to note that the negative impacts of mining in general, including mica mining, are broader than child labour. Although research on mining and children has tended to focus solely on the aspect of child labour, mining impacts children in many other ways. Children living in the proximity of polluting mines may be affected by contaminated water, soil, air and other environmental degradations and dangers. Or they may face displacement, increased migration, exposure to conflict, and lack of access to schools. In the case of illegal mining, the possible impact on children's rights increases exponentially. See Chapter 8 for a mining risk analysis for children, focused on mica.

2.3.2. ANALYSING THE GLOBAL MICA MARKET

In addition to desk research, a commercial market research report was used to help define and analyse the global mica market. SOMO made use of two Transparency Market Research (TMR) reports including Mica Market: Global Industry Analysis, Size, Share, Growth, Trends, and Forecast 2016-2024 and Mica Market: Global Production and Import-Export Analysis 2015.[9] The TMR reports provided an overview of the market for mica, both in sheet form (predominantly used in the electric and electronics industries), and in scrap form (used to make mica flakes and mica powder for the pigment sector, for paints and coatings as well as for construction, plastic, rubber, and cosmetics). The TMR report also divides the market into two main categories: natural mica and synthetic mica. The first TMR report estimates future demand and growth for the mica industry given current demand, while the second report identifies current supplies of mica based on production and trade figures. For more information, see Chapter 3.

While the TMR reports provide information on estimated demand for and supply of mica, they should also be considered as one perspective and not necessarily the definitive market analysis for the mica industry. This report will also describe the inherent contradictions that SOMO found in the TMR report, and question some of TMR's findings.

2.3.3. ANALYSING THE DEMAND FOR MICA BY DIFFERENT INDUSTRIES

Mica would receive greater financial and market interest if it was a traded commodity like gold, copper or tin. Unlike other minerals and commodities, there are virtually no global market overviews or analytical oversights of mica supply and demand, nor of which products and countries use mica across industries, or even where it is deemed essential.

This research does not aim to give a comprehensive overview of all of the industries or sectors that use mica in their products. However, in order to understand the market forces that drive the supply of mica, an understanding of the dynamics around the demand for mica – and therefore those industries that use it – is imperative.

Over the course of this research it became increasingly apparent that industries other than paint and cosmetics – and specifically the electronics and automotive industries – are also significant users of mica. Since there is very little information available about how these industries or sectors use mica, or what specific grades of mica they use, or where mica can be found in their products, or where the mica they use originates, it was decided to extend the research question to include the electronics and automotive sectors.

After having conducted extensive desk research, SOMO approached some of the major companies within these industries directly: to validate and verify findings, as well as to glean as much information as possible about the use of mica in both of these sectors. This information is presented in Chapters 5 and 6 of this report.

2.4. SOURCES OF INFORMATION

INDUSTRY SOURCES

Given the lack of available information about global mica and the significant variations in datasets, SOMO decided to conduct interviews with industry experts. The goal was provide insight into mica markets, both on the supply and demand sides, and to help validate or disprove data findings. SOMO held six interviews with industry experts. These interviews were done on the condition of anonymity, and with the agreement that interviewees' input was off the record and would be considered as background material. When information derived from these interviews has been used in this report, the footnote reference states that the information is based on the expert interviews held in 2017 and early 2018. Terre des Hommes has been informed about the identity of the experts interviewed by SOMO.

Regarding the use of mica specifically by the electronics and automotive industries, SOMO contacted 30 multinational companies individually, including 17 electronics companies and 13 automotive companies. The companies were asked questions about where mica is found in their products and in what quantities, as well as the status of their risk-based human rights due diligence processes. All of SOMO's discussions, interviews and surveys with industry representatives were held off the record, and quotes have therefore not been attributed directly to individuals or specific companies.

Finally, the attempt to ascertain how and in which approximate quantities mica is used by electronic and automotive companies met with some very clear limitations. Firstly, the quality of information received from the industries was extremely varied, ranging from very specific (specifying components containing mica) to very general (the provision of a supply chain policy on minerals). Secondly, given that the companies in both the electronics and automotive sectors are at the preliminary stages of investigating the location of mica in their manufacturing processes, products and components, the lists of mica applications provided to SOMO were in no way comprehensive or exhaustive.

SOMO also contacted the Responsible Mineral Initiative (RMI, formerly the Conflict-Free Sourcing Initiative) with a series of related questions. The RMI was established by the Responsible Business Alliance (formerly EICC, the Electronic Industry Citizenship Coalition), which partners with the Automotive Industry Action Group (AIAG).

In August 2017, RMI members formed an exploratory workgroup focusing on mica. Upon receiving the SOMO inquiry in October 2017, they decided to coordinate a collective response on behalf of their members. Ten companies responded directly to SOMO; many of them also shared data with the RMI. Twenty companies did not reply to SOMO; they either relayed their data directly to the RMI or did not cooperate with the inquiry.

DATASETS USED

SOMO used four public datasets to conduct this research, and one dataset included in the purchased TMR report (as previously noted in section 2.3.2. of this report). Datasets covering the same topic, for example official mica production figures, were compared in order to evaluate results. The datasets used in this investigation varied considerably, which exposed gaps in knowledge and coverage about mica. The following datasets were used over the course of this research.

USGS: The United States Geological Survey is considered an eminent authority on geological and related scientific issues worldwide.[10] One of its key functions is to provide quality scientific information to the US public through various means, including datasets. Production figures for mica-producing countries were analysed from the UGSG dataset. SOMO also contacted the USGS mica expert, as well as various USGS country experts, to obtain more information.

BGS: The British Geological Survey is also considered an eminent authority on geological and natural environmental research worldwide.[11] Its focus is on providing the UK public and government with objective and authoritative geoscientific data, information and knowledge in order to help society manage its natural resources sustainably, manage environmental change and be resilient to environmental hazards. Production figures for mica-producing countries were analysed from a BGS dataset. SOMO also contacted the BGS to further clarify certain findings in this research.

UN Comtrade: The United Nations collects national trade statistics, including exports and imports, in a dataset called UN Comtrade. Customs documents are used to collect data on physical goods, and according to the UN's website,[12] Comtrade is the world's most comprehensive database on trade topics. SOMO analysed Comtrade export and import trade figures in

9 These reports were made for SOMO and are not online available.

10 USGS, https://www.usgs.gov
11 BGS, http://www.bgs.ac.uk
12 UN Comtrade, https://comtrade.un.org

order to account for the export of mica from producing countries, and the import of mica for those countries buying mica from producing countries.

OEC: The Observatory of Economic Complexity is a visualisation tool that helps to make UN Comtrade data easier to comprehend.[13] The OEC dataset has two drawbacks: the data is dated, and it is processed through a third party, which can result in errors.[14] SOMO also reached out to the OEC to verify findings.

TMR: Transparency Market Research provides custom-made market analysis. TMR provided SOMO with a mica report, which was delivered in two parts, and included data concerning both mica demand and mica supply.[15] TMR used a wide variety of sources, including the above-mentioned datasets and other geological survey institutes, mining databases and market forecasting tools to produce their results. SOMO also consulted TMR about its sourcing in order to clarify their findings.

2.5. DISCLAIMER ON DATA, STATISTICS, ESTIMATES AND FIGURES

The available data on all aspects of mica varied considerably, and required rigorous scrutiny and questioning. Ultimately, all of the data collected for this report should be considered as estimates and indications. This research has unequivocally demonstrated that there is very little reliable, quantifiable data available relating to mica supply or demand.

Data on mica from UN Comtrade and the OEC, as well as some of the TMR, UGSS and BGS data, has reportedly come from statistics and reports produced by governments in the relevant mica-producing countries. In this analysis, it became apparent that while some governments under-report official mica production, others appear to either report the same figures each year or report nothing at all.

Official UN Comtrade data is based on customs documentation: physical goods that are documented when exported from and/or imported into a country. This data is not checked or validated before it is entered into the UN Comtrade database.

Although the USGS and the BGS are considered eminent authorities on global geology deposits and mineral production, even their data must be taken with caution for two reasons. Firstly, although the USGS and BGS provided SOMO with some source details when asked, the primary sources used by these eminent geological authorities were not provided. Both institutes divulged that much of the data they provide is based on a variety of sources, including their own estimates, unnamed sources, government websites, primary or secondary sources, unnamed publications, and companies. Secondly, some of their data is based on figures provided by the governments of mica-producing countries, which as previously stated may be under-reported or not reported at all.

2.6. REVIEW PROCESS

The chapters of this report on the electronics and automotive sectors, and the chapter on due diligence efforts by companies in these industries, were sent to the members of the Responsible Minerals Initiative (RMI) active in the exploratory workgroup focusing on mica. SOMO's standard period for review is ten working days. As no individual companies are mentioned in the report, SOMO did not send the report to individual companies for review. All of the companies that responded directly to SOMO are also member of the RMI. SOMO received a coordinated feedback of the RMI members on February 9, 2018.

2.7. STRUCTURE OF THE REPORT

This report has ten chapters and an extensive annex, which includes profiles of mica-producing countries.

The first chapter of this report is an executive summary. This second chapter is an introduction, and provides background for the report, clarifies the methodology used, and adds a disclaimer concerning the data and other limitations to the findings. The third chapter introduces basic facts about mica and gives an overview of the global mica market. The fourth chapter outlines the industries that use mica, and the fifth and six chapters include more detailed information about the electronics and automotive industries. The mica due diligence process is summarised in the seventh chapter, whilst the eighth chapter is an analysis of the risks associated with mica mining. The ninth chapter provides an overview of global sheet mica deposits. An overview of the mica-producing countries and the risks associated with these countries is outlined in the tenth chapter, and the final chapter of the report offers conclusions and recommendations.

13 OEC, http://atlas.media.mit.edu/en/profile/hs92/2525
14 A. Simoes, Founder OEC, OEC, email to R.Cowan at SOMO on 6 June 2017.
15 TMR, http://www.transparencymarketresearch.com/about-us.html

3. BASIC FACTS ABOUT MICA AND THE GLOBAL MICA MARKET

For the general population, mica is most commonly associated with the sparkle found in cosmetics and car paint, or with stoves panes. Most of us do not know exactly what electrical, physical and chemical properties make mica one of nature's most useful and widely used minerals across many sectors. This chapter will introduce mica in more detail.

This chapter also provides some basic facts about the global mica market. This information is needed in order to understand the following chapters, as it clarifies the terminology used in this report. This chapter also introduces the different markets for natural and synthetic mica, clarifies the differences between the various grades of mica (sheet mica, ground mica, built-up mica and so forth), and describes the industries for which the specific grades are relevant. As previously mentioned, in addition to desk research SOMO used two commercial Transparency Market Research (TMR) reports to help define and analyse the global mica market.

3.1. WHAT IS MICA?

Mica is the name given to a group of minerals that are physically and chemically similar. These minerals are called 'sheet silicate' because they form in distinct layers.[16] Mica comes from the Latin word *micare*,[17] which means to shine, flash or glitter.[18] The mica group of minerals contains a total of 37 different types of mica. The main types of mica are:

- muscovite or white mica (potassium mica);
- phlogopite or amber mica (magnesium mica);
- biotite or black mica (ferro-magnesium mica);
- andlepidolite (lithium mica).

Mica has a crystalline and layered structure, and due to its hexagonal structure can be split into sheets as thin as one micron. The splitting of mica does not compromise its mechanical, physical or electrical properties.

Mica's outstanding physical, chemical and electrical properties mean that it is:

- chemically inert, and does not react to water, acids, oil or solvents;
- lightweight, flexible and strong;
- able to resist extremely high temperatures or sudden changes in temperature;
- able to withstand high voltages and insulate with low power loss;
- and able to absorb or reflect light, which provides a decorative effect and protects against ultraviolet (UV) light.[19]

3.2. THE GLOBAL MICA MARKET

The global mica market can be divided into two main categories: natural mica, which is found in nature and mined from rock in the ground, and synthetic mica, which is made in factories. An analysis of the size of the global mica market, as seen in the TMR report, is based on the actual (A) and forecast (F) demand for mica by the end-user industries.

According to TMR, the total market value in 2015 of mica, including both the natural and synthetic forms, was almost half a billion dollars (US$ 478 million). This figure is based on the total market volume that year, which was 951,129 tonnes. Asia Pacific is the principal region for the mica market, given that the majority of mica processing companies are based in India and China. China processes most of the world's mica, and accounted for more than 45 per cent of the mica market in 2015.[20]

In 2015, according to TMR, the size of the global natural mica market amounted to 846,505 tonnes, while the market for synthetic mica totalled 104,624 tonnes. TMR estimates that the market for natural mica will grow 2.5 per cent by volume each year between 2016 and 2024, based on the amount of mica demanded by industries. The global market for synthetic mica is expected to grow even faster, with an annual growth rate of 3.9 per cent over the same period.[21]

In terms of revenue, TMR forecasts that the natural mica segment will increase with an annual compound growth rate of 3.6 per cent, and the synthetic segment at the rate of 5.3 per cent.[22]

GROWTH EXPECTATIONS

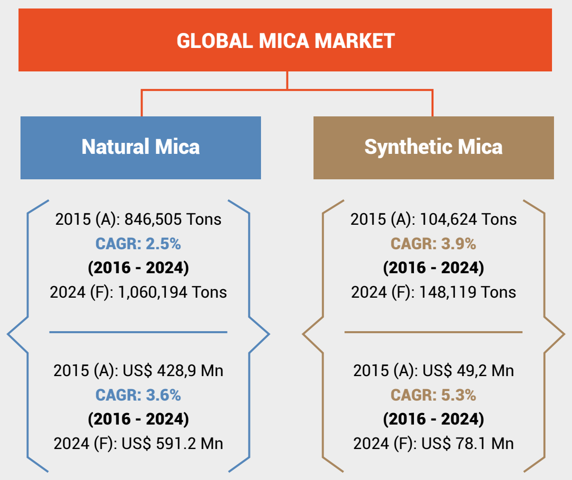


Figure 2: Growth expectations in the two main categories of mica
Source: TMR, 2016.

16 Minerals Database, Mica, https://mineralseducationcoalition.org/minerals-database/mica/ (19 January 2018).
17 Latin Dictionary, http://www.latin-dictionary.net/search/latin/micare, (19 January 2017).
18 J.B. Hedrick, "Mica", US Geological Survey, May 2008, http://on.doi.gov/1PzQQpF, (19 January 2017)

19 Government of India, Ministry of Mines, Indian Bureau of Mines, "Indian Minerals Yearbook 2014 (Part III: Mineral Reviews), MICA", December 2015, http://bit.ly/1QbmKDY; EEPC India, M.L. Rajgarhia, report "Indian mica industry, outlook and export prospects", February 2011; Minerals Zone, "Mica", http://bit.ly/1l70cMB (accessed 7 August 2015); US Geological Survey (USGS), J.B. Hedrick, "Mica", May 2008, http://on.doi.gov/1PzQQpF; US Geological Survey (USGS), J.C. Willett, "Minerals Yearbook, mica", January 2016, pages 110 and 111, http://on.doi.gov/1PiwO0D.
20 Transparency Market Research, "Mica market: Global Industry, Size, Share, Growth, Trends and Forecast, 2016-2024", August 2016. Hereafter referred to as 'TMR report, 2016'.
21 TMR report, 2016.
22 Prices considered for calculation of revenue are average regional prices obtained by TMR through primary quotes from numerous regional suppliers, distributors, and direct selling regional producers, but also on manufacturers' feedback.

That the global consumption of mica is steadily growing and that prices are rising indicates a competitive market. However, this report will demonstrate that based on national export figures, mica prices vary considerably between producing countries. According to TMR, the top drivers of mica's market growth are increasing demand within the electronics industry, and the growth of the construction, paint and coatings industries, particularly in Asia Pacific.

Figure 3 shows TMR's estimates that the global mica market will grow to nearly US$ 700 million in 2024, up from almost half a billion dollars in 2015. This growth is based on rising demand and increasing prices.

The demand for natural mica currently far outweighs the demand for synthetic mica. Natural mica accounted for about 90 per cent of total market share in 2015,

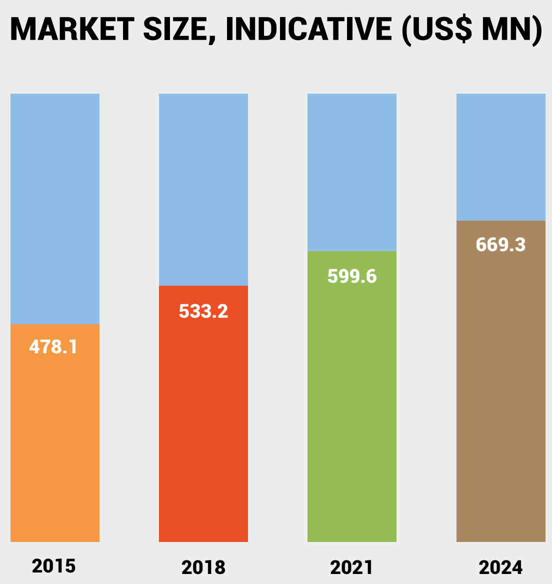


Figure 3: Indicative market size of mica
Source: TMR, 2016.

while the remaining 10 per cent consisted of synthetic mica.[23] This means that end-user markets and the industries that use mica are highly dependent upon mica that is extracted by mining. TMR forecasts that in 2024, the market share split between natural mica (88 per cent) and synthetic mica (12 per cent) will not change substantially. If the forecasts are accurate and the status quo remains, synthetic mica will remain a niche product and will not actually compete in the same markets as natural mica.

3.2.1. NATURAL MICA

Natural mica is a silicate mineral that occurs in igneous rock formed by magma or lava; sedimentary rock that is built up in layers; and metamorphic rock transformed by other types of rock. Mica's supply chain starts with the mining of mica ores.
Ordinary mica crystals as they come out of a mine are in rough blocks or lumps of irregular shape, size and thickness. They may have impurities and structural imperfections. To transform from crude or raw form to commercial quality, these blocks must go through a process of cutting, inspection, sorting and processing.

There are 37 different types of natural mica. However only muscovite and phlogopite have any real commercial value and are used by industries. Muscovite, which is light-coloured and can contain small amounts of coloured impurities, or iron oxides, is by far the most frequently mined type of mica.[24] The extent of these impurities strongly depends upon the origin of the mica, including the mine and even the specific pit within the mine.[25] Muscovite has better electrical properties (it is able to withstand high voltages and insulate with low power loss) than phlogopite, and the pearlescent pigments used for cosmetics are generally composed of muscovite mica.[26] Phlogopite, the magnesium mica, can better resist extremely high temperatures, and is used in applications requiring a combination of high heat stability and electrical properties.[27]

23 TMR report, 2016.
24 J.W. Schlanz and J.T. Tanner Jr., "Industrial minerals & rocks: commodities, markets, and uses; mica", 2006, page 639.
25 European Coatings journal, 2003, www.european-coatings.com/content/download/.../1/.../45141.pdf
26 https://imageserv11.team-logic.com/mediaLibrary/110/Synthetic_Mica_Presentation.pdf
27 G.C. Hawley, 'Industrial Minerals review 2014', Mining Engineering, July 2015.

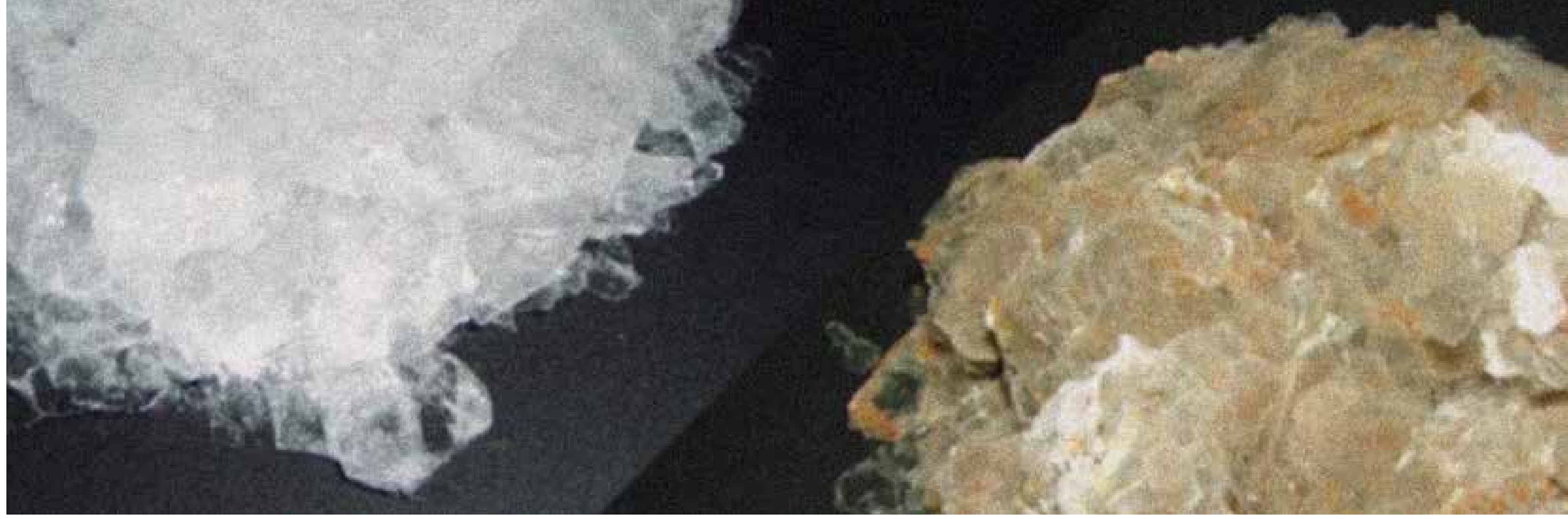


Photo source: Impact Colors Inc.

India is a key exporter of muscovite mica. According to industry experts, India is unequivocally the most important country supplying natural mica, and this is widely acknowledged in the market. Some of the expert interviews confirmed that many companies consider that India has by far the best quality, largest volumes and lowest prices for ground mica. According to industry experts, other countries – especially those with the same or similar quality of mica as India's – would need to drastically scale up their mica mining capacities in order to bypass India as suppliers for end-users. There are different opinions about the real possibilities for scaling up. Some experts said that scaling up would be relatively easy and feasible within a few months, while others indicated that it would take many years and require significant investments given that other mica-producing countries do not have the knowledge, skills, infrastructure or equipment needed to surpass India.[28]

The industry experts consulted did however agree on the fact that for many firms, bypassing India's mica production is only a theoretical option on the short term. This is because companies that source large amounts of mica are dependent on Indian exports, and could not source at current levels without the country's mica production.[29]

3.2.2. SYNTHETIC MICA

Synthetic mica is made artificially by heating certain raw materials[30] in an electric resistance furnace and allowing mica to crystallise from the melt during controlled slow cooling.[31] This results in a fluorine-containing mica with the characteristics of muscovite and phlogopite.

Synthetic mica has the same special characteristics as natural mica. The temperature resistance of synthetic mica is up to 1100 degrees Celsius, even higher than the 800 degree resistance of natural mica. Synthetic mica is colourless.

The development and use of synthetic mica as a replacement for natural mica could reduce reliance on mica mining. Currently, the main industry using synthetic mica is the cosmetics sector. According to the cosmetics company Lush, synthetic mica is brighter than natural mica and has a more uniform finish, making it particularly suitable for makeup products.[32]

No human rights violations or environmental problems were found concerning the manufacture of synthetic mica based on publicly available information within the scope of this research. However, further research could be done in order to better understand the manufacturing process and related issues.

28 Based on expert interviews in May 2017.
29 Based on expert interviews in May 2017.
30 One source indicates that this raw material includes Potassium, Magnesium, Aluminium, Fluorosilicate and/or Synthetic Fluorophlogopite, https://imageserv11.team-logic.com/mediaLibrary/110/Synthetic_Mica_Presentation.pdf see also: Google patents, Method of making synthetic mica, https://patents.google.com/patent/US3087785, (July 2017).
31 The free dictionary, http://encyclopedia2.thefreedictionary.com/synthetic+mica, (July 2017).
32 Lush, "Synthetic Mica" https://uk.lush.com/ingredients/synthetic-mica (19 January 2018).

Given that synthetic mica is made in a laboratory or factory, there is virtually no risk that children are involved in the manufacturing process. Some industry experts suggested that certain buyers would rather pay a premium for synthetic mica, given that it is definitely not mined by children. This is a unique selling point, and justifies the higher price of synthetic mica.[33]

According to industry experts, choosing synthetic over natural mica depends on the innovation process and the design of the end product, as well as how closely synthetic mica can be matched to natural mica. Other considerations in choosing synthetic mica include quality and price.

ANALYSIS OF GLOBAL MICA MARKET VALUE SHARE BY FORM, 2016 AND 2024

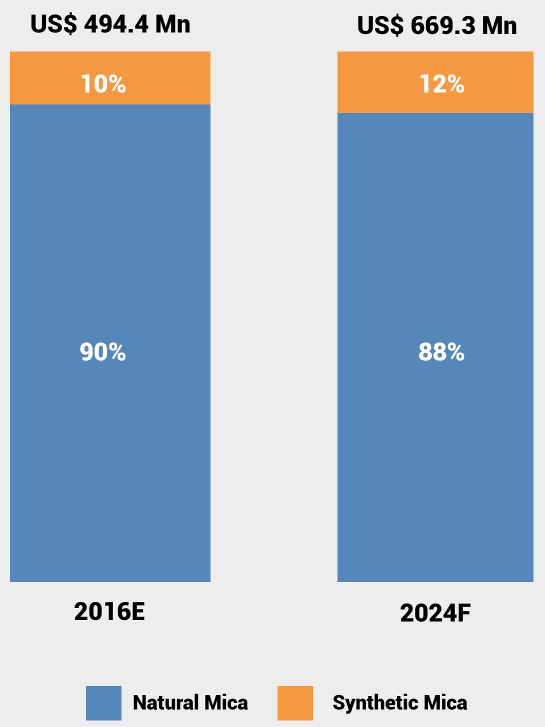


Figure 4: Source: TMR, 2016.

Some industry experts suggest that the price of synthetic mica will fall as production volumes grow.[34] However, the TMR report concludes that the synthetic mica market does not show signs of rapid growth and that it will have increased its market share by only 2 per cent by 2024. This means that synthetic mica will reach an overall market share of 12 per cent over an eight-year period, up from 10 per cent in 2015.[35]

Other industry experts claim that synthetic mica's market share could grow faster than TMR's prediction. Expanding the use of synthetic mica is highly dependent on the development of new formulas for coatings and paints that are specifically suited to synthetic mica. At the moment it is not possible to simply substitute synthetic mica for natural mica in an existing product formula, such as for example a specific colour of paint. According to one of the industry experts interviewed, there are three general reasons that this substitution is not currently possible.

The first reason is that the visual effect of natural mica is different from that of synthetic mica. Manufacturers in end markets must already make the choice for synthetic mica in the design phase of any newly-developed product. Formulas are apparently agreed on within certain industries and then remain the same for many years. For example, paints and coatings manufacturers that make car maintenance products must follow the original colour specifications as set by the car manufacturers, as the original paint and any repair paint must be visually similar. In this case, according to industry experts, car manufacturers would need to choose synthetic mica at the design phase, and the coatings industry would in turn have to choose synthetic mica in order to comply with the visual specifications dictated by the car manufacturer.

At the moment, industry experts state that there are no commercial indications that car manufacturers are prepared to convert to synthetic mica for their automobile paints and coatings.

A second reason for not substituting synthetic mica for natural mica, according to industry experts, concerns

33 Impact Colors Inc., 'Synthetic Mica', https://imageserv11.team-logic.com/mediaLibrary/110/Synthetic_Mica_Presentation.pdf; expert interviews May 2017.
34 Based on the expert interviews in May 2017.
35 TMR report 2016.

the reportedly superior quality of natural mica when used in certain applications. Natural mica produces complicated and brilliant visual effects that have yet to be replicated in the laboratory. For example, paints and coatings manufacturers speak of the multi-coloured shine of a natural mica coating on cars, which changes brilliance at different angles and on curved surfaces.

The third reason that synthetic mica is not frequently substituted for natural mica is that it is currently much more expensive than natural mica. However, if the car industry were to make the conversion, there would be sizeable shift in market forces, and the market share of synthetic mica would increase substantially.[36]

Currently, almost all synthetic mica production is for the cosmetics industry. The volumes of mica used for cosmetics are low, and the prices are much higher than those of other end-users.[37] An industry expert gave the example that very little mica is needed for small cosmetics products like nail varnish and eye shadow, but the prices paid by the cosmetics industry for both natural and synthetic mica are the highest.

Desk research did not uncover the use of synthetic mica by the electronics sector. This can be clarified by the fact that the electronics industry uses natural mica next to alternative materials, such as acrylate polymers, cellulose acetate, ceramics, fibreglass, fish paper, nylon, phenolics, polycarbonate, polyester, styrene, vinyl/PVC, and vulcanised fibre.[38]

According to an industry expert, existing synthetic mica production facilities are currently not producing at full capacity,[39] as the demand is still lower than the available capacity. Synthetic mica is manufactured primarily in China and Japan, although there are some production facilities in Europe.[40]

3.2.3. SUBSTITUTES FOR MICA

Next to natural and synthetic mica, some pearlescent pigment producers are using other 'substrates' as a basic ingredient, and sometimes as a significant portion of total additives.[41] According to the *European Coatings Journal* in 2003, 98 per cent of the world market for pearlescent pigments was based on natural muscovite mica at that time. However, a high commercial acceptance for new substrates like glass, SiO_2 (silicon dioxide) and α-Al_2O_3 (aluminium oxide) flakes was mentioned, as these flakes "show lower optical absorption, and additional advantages like special colour effects".[42]

In some sectors and products, the trend has been towards a greater use of non-mica-based substrates and this tendency will presumably continue. Currently however, natural mica is still the dominant ingredient used by the pearlescent pigment industry, since upwards of 80 per cent of its products are still based on natural mica. Pearlescent pigments made with non-mica-based substrates are mainly produced for the automotive sector.[43]

Information regarding the possibilities for using mica substitutes within the electronics sector is conflicting. Although one source indicated that there are plenty of examples of substitution, other sources claimed that mica is not easily replaced, particularly in the electronics sector.

According to TMR market analysts, it is possible to use a wide range of substitutes for mica in electronics and insulation applications, including acrylate polymers, cellulose acetate, fibreglass, fish paper, nylon, phenolics, polycarbonate, polyester, styrene, vinyl/PVC, and vulcanised fibre.[44]

However, the scientists and technical journals surveyed for this report practically eulogise the merits of mica for electrical and electronics systems.

The technical magazine *Polymers* highlights the importance of sheet mica as blocks or splittings for the electronics industry. A spokesperson stressed that when

36 Based on the expert interviews in May 2017
37 Based on the expert interviews in May 2017.
38 TMR report 2016, page 36.
39 Based on the expert interviews in May 2017.
40 TMR report 2016, page 55.
41 Based on the expert interviews in May 2017.
42 European Coatings journal, 2003, www.european-coatings.com/content/download/.../1/.../45141.pdf
43 Based on the expert interviews in May 2017.
44 TMR report 2016, page 36.
45 "Mica/Epoxy-Composites in the Electrical Industry: Applications, Composites for Insulation, and Investigations on Failure Mechanisms for Prospective optimizations", Polymers 2016, 8, 201; doi:10.3390/polym8050201, www.mdpi.com/2073-4360/8/5/201/pdf, (July 2017).

THE FLOWCHART SHOWS THE MOST IMPORTANT TERMS EXPLAINED IN THE GLOSSARY.

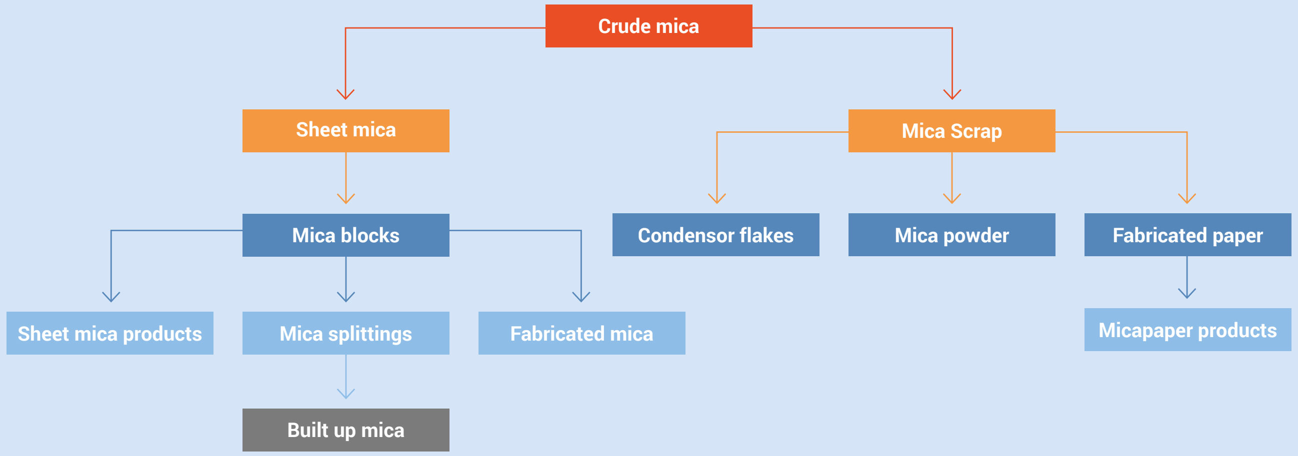


Figure 5: Flowchart of mica production
Source: Gunpatroy Pvt. Ltd,[48] adapted by SOMO.

splittings are used for the production of so-called 'built-up' mica, which is mainly used in the electrical and electronics sectors, the strength of the mineral's special properties is such "that it cannot be replaced by other materials".[45]

This was confirmed by Jason Cole at the University of Waterloo in Canada. "When it comes to modern technology, sheet muscovite is an indispensable resource. It is used in almost every electronic device sold today as an insulator. Its high resistance to the passage of electricity and heat are so great that no substitute, artificial or natural, has proved to be economically suitable to replace it. No other mineral has better cleavage, flexibility or elasticity. [...] Sheet mica is just as important to the electrical and electronic industries as copper wire, and now ranks as one of the essential minerals of modern life."[46]

3.3. MICA BY GRADE

There are a variety of terms related to the form or 'grade' of mica. Each grade is identified by a specific industry code that is used in import and export statistics. The appendix to this report displays all of the classification codes for mica in its basic forms, excluding mica manufactured in semi-finished products.[47] Mica in crude form, including sheet and scrap mica, falls under industry HS Codes starting with the numbers 2525. These codes have been used for the retrieval of production, export and import data.

The TMR market report divides the global market into three different grades: ground mica, sheet mica and built-up mica. The main terms used in this report, for clarity and consistency, are **crude mica**, **sheet mica**, and **scrap mica**. The terms used in this report and how they relate to each other are visualised in the flowchart in Figure 5 (also see page 18 following the glossary). All mica definitions can also be found in the glossary.

Basically, crude mica ends up in two main categories: sheet mica and scrap mica. Scrap mica is the basis for mica flakes, mica powder and mica paper, which can be used across many different industries. Sheet mica is the basis for mica used in the electrical and electronic sectors including for capacitors (condensors), mica splittings and fabricated mica.

46 J.Cole, "Mica" Wat on Earth, November 2001, https://uwaterloo.ca/wat-on-earth/news/mica (24 July 2017)
47 This concerns HS Code starting with 6814, which are the worked, articles of mica, including agglomerated or reconstituted mica; whether or not on a support of paper, paperboard or other materials.
48 Website Gunpatroy Pvt. Ltd, http://www.grmica.com/About_Mica.php#aa

3.3.1. GROUND MICA

Ground mica is the collective term for mica flakes and mica powder. Scrap mica is crushed or ground into either mica flakes or mica powder. Mica paper is also produced from mica scrap; after being crushed, it is pulped with various binders and pressed into paper-like sheets.[49] According to patent information, mica powder cannot be processed into paper because there is insufficient contact between the individual mica particles.[50]

Mica flakes are sold in different sizes, indicated in meshes.[51] Fine, medium and coarse mica flakes can measure between 4 and 30 meshes (this would be between 0.185 and 0.0328 inches). A rotary hammer crushing machine is used to prepare mica flakes.[52]

There are different techniques for making mica powder. Size differences in mica powder are related to the method of grinding: dry ground (APS 1.2 mm to 150 µm), wet ground (APS 90 to 45 µm) or micronised (APS <53 µm).[53]

The corresponding HS industry codes for ground mica are grouped under 252520:

HS CODE: 25252010	HS code for mica flakes, 2.20 mesh
HS CODE: 25252020	HS code for mica powder, dry ground
HS CODE: 25252030	HS code for mica powder, micronised
HS CODE: 25252040	HS code for mica powder, wet ground
HS CODE: 25252050	HS code for mica powder, calcined
HS CODE: 25252090	HS code for other

According to TMR, ground mica is the dominant segment of the key mica grades utilised, amounting to 53 per cent of the global market in 2015 (see Figure 6). TMR states that ground mica is used in industries including paints and coatings, construction, plastic, rubber, and cosmetics. Given that all of these industries are growing globally, it is anticipated that the ground mica segment will expand at a compound annual growth rate (CAGR) of 2.8 per cent in terms of volume and 4 per cent in terms of value.[54]

3.3.2. SHEET MICA

The second main grade is sheet mica. Sheet mica pieces are graded into different standard sizes and commercial qualities before they are offered on the market. The quality of sheet mica is determined by visual assessment and judgement. In this system of quality evaluation, emphasis is put on clarity, colour, flatness, hardness and freedom from spots, stains, air bubbles, visible inclusions and structural imperfections.[55] The grading of mica sheet size is calculated based on the maximum usable rectangular area yielded by a piece of sheet mica.

Mica splittings may be layered with other products and glued together to become laminate products. This is called built-up mica, or micanite.[56]

Sheet mica can be cut, stamped, punched, and converted into different shapes and sizes. For some electrical applications of mica, it is cut and punched with a simple machine according to required specifications. This is called fabricated mica.

Sheet mica is the preferred grade of mica for the electronics industry. Fabricated mica, built-up mica and mica capacitors are all used in the electronics sector, although these industries also use mica paper products made from scrap mica.

The corresponding HS industry codes for mica rifted into sheets or splittings are grouped under 252510:

HS CODE: 25251010	HS code for mica blocks
HS CODE: 25251020	HS code for condenser films trimmed but not cut to shape
HS CODE: 25251030	HS code for mica splittings, book form
HS CODE: 25251040	HS code for mica splittings, loose
HS CODE: 25251090	HS code for other

According to TMR, during the forecast period (2016-2024) the sheet mica segment is likely to expand at a CAGR of 2.6 per cent in terms of volume and 3.8 per cent in terms of value.[57] The increased usage of mica in

49 SOMO/Terre des Hommes, "Beauty and a Beast", May 2016.
50 It is needed that the particle size of mica is reduced not by grinding but by treating in such a way that the mica is essentially delaminated, i.e. split into platelets along the cleavage planes (in essence flakes). It is only these platelets which can be used for making mica paper. U.S. Pat. No. 2,614,055, https://www.google.ch/patents/US4180434
51 Mesh size is the mesh number (a US measurement standard) and its relationship to the size of the openings in the mesh and thus the size of particles that can pass through these openings. Higher mesh numbers = finer particle sizes.
52 Prakash Mica Experts, http://www.pmegroup.net/pme/mica-flakes.html, (July 2017).
53 National Geoscience Database Of Iran, http://ngdir.ir/Minemineral/MineMineralChapterDetail.asp?PID=3277, (July 2017).
54 TMR, 2016.
55 Gunpatroy, "About Mica", http://www.grmica.com/About_Mica.php#aa (20 January 2018).
56 Micamafco, "Grades of Mica Sheets," http://www.micaworld.in/micanite.html (20 January 2018).
57 TMR, 2016.

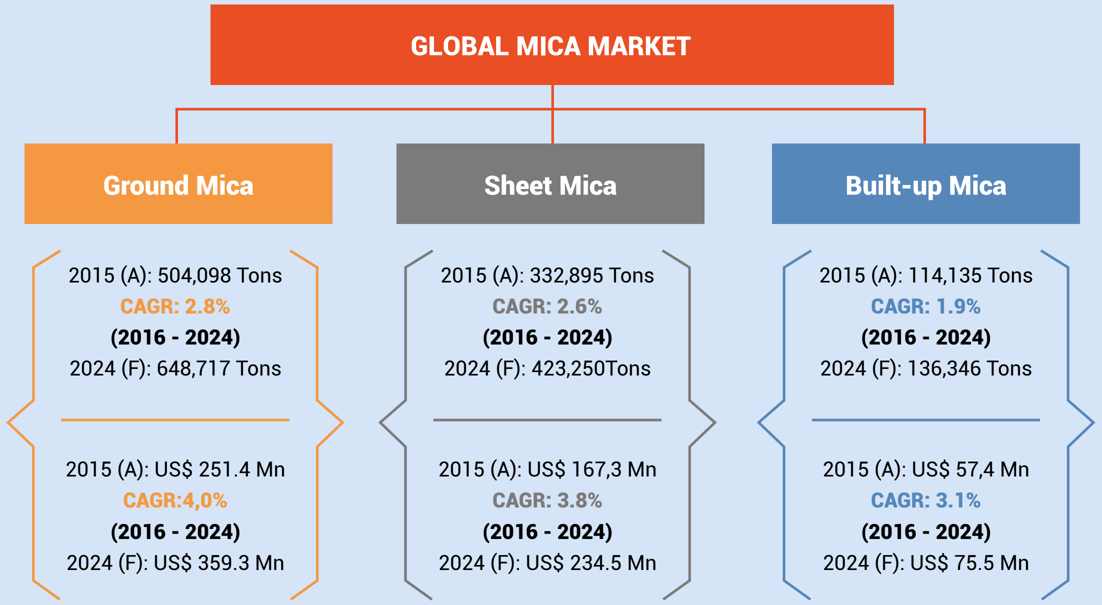


Figure 6: Global market value of mica by grade
Source: TMR, 2016.

the electronics industry and the rising demand for electronic equipment are expected to boost the demand for mica in the Asia Pacific region.[58]

3.3.3. BUILT-UP MICA

Built-up mica is manufactured from mica splittings and is therefore in fact a subcategory of sheet mica; TMR however considers it as a separate grade. To make built-up mica, splittings are arranged to overlap in layers of uniform thickness and then cemented with shellac, epoxy, alkyd or silicone and bonded by heat and pressure. The cemented splittings are then bonded to fibreglass cloth, silk, linen, muslin, plastic or another material to form a composite sheet.[59] Variations can be made in the manufacturing method, the types of mica, and the type or quantity of bonding material used in order to form thick, thin, stiff or flexible products. Built-up mica is primarily used as insulation material in electrical equipment. The built-up mica segment is expected to expand at a CAGR of 1.9 per cent between 2016 and 2024 in terms of volume, and 3.1 per cent in terms of value.[60]

3.3.4. GLOBAL MARKET VALUE OF MICA BY GRADE

According to TMR, ground mica is the most used grade of mica and shows the largest annual growth both in terms of tonnes and value. This growth is due to the increasing use of ground mica in the construction, paints and coatings, plastic, rubber and cosmetics industries.[61]

According to TMR, ground mica, which includes mica flakes and mica powder, accounted for a 53 per cent share of the global mica market in 2015 in terms of market value. Sheet mica and built-up mica together accounted for 47 per cent, according to TMR. These grades are used mainly by the electronics sector and by the automotive industry.

3.4. MICA MINING METHODS

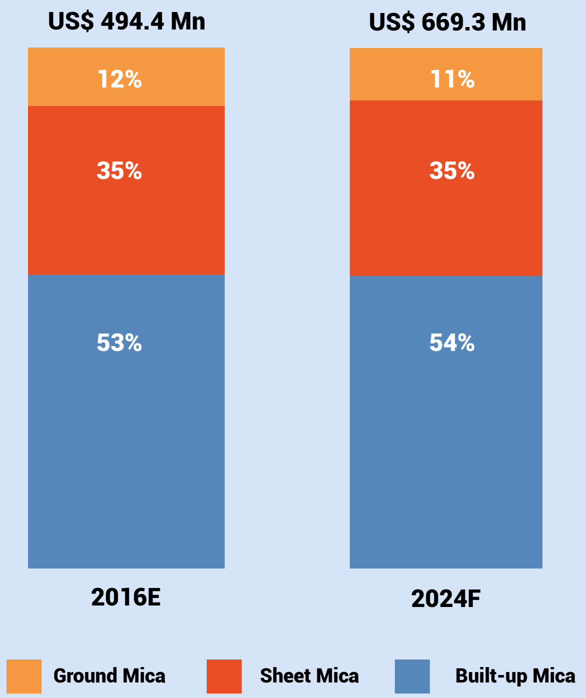
This section describes the methods for mining the two main grades of mica: sheet mica and scrap mica. The reason for describing these methods is to ascertain risk levels related to the mining of these different mica grades. Since certain industries use only one grade of mica, it is important and relevant to understand these different methods in order draw links between mining methods and industries, and to exclude certain industries from particular mica mining methods.

3.4.1. MINING OF SHEET MICA

Sheet muscovite is obtained from coarse-grained igneous rocks called pegmatites. Pegmatites also contain feldspar, quartz, and various accessory minerals.[62] Sheet mica can be recovered by both deep shaft mining and open-pit surface mining, but the latter is only possible in the case of semi-hard pegmatite ore.

It is typical in sheet mining that when a pocket of mica is found in a pegmatite, extreme care is exercised in its removal in order to minimise damage to the crystals and to keep the sheets intact. If small explosives and drilling are used, care must be taken to avoid penetrating the mica pocket. The charge needs to be just sufficient to shake the mica free from the host rock. Next, the mica is hand-picked and placed in boxes or bags for transport to the location where it will be graded, split and cut to various specified sizes for sale.[63] This process of assessing, grading, splitting, cutting and trimming is done by hand. This means that sheet mining is always a labour-intensive process, and therefore not considered economical in countries where labour costs are higher than the relative value of the mica. This is particularly true when other countries with good sheet mica deposits have much lower labour costs.

FIGURE 7: GLOBAL MARKET VALUE OF MICA BY GRADE IN 2016 AND 2024



Source: TMR, 2016.



Using scissors to remove ragged edges and other imperfections *Source: photo still from Der Spiegel footage.*[64]

Pry bar and crack hammer, the most essential tools for sheet mining.[67]

58 TMR, 2016.
59 National Geoscience Database of Iran,"Mica" http://ngdir.ir/Minemineral/MineMineralChapterDetail.asp?PID=3277 (20 January 2018).
60 TMR, 2016.
61 TMR, 2016.

62 ScienceViews.com, http://scienceviews.com/geology/mica.html, (July 2017).
63 Minerals Database, Mica, https://mineralseducationcoalition.org/minerals-database/mica
64 Spiegel Online, http://www.spiegel.de/wirtschaft/indien-wie-kinder-in-den-glimmer-minen-von-jharkhand-ausgebeutet-werden-a-1149309.html (July, 2017).

Sheet mica is considerably less abundant than flake or scrap mica. The costs involved in locating the vein, and the unpredictable quality and quantity of the mica once the vein has been located and worked, make it an economically risky mining procedure.[65] Therefore, although the United States has sheet mica resources, the country imports most of its sheet mica,[66] and sheet mica production there has declined to almost nil due to the high costs of mining and labour.

3.4.2. MINING OF SCRAP MICA

Scrap mica is produced either in the course of mining sheet mica, or is recovered as a by-product or co-product from the mining of other naturally occurring minerals including feldspar, quartz and kaolin (a clay-like material).

In the first case, scrap mica is basically a by-product of the sheet mica mining. The waste (the scrap mica), as part of the process of sheet mining, results as scrap mica to crude of approximately 60 to 90 percent.[68] Another source gives a far lower percentage, indicating that a good quality mica deposit may result in 10 per cent commercially useful mica sheets while the rest can be sold as scrap mica. When the quality of a mica deposit is low, the total output from a mine may be sold as scrap mica. [69]

India has vast resources and deposits of sheet mica (also see Chapter 9). Therefore, practically all of the country's scrap mica is derived from its sheet mica production. The best quality of scrap mica is considered to be the by-product of sheet mining. Although the US has sheet mica resources, the majority of scrap mica produced in the US is recovered as a by-product or co-product of domestic feldspar and kaolin beneficiations obtained from open quarries as well as from other micaceous rocks. This quality of this scrap mica is considered to be far inferior to the Indian grade and quality, and is only suitable for use as a raw material by the ground mica industry.[70]

Scrap mica that is a by-product of sheet mining is said to possess the essential quality for use in reconstituted mica paper, mica flakes and powder for the pearlescent pigment and cosmetic industries.[71] In particular, 'factory' scrap is considered to be the highest grade and quality of scrap mica, and is favoured for the manufacturing of mica paper. This type of scrap is obtained during the course of trimming and fabricating sheet mica in the factory with sharp knives, and is also recovered during the cutting and stamping of sheet mica into pieces of specific sizes and shapes.[72]

The recovery of scrap mica as a by-product or co-product from the mining of feldspar, quartz and kaolin mainly happens through conventional open-pit methods. Bulldozers, shovels, scrapers and front-end loaders are used for the mining of soft residual material. The hard rock mining of mica-bearing ore requires drilling and blasting. After blasting, the ore is reduced in size with drop balls, and loaded with shovels onto trucks for transport to the processing plant. This is where the mica, quartz and feldspar are ultimately extracted.[73]

65 Minerals Education, "Mica" https://mineralseducationcoalition.org/minerals-database/mica/ (20 January 2018).
66 ScienceViews.com , http://scienceviews.com/geology/mica.html
67 Source photo of pry bar and crack hammer http://www.johnbetts-fineminerals.com/jhbnyc/articles/tools.htm. The photo of deep mining shaft is a still from the footage of Der Spiegel, http://www.spiegel.de/wirtschaft/indien-wie-kinder-in-den-glimmer-minen-von-jharkhand-ausgebeutet-werden-a-1149309.html
68 MiningLink, Mica, http://mininglink.com.au/natural-resource/mica.
69 ISSUU, Mica sheets used in numerous industries for high performance thermal and electrical insulation, May 8, 2017, https://issuu.com/ax-immica4/docs/mica_sheets_used_in_numerous_indust
70 Mica Manufacturing Co, http://www.micamafco.com/processed1d9db.html?nm=processed , (July 2017).
71 Mica Manufacturing Co, http://www.micamafco.com/processed1d9db.html?nm=processed, (July 2017).
72 Mica Manufacturing Co, http://www.micamafco.com/processed1d9db.html?nm=processed, (July 2017).
73 Mica Manufacturing Co, https://mineralseducationcoalition.org/minerals-database/mica/, (July 2017).

4. MICA AND THE INDUSTRIES THAT USE IT

This chapter will give more insight into the widely different uses of mica. Mica's exceptional physical, chemical and electrical qualities allow it to be used in many applications, and across many consumer, manufacturing and industrial sectors.
In SOMO and Terre de Homme's 2016 mica report entitled *Beauty and a Beast: Child labour in India for sparkling cars and cosmetics*, there was a strong focus on the use of mica in pearlescent pigments, which are subsequently added to paints, coatings, cosmetics, plastics and ink. This was because pearlescent pigment producers source the majority (60 per cent) of the mica production in the Indian regions of Jharkhand and Bihar.

This chapter elaborates on the global market shares of mica based on its value by different industries.

The data on the global mica market in this chapter is based on the TMR report. While the report provides information on actual demand (2015A) and forecasted demand of mica (2024F), it should be considered as one perspective and not necessarily the definitive market analysis for the mica industry.

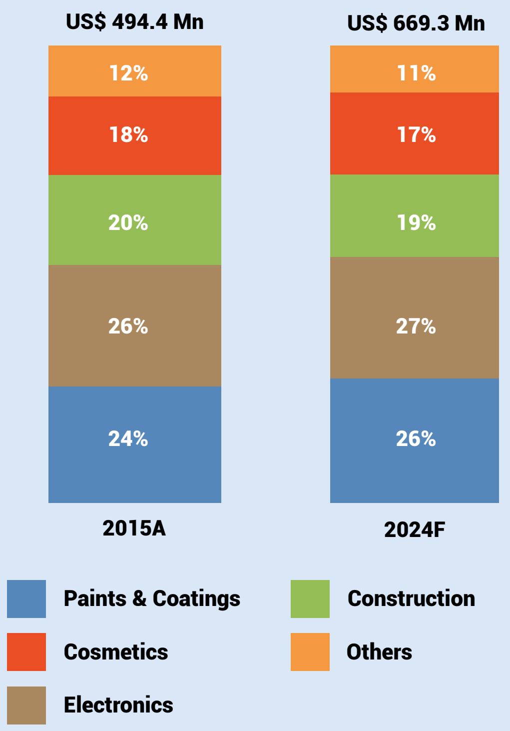
4.1. END-USERS IN THE GLOBAL MICA MARKET

The TMR report divides the end-users in the global mica market into four main sectors, and has a category for unspecified other sectors. The sectors are: paints and coatings, electronics, construction and cosmetics. This division is arbitrary, in SOMO's opinion, since the automotive sector could arguably stand alone as a sector. However, the automotive sector is also complicated; it covers all end-uses as mica can be found in various components of cars including paints and coatings, electrical and electronics applications, and filler and insulation applications.

Although TMR does not provide a definition of the electronics sector in their report, it is clear that they consider the electronics and electrical industries as one sector, which they generally refer to as the electronics industry.

In line with the TMR report, SOMO also refers to the electronics industry in a broad sense in this report. The term includes the production of electronic products, e.g. for consumers, and for different industries, as well as electrical products.. Industrial electronics includes

FIGURE 8: GLOBAL MICA MARKET, VALUE SHARE BY END-USER, 2015 AND 2024



Source: TMR, 2016.

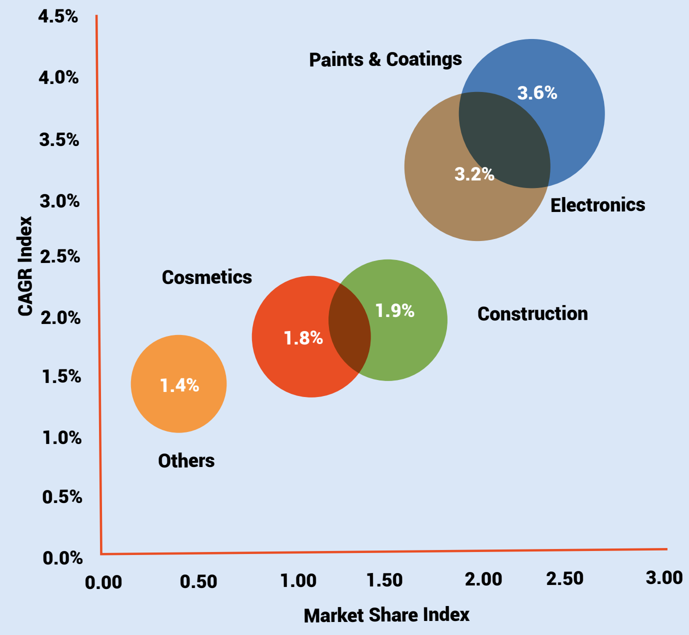


FIGURE 9: MICA MARKET ANNUAL GROWTH ANALYSIS BY END-USER

Source: TMR, 2016.

components or products for the automotive, aerospace, telecommunications, medical equipment, defence and other industries. Consumer electronics include products such as computers, televisions and household electronics.[74]

Currently, the electronics, which uses both sheet and scrap mica as this report will demonstrate, dominates the global mica market.[75] According to TMR, this industry accounted for a 26 per cent share of the mica market in terms of value in 2015, making it the main buyer of mica worldwide. It is closely followed by the paints and coatings industry. According to TMR, it is expected that the electronics sector will continue to dominate the market with at least a 27 per cent market share of mica in 2024.[76]

The paints and coatings sector is the second largest buyer of mica worldwide, accounting for a market share of 24 per cent. The main grade for this industry is mica flakes, followed by mica powder. This sector is expected to grow to reach a 26 per cent market share of the global mica market in 2024.

The construction sector, which uses mainly ground mica, is the world's third largest buyer of mica, according to TMR. It has a 20 per cent market share, which is expected to remain almost the same in 2024 with a 19 per cent market share.

The cosmetics sector uses ground mica (mica flakes and powder), and is the fourth largest buyer of mica according to TMR. This sector accounted for 18 per cent

74 The coordinated feedback of the RMI on this chapter includes the observation that RMI member inquiries increasingly indicate that mica is far more relevant to large form factor electronics (such as industrial equipment and white goods), and far less relevant for smaller, miniaturised consumer electronics. (Feedback RMI by email, 9 February 2018).
75 TMR, 2016.
76 Please note that the 27% market share represents the value of the mica and not the volume.

of the market share in 2015, and is expected to remain around the same, at 17 percent, in 2024.

Demand for mica is expected to continue to grow in the coming years. In particular, the demand for paints and coatings, as well as by the electronics industry, will drive the market. The demand for mica from the paints and coatings industry is expected to have the highest annual growth during the forecast period: a CAGR of 3.6 per cent between 2016 and 2024. Mica demand from the electronics industry has the second highest growth rate per year: a CAGR of 3.2 per cent between 2016 and 2024 (see Figure 9).

4.1.1. ELECTRONICS INDUSTRY

Mica is essential for the electronics industry due to its physical, chemical and electrical qualities, as well as its perfect cleavage, flexibility, elasticity, infusibility, low thermal and electrical conductivity, and high dielectric strength. Particularly for the purpose of electrical insulation, mica exceeds all comparable materials due to its extremely high temperature resistance and low coefficient of thermal expansion.[77] It has been said that "mica is nature's most perfect insulation."[78 79]

Mica is found in many everyday electrical and electronic consumer items including toasters, hairdryers, LED lights and other lighting equipment, acoustic guitars and smoke detectors. It can also be found in more complicated applications, such as automotive sensors and lithium-ion batteries, as well as in highly precise defence, aerospace, radio and medical applications (also see Chapter 5).

Sheet mica is used in electrical condensers and capacitors, as insulation sheets between commutator segments, or in heating elements.[80] Sheets of mica of specific thicknesses are also used in optical instruments,[81] and ground mica is used as a filler, absorbent, and lubricant, as well as in various processed forms for its insulating properties. The electronics sector also uses mica that is ground and combined with other binding products including silicone or resin. This is used to make mica tape, mica paper (sometimes called mica sheets, not to be confused with sheet mica), mica tubes, and other flexible mica products used for insulation.[82] Muscovite mica is most frequently used for constructing mica capacitors.[83]

4.1.2. PAINTS AND COATINGS INDUSTRY

Paints and coatings is the leading sector for pearlescent pigments containing mica.[84] Mica flakes are the preferred grade of mica for pearlescent pigments.[85] The consumption of dry ground mica in paint is its second largest use.[86]

Mica is also used as a pigment extender in the paints and coatings industry. Mica extends the shelf life of pigments, and also brightens their intensity. Mica added to paint reinforces the film, improves the flexibility, and lowers the internal stress caused by various factors. It is employed in all kinds of paints including anti-corrosive paints, fire-resistant paints, and marine paints.[87]

77 Polymers, 2016, Mica/Epoxy-Composites in the Electrical Industry: Applications, Composites for Insulation, and Investigations on Failure Mechanisms for Prospective Optimizations, www.mdpi.com/2073-4360/8/5/201/pdf : Rotter, H.-W. Glimmer & Glimmererzeugnisse: Eigenschaften, Entwicklungen, Anwendungen; Siemens Aktiengesellschaft: Berlin, Germany, 1985; ISBN: 3-8009-1451-4.
78 "What is mica?" Spruce Pine Mica, http://www.sprucepinemica.com/frequently-asked-questions.html (11 December 2017)
79 The RMI stresses the point that alternative materials are often used instead of mica in electronics. (Also see page 32 for a list of mica alternatives.) According to the RMI, mica is not essential in the sense that it can be replaced by other materials. They also point out that their preliminary research indicates that mica is not critical for modern (small) consumer electronics, but is rather more commonplace in larger-sized older electronics. (Feedback RMI by email, dated 9 February 2018). The information SOMO found through desk research regarding the possibilities for using mica substitutes within the electronics sector is conflicting; some sources indicate that there are plenty of examples of substitution, while other sources claimed that mica is not easily replaced, particularly in the electronics sector (also see page 33, footnotes 45 and 46).
80 Britannica, "Mica Mineral," https://www.britannica.com/science/mica (12 December 2017)
81 Britannica, "Mica Mineral," https://www.britannica.com/science/mica (12 December 2017)
82 BCI Insulation, "Mica Products", http://www.bci-insulation.com/BCI-Insulation-Mica (10 January 2018)
83 http://www.futureelectronics.com/en/capacitors/mica-capacitor.aspx (June, 2017)
84 TMR, 2016.
85 Based on expert interviews, May 2017.
86 Micamafco, http://www.micaworld.in/micapowderandflakes.html
87 TMR, 2016.

4.1.3. COSMETICS AND PERSONAL CARE INDUSTRY

The cosmetics and personal care industry uses pearlescent pigments based on muscovite mica flakes to make beauty products look and feel more luxurious. Mica's reflective and refractive properties make it an important ingredient in blush, eye shadow, body and hair glitter, nail polish, and facial foundation.[88] The crystalline elements give products ranging from bubble bath to lipstick a sparkly appearance. To a lesser extent, mica powder is used as filler in cosmetics and personal care applications including shampoo, conditioners and toothpaste, and it also brings a sparkle to these products.

4.1.4. CONSTRUCTION INDUSTRY

Mica is used as a joint filler in the construction of gypsum plaster boards and more widely in the construction industry for wall boards, cladding, joint compounds and plasters.[89] It also acts as a reinforcing agent for cement joints, and prevents cracking. Ground mica and mica powder are also used to protect wall surfaces from absorbing moisture.[90]

4.1.5. OTHER INDUSTRIES

Oil well drilling (onshore and offshore): Mica is often used in oil well drilling fluids. Mica flakes are preferably used in water-based and oil-based drilling operations as an additive mud chemical to prevent the loss of circulation and seepage. Mica is added in order to seal off the lost circulation zones. The platy structure of mica flakes facilitates the overlapping of particles to form a layer or wall, and acts as a sealant to bridge the openings.[91]

Plastics and printing ink manufacturers: As is the case for paints, coatings and cosmetics, pearlescent pigments are also often used for plastics and printing ink. The plastics industry also uses dry ground mica as an extender and filler, especially for lightweight insulation in automobile parts to suppress sound and vibration. Mica is used as a reinforcing material in plastic automobile fascia and fenders, providing improved mechanical properties and increased strength, stiffness, and dimensional stability. Mica-reinforced plastics also have high heat dimensional stability, reduced warpage, and the best surface properties of any filled plastic composite.[92]

Rubber industry: The rubber industry uses ground mica as inert filler and as a mold release compound in the manufacture of molded rubber products, such as tyres and roofing. The platy texture acts as an anti-blocking, anti-sticking agent.[93] The mica helps to release the newly-made tyres out of their casing molding (like a cake gets released from its cake pan when using flour)

The automotive sector: In addition to coatings for cars, there are several mica applications in the automotive sector including some rubber tyres, bitumen foils, brake pads, clutches, and so forth.[94] Muscovite powder is widely used as filler in non-asbestos acoustic products for the treatment of automobile underbodies and noise protection systems due to its functional morphological and surface characteristics.[95] In addition to coatings, paints, and fillers, cars also have many different electrical, electronic and mechanical systems that contain mica, including capacitors, commutators and insulators (also see Chapter 5).

88 Micamafco, http://www.micaworld.in/micapowderandflakes.html
89 MicaFort, "MicaFort Applications," https://www.lkabminerals.com/en/products/building-construction/micafort-in-building-and-construction/ (22 January 2018).
90 TMR, 2016.
91 Micamafco, http://www.micamafco.com/drynet55bc.html?nm=dry
92 Micamafco, http://www.micaworld.in/micapowderandflakes.html
93 Micamafco, http://www.micaworld.in/micapowderandflakes.html
94 TMR, 2016.
95 Micamafco, http://www.micaworld.in/micapowderandflakes.html

5. MICA USED BY THE ELECTRONICS INDUSTRY

5.1. INTRODUCTION

Data shows that the electronics industry dominates the global mica market; it is the main buyer of mica worldwide. The demand for natural mica by the electronics sector is expected to grow by 3.2 per cent each year (see Chapter 4).

At the same time there is very little knowledge about how this industry uses mica, where mica can be found in electronics products, and the origin of the mica used. This chapter therefore focuses on the use of mica in electrical and electronics applications (together termed the electronics industry) while the following chapter will focus on the automotive sector.

Scientific and commercial literature shows that the properties of mica make it essential for the electronics industry (also see Chapter 4). However, in discussions with electronics industry players over the course of SOMO's previous mica investigation in 2016,[96] some electronics companies claimed to be only minor mica users. For example, a consumer electronics company stated that almost all of the mica found in its products ends up in hairdryers and toasters.[97] This shows that awareness about the broad and extensive use of mica in electronics and electrical devices was (and still is) very low, even among industry and supply chain experts.

SOMO argues that TMR's assessment of the electronics industry as the biggest global mica buyer, with an estimated market share of 26 per cent in 2016, is still underestimated. TMR estimates that in 2016, 35 per cent of the value of the global mica market came from sheet mica, while 12 per cent was from built-up mica (see Figure 7). TMR considers built-up mica as a separate category; SOMO however argues that since built-up mica is made from sheet mica, this data should be interpreted to mean that the overall value of the sheet mica market is 47 per cent of the total mica market. This signifies that the remaining 53 per cent of the total value of the mica market comes from ground mica.
Since TMR underestimates the value of the sheet mica market (which is, as explained above, a combination of sheet mica and built-up mica), it may have also underestimated the electronics sector's demand for sheet mica. TMR reports that sheet mica is not used by the paints and coatings, cosmetics or construction sectors, but by the electronics category as well as possibly the 'other' category. This implies that if the electronics sector is the main buyer of sheet mica, their market share is closer to 47 per cent. There is one factor that can weaken TMR's assumption that basically all sheet mica is used by the electronics sector, and that is the identification of another sector that uses large amounts of sheet mica.
Furthermore, TMR does not appear to include ground mica as a grade used by the electronics or electrical sectors. This report will demonstrate that ground mica is also a significant ingredient, particularly for electrical and electronic insulation. Since the electrical and electronics industries also use ground mica, TMR's assumptions relating to the electronic industry's overall demand for mica is also possibly underestimated.

5.1.1. INFORMATION PROVIDED BY INDUSTRY SOURCES

Regarding the use of mica specifically by the electronics industry, SOMO contacted 17 electronics companies individually.[98] The companies were asked questions about where and how much mica is found in their products, as well as about the status of their risk-based human rights due diligence processes. SOMO also contacted the Responsible Mineral Initiative (RMI), established by the Responsible Business Alliance (formerly EICC, the Electronic Industry Citizenship Coalition), which partners with the Automotive Industry Action Group (AIAG) with a series of related questions.

The data shared by the RMI represents the aggregated and anonymised results of research conducted by its members on the applications of mica in electronics and automotive products. As the data represent aggregated survey results for individual companies and products, it must be interpreted as examples of mica use. Thus it cannot be assumed that mica is present in every component listed for any product. The RMI also emphasises that the shared data does not present a complete, comprehensive picture of mica applications, but rather that it is the result of initial investigations.[99]

The RMI shared that it understands that mica is commonly used in electrical devices and is only applied in very minor quantities in electronic devices, and asked for a definition of the categories of electronics. This chapter therefore tries to clarify some differences between electrical devices and electronics, and will demonstrate that there is much overlap and interdependence. As a result, since electrical and electronic devices and processes are interlinked, there is no reason for NGOs such as Terre des Hommes to solely limit their engagement efforts to manufacturers of electrical products. SOMO refers to the electronics industry in a broad sense in this report: the term includes the production of electronic products for consumers and for different industries, as well as electrical products. It should be kept in mind that electronics systems also exist far beyond what is considered the 'electronics industry'; electronic components are also widely used in a range of other industries, including for example the automotive, aerospace, defence and medical sectors.[100]

5.2. THE DIFFERENCE BETWEEN ELECTRICAL AND ELECTRONIC DEVICES

'Electrical' and 'electronic' devices are terms and concepts that warrant clarification given that they are related. However, there are key differences. Both electrical and electronic processes involve moving electricity around a circuit to power systems, products and machines. However the main difference between electrical and electronic circuits is that electrical circuits have no decision-making, or processing, capability, whilst electronic circuits do.[101]

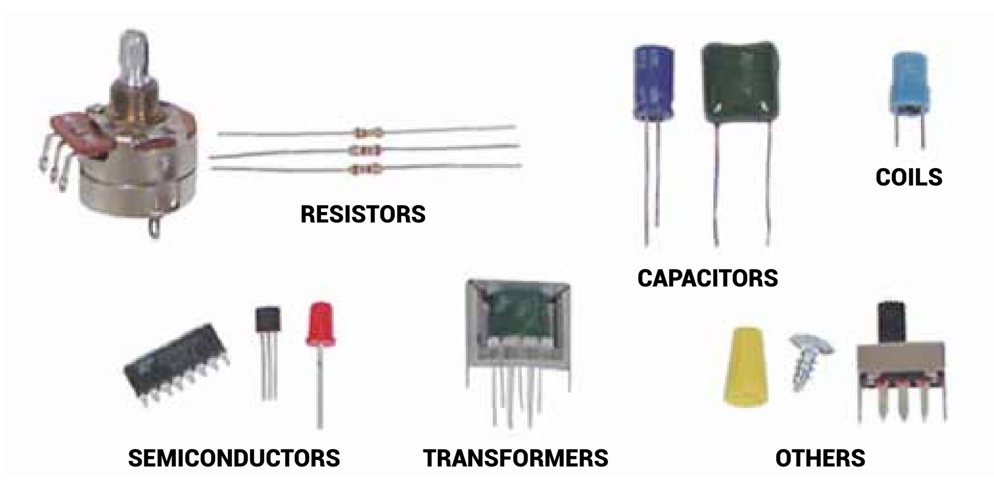
Electronic devices not only convert electrical energy into light, heat or motion, but they also help transfer information. It is typical for an electronic device to have a printed circuit board, or PCB, which is its 'brain'. This means that all electronic appliances contain a PCB of some type: computers, printers, televisions, stereos, musical instrument amplifiers and synthesisers, digital clocks, microwave ovens and mobile phones, to name just a few.

An example of a printed circuit board, or PCB, present in all electronics.

PCBs are thin boards made from an insulating material with a metal coated surface. Etches are made in the metal with acid in order to create pathways for electricity to travel among the various electronic components, which are surface-mounted on the board with solder.[102] Examples of such components include transistors, vacuum tubes (which are the active electronic components), resistors, capacitors, inductors, transformers and diodes (i.e. passive electronic components). See below for some examples of electronic components mounted on PCBs.

96 For the report "Beauty and a Beast: Child labour in India for sparkling cars and cosmetics," March 2016.
97 SOMO/Terre des Hommes, "Beauty and a Beast", May 2016, page 53.
98 Brand companies as well as electronics manufacturing services companies (EMS).

99 Communications with the RMI, 17 December 2017.
100 The RMI states that referring to the 'electronics industry' overemphasises the use of mica by this industry and does not provide a clear understanding of the use of mica in other industries with electronics components products. (Feedback RMI by email, 9 February 2018).
101 Bright Knowledge website, "Electrical and electronic engineering: What's the difference?" https://www.brightknowledge.org/engineering/electrical-and-electronic-engineering-what-s-the-difference (9 January 2018)
102 Sciencing, "What Are Printed Circuit Boards Used for?", By Dan Keen, April 24, 2017 https://sciencing.com/printed-circuit-boards-used-5031475.html.



Examples of electronic components mounted on PCBs.[103]

It is important to realise that the distinction between electrical and electronic devices is blurry. Most modern appliances use a combination of electronic and electrical circuitry, linked through transistors, or electronic switches. This means that a small circuit, for example a PCB with components including transistors, capacitors and resistors, can be used to operate larger electrical equipment. [104]

Moreover, traditional electrical devices are increasingly equipped with electronics to make them 'smart'. An example is the lighting industry; due to the trend towards smart lighting, today almost all lighting products contain electronics. Also, the development of the so-called 'Internet of Things' means that traditional electrical home appliances are being embedded with electronics, software, sensors, actuators and network connectivity. This enables these objects to connect and exchange data. SOMO argues that electrical product manufacturers and electronics manufacturers can no longer be distinguished from each other, and must therefore be considered as belonging to the same industry.

5.3. WHERE IS MICA FOUND IN ELECTRONICS?

5.3.1. MICA ON PRINTED CIRCUIT BOARDS

Capacitors, resistors and insulators are mounted on printed circuit boards (PCBs), and any of these components can contain mica. There are many examples of mica capacitors[105] mounted on printed circuit boards for sale.[106] The RMI member survey stressed that mica is not consistently used in all versions of a component. While mica may be used in some capacitors, many capacitors used in electronics are plastic or ceramic and may not contain mica.[107]

Some of the companies surveyed by SOMO also confirmed that mica is found in their PCB components: "Based on our research to date, we believe that mica may be present in a handful of printed circuit board components (we have found 13 parts that contain mica 0.03 grams or less)."[108]

103 Electronics and you, http://www.electronicsandyou.com/blog/wp-content/uploads/2013/06/Electronic-Components.jpg
104 Bright Knowledge website, "Electrical and electronic engineering: What's the difference?" https://www.brightknowledge.org/engineering/electrical-and-electronic-engineering-what-s-the-difference (9 January 2018).
105 Thomasnet, "Testing PCB Components" https://www.thomasnet.com/articles/automation-electronics/testing-pcb-components/ (10 January 2018).
106 West Florida Components, https://www.westfloridacomponents.com/blog/mica-capacitors-use/ (10 December 2017).
107 RMI communications 17 December 2017.

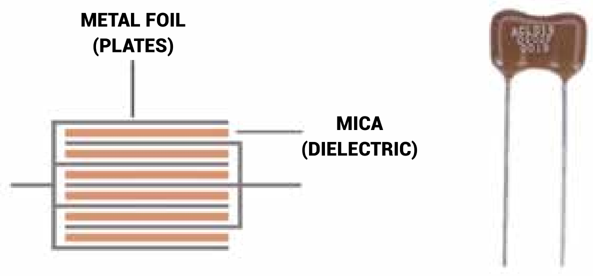
Another company found 797 parts containing mica, and the majority of these parts are capacitors, resistors and insulators. Approximately 80 per cent of the parts that this company identified as containing mica are resistors. Although the company could not comment on the volumes of the materials, they ascertained that capacitors and resistors appear on virtually every printed circuit board, and that every electronic device contains a printed circuit board. This company has realised that it has manufactured countless products containing one of more of these components, and that the products might be industrial, commercial or consumer devices (e.g. network equipment or gaming devices).[109]

5.3.2. MICA CAPACITORS

Capacitors (also called 'condensers') are one of the most basic electronic components. They have many uses in both electronic and electrical systems. They are so ubiquitous that finding an electronic or electrical product that does not include at least one capacitor for some purpose is rare.[110]

The most fundamental electrical characteristic of a capacitor is its capacitance, or the ability to store electrical energy. Capacitors come in all shapes and sizes, but they normally have the same basic component, which includes two conductors (or plates) and an insulator between the plates. This insulator is a non-conducting substance, called a dielectric. A dielectric is any material that has the ability to store electrical energy. The amount of energy that can be stored depends on the area, the dielectric constant, and the thickness of the dielectric. Capacitance is a unit of measure that describes the electrical storage capacity of a capacitor.[111] Dielectric strength is the maximum electric field that a dielectric can withstand without becoming a conductor.[112] Some consider mica as probably to be the best dielectric material for this purpose.[113] [114]

Mica capacitors are said to be the most stable, reliable and high precision capacitors. They are also more expensive, and used for applications where high accuracy and low capacitance change over time is desired. Muscovite mica is most frequently used for constructing mica capacitors. Mica capacitors are said to be ideal for applications such as high frequency and radio frequency applications, coupling circuits, resonance circuits, radars and lasers.[115] They are also used for military aerospace electronics, in for example jet aircraft and missiles,[116] as well as for on board communication, aircraft power supplies and two-way mobile radios.

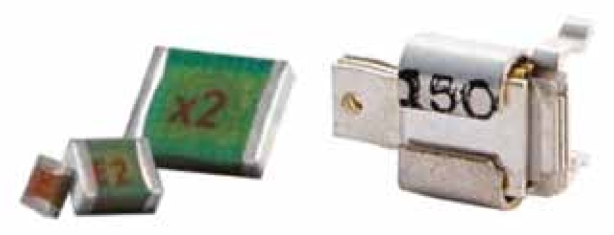


Mica capacitor.
Source: Technology UK. 117

Mica capacitors can also be used in power conversion circuits for low-capacitance snubber applications. These capacitors are found in radio/TV transmitters, cable TV amplifiers, avionics, and high-voltage inverter circuits.[118]

Mica RF (radio frequency) capacitors, like the square green ones below, are also used for signalling in magnetic resonance imaging (MRI) machines.[119] The other mica capacitor is used for MRI coils and other medical equipment.[120]

108 Industry expert communications on 15 December 2017.
109 Industry expert communications on 16 November 2017 and 6 December 2017.
110 A.Hambly, Facts101: Electrical Engineering, Principles and Applications, Cram101 Publishing, https://books.google.nl/books?id=Jykz4qAYgM-8C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false (14 December 2017).
111 Knowls Capacitors, "Capacitors for RF Applications" (14 December 2017).
112 S.Birdy, Capacitors, https://www.slideshare.net/stambirdy/capacitor?next_slideshow=1 (14 December 2017).
113 Iver P. Cooper, Grantville Gazette, Volume 9 , https://grantvillegazette.com/wp/article/the_sound_of_mica
114 The RMI adds that this is debatable and is rather a design decision based on tradeoffs of form factor and density for inferred performance/strength. Feedback RMI by email, 9 February 19, 2018.
115 Physics and radio electronics, electronics devices and circuits, passive components, mica capacitor, http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/capacitors/micacapacitor.html, (June 2017).
116 Future Electronics, Mica capacitors, http://www.futureelectronics.com/en/capacitors/mica-capacitor.aspx (June, 2017).
117 Technology UK, "Capacitors" https://www.technologyuk.net/physics/electrical-principles/the-capacitor.shtml (14 December 2017).
118 Richardson RFPD, http://www.richardsonrfpd.com/Pages/Product-End-Category.aspx?productCategory=10116 (December 2017).
119 CDE Multilayer RF Capacitors, http://www.cde.com/resources/catalogs/MC.pdf (15 December 2017).
120 CDE MCM and MIN PTFE and Mica Capacitors https://eu.mouser.com/new/cde/CDE-MCM-MIN-caps/ (15 December 2017).



Source: Mouser Electronics.

5.3.3. MICA IN SENSORS

Capacitive sensor technology also uses mica as a dielectric material, meaning that sensors of various kinds could also contain mica. Sensors are used to monitor motors, generators, switchgears and transformers,[121] and are found in cars, routers and wireless networks, and acoustic systems.

The accordion-like mica capacitors below[122] are sensors used to test motors and generators. The smooth cylindrical capacitors are used for high-current and high-voltage circuits designed for radio frequencies ranging from 100kHz to 3 MHz.[123] The third sensor, which is map-like and mica-insulated, is used to measure thermal conductivity.[124]

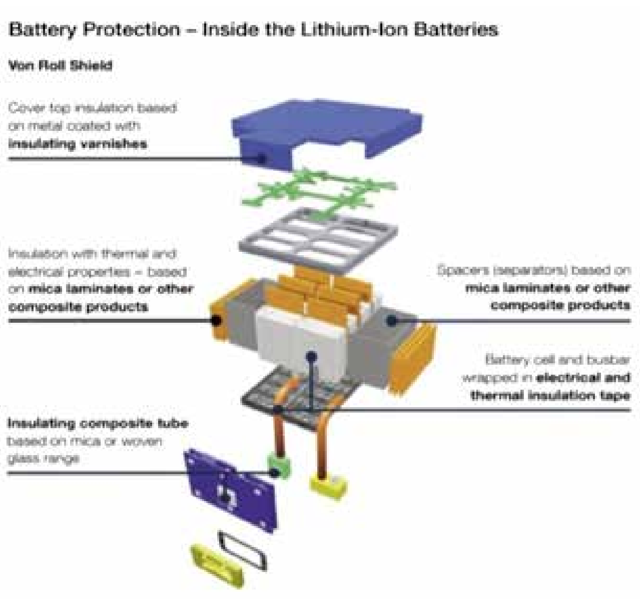
5.3.4. MICA AS PART OF SEMICONDUCTOR SYSTEMS

Mica can also be found as part of semiconductor systems.[125] Sheet mica in the form of a washer or disk is one of the main materials used to mount and isolate semiconductors.[126] "In many situations, the case of the semiconductor must be electrically isolated from its mounting surface […] and mica has been widely used in the past because if offers high breakdown voltage and fairly low thermal resistance at low cost."[127]

In addition, a new scientific breakthrough reported by the American Institute of Physics demonstrates that mica's chemical properties allow it to be used as an agent to build semiconductor films.[128] If this technique is commercialised in the future, it could have an impact on the demand for mica.

5.3.5. MICA IN LITHIUM-ION BATTERIES

High-voltage and lithium batteries can also use mica to provide electrical isolation and insulation.[129] A lithium-ion battery (LIB) is a rechargeable battery and can be used in various applications.



Source: VonRoll.[130]

121 Iris Power, "Epoxy Mica Capacitors (EMS Sensors) Partial Discharge Monitoring," https://irispower.com/products/epoxy-mica-capacitors-emc/ (12 December 2017).
122 Iris Power Epoxy Mica Capacitors, https://irispower.com/wp-content/uploads/2016/11/Iris-Power-EMC-Brochure-1.pdf (14 December 2017)
123 CDE, Cylindrical Types, High-Voltage Mica Capacitors, http://www.cde.com/resources/catalogs/HVOLT-CYL.pdf (10 December 2017).
124 Hot Disk, Mica Sensors, https://www.hotdiskinstruments.com/products-services/sensors/mica-sensors/ (15 December 2017).
125 Micamafco, "Mica insulators for power transistors, diodes, rectifiers IC's and other semiconductors", http://www.micamafco.com/micainsulators11c0b.html?nm=micainsulators (10 January 2018).
126 Altronic, "Mica Washers", http://alutronic.com/products/insulation-and-heat-conduction/mica-washers (10 January 2018).
127 B.Roehr, "Mounting Considerations For Power Semiconductors," On Semiconductor, May 2001, https://www.onsemi.com/pub/Collateral/AN1040-D.PDF (10 January 2018).
128 A.Littlejohn, Y.Xiang, E.Rauch, T-M.Lu, G-C.Wang, "Van der Waals epitaxy of Ge films on mica", Journal of Applied Physics 122, http://aip.scitation.org/doi/pdf/10.1063/1.5000502 (10 January 2018).
129 Vonroll,"Energy Storage Solutions Battery Protection," http://www.vonroll.com/userfiles/downloads/1435128730441199/Energy_Storage_Solutions_BatteryProtection_Flyer_web.pdf (12 December, 2017).
130 Von Roll, "Energy Storage Solutions: Battery Protection," http://www.vonroll.com/userfiles/downloads/1435128730441199/Energy_Storage_Solutions_BatteryProtection_Flyer_web.pd (12 December 2017).

APPLICATION	DESCRIPTION
Printed Circuit Boards (PCB / Linear / SMPS)	Several of the electronic components on a PCB, including capacitors, connectors, resistors and insulators, can contain mica.
Sensors	E.g. sensors found in routers and wireless networks, and sensors for proximity sensing and position sensing.
Semiconductor systems	Sheet mica in the form of a washer or disk is one of the main materials used to mount and isolate semiconductors.
Lithium-ion batteries / rechargeable batteries	Mica laminates are used as spacers and for thermal and electrical insulation. Mica is also used for the insulating composite tube.
Plastics for electronics	For computer cases and screen frames (also called housing), and also in small plastic components.
Sound systems	E.g. speakers, amplifiers, woofers.
Displays	Mica is used as a filler for LCDs.[131]
Lighting systems	E.g. lamps, LED. Mica discs and mica tape are used for insulation.
Paint	E.g. pearlescent paint, with mica flakes as the basis.
AC/DC motors	AC motors are powered by alternating current, while DC motors are powered by direct current such as batteries.
Adaptors	Adaptors and chargers to recharge batteries.
Card sockets	To insert memory cards.
DRAM	Dynamic random-access memory; this is a semiconductor memory to be mounted on a PCB.
Encoder	A circuit that changes a set of signals into a code; a small electronic component on PCBs.
Hinges	Hinges for panels and electronic enclosures.
Ignitions	A switch to bring about ignition.
Keypads	A set of buttons arranged in a block or 'pad', bearing digits, symbols or alphabetical letters.
Power modules	The physical containment for several power components.
Remote controller	An electronic device used to operate another device wirelessly from a distance.
SSDs	Solid-state drive, a storage device for persistent data on solid-state flash memory. Alternative for a hard disk drive.
Thermostats/thermistors	To read and report temperature changes.
Trays/drains	Concerns uses for ground mica in a plastic form.
Tuners	A device for tuning, especially an electronic circuit or a device used to select signals at a specific frequency for amplification and conversion to video, sound, or both.
Valve.	A device that controls electric current between electrodes in an evacuated container.
VFDs	Vacuum fluorescent display, a display device commonly used on consumer electronics equipment such as video cassette recorders, car radios and microwave ovens.[132]
Wires/cables/harnesses	Mica is used as an insulator in wires and cables, and harnesses.

Table 1: Applications of mica in electronics components *Source: Compiled by SOMO.*

131 A liquid-crystal display (LCD) is a flat-panel display as on digital watches, portable computers, mobile phones and calculators. http://www.dictionary.com/browse/lcd .
132 Or, a variable frequency drive (VFD), a type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply. It is not clear what is meant.

5.3.6. MICA IN PLASTICS FOR ELECTRONICS

Mica-filled polypropylenes (PP)[133] also go by the catch phrase of 'phantom plastics'. These are new kinds of plastics that have been mixed with functional fillers like mica. This gives them a much wider range of properties not normally associated with plastics, such as high electrical conductivity and thermal conductivity. Mica is one of the most common mineral fillers for polypropylene.[134]

One electronics company confirmed that they found a plastic part in one type of component or accessory containing two grams of mica.[135] Plastics for computer cases and frames (housing) can also contain mica.[136]

5.3.7. OVERVIEW OF MICA IN ELECTRONICS COMPONENTS

The RMI member survey identified seven core functionalities of mica across automotive and electronics products including:

- Appearance
- Coating
- Filler
- Insulation
- Friction
- Electrical
- Functional

Based on desk research, interviews, contacts with companies and the RMI member survey, SOMO compiled the following overview of mica applications in electronics.

5.4 WHERE IS MICA FOUND IN ELECTRICAL APPLICATIONS?

5.4.1. INSULATION

Mica, both in sheet and in processed form, is also used in many electrical applications due to its insulating properties. Mica is extremely stable when exposed to moisture and extreme temperatures, while maintaining superior electrical properties as an insulator. The mechanical properties of mica also allow it to be cut, punched, and stamped while maintaining high thermal conductivity.[137] Insulating film, paper, sheets, washers, tubes and custom-fit pads that use mica, alone or mixed with other materials including resin, can be found in countless consumer goods and household items.

The flat mica heating pad with wires pictured below[138] is an example of a custom-fitted product used in industrial mechanics. Processed mica paper is also fitted as an insulator to make products including toasters, kettles, room heaters and irons,[139] pictured below. The Swiss roll mica composite in the diagram below is combined with polymers and used for insulation for car parts including fan blades, dashboard panels, plastic seats, ignition system parts, and air conditioning heaters, among others.[140]

Sources: RSOnline, MicaWorld.

Mica that is ground and processed into paper and sheets has the added advantage of being rigid, used in heating elements for industrial and household appliances, or flexible, used in hairdryers, space heaters, circuit breakers and transformers.[141] The mica paper roll, tape and washers seen below can be cut and custom fit into components used in electrical devices. They can withstand temperatures upwards of 500 degrees Celsius.

133 Atoz Plastics, "Compounding of Polypropylene," http://atozplastics.com/upload/literature/compounding_page4.asp (18 December 2017).
134 Phantom Plastics, "Functional Fillers," http://phantomplastics.com/functional-fillers/ (18 December 2017).
135 Industry expert communications on 15 December 2017.
136 RMI communications 17 December 2017.
137 Aavid, "Mica Insulating Hardware," https://www.aavid.com/product-group/interface/insulators/mica (14 December 2017).
138 RS Mica Heater, https://uk.rs-online.com/web/p/mica-heating-pads/7904836/ (9 December 2017).
139 MicaMafco, Mica Heating Elements, http://www.micaworld.in/micaheatingelements.html (5 December 2017).
140 MicaMafco, Mica Heating Elements http://www.micaworld.in/micacomposite.html (17 December 2017).
141 CoGebi, Mica Sheets: Flexible, http://www.cogebi.com/mica-sheets (5 December 2018).

Source: Cogebi.

5.4.2. OVERVIEW OF MICA IN ELECTRICAL DEVICES

The technical magazine *Polymers* published a selection of mica applications in the electrical sector in 2016, which gives a general overview. This overview partly overlaps with the overview of applications of mica in electronics in Table 1.

APPLICATION / DEVICE	EXAMPLE OF USAGE
Electrical devices	Inductor of voltmeters, commutators, power inverters, high-voltage commutators, rotating field coils, high-voltage transformers, heat traps.
Radio receivers, TVs, radar	Solid-state systems, condensers, tubes, microwave windows, transistor shielding.
Electric light devices	Arc lamps, huge incandescent lamps, bases for lampshades, neon lamps, dimmer counters, turn signal systems.
Mixed electrical applications	Fuse cover platelets, spark plugs for high compression engines, sealing shims, insulators.
Electric household appliances	Coffee machines, cigar lighters, hair rollers, irons, immersion heaters, permanent wave devices, toasters, vibrators, space heaters, hairdryers, waffle irons.
Electrical monitoring systems	Grid resistors, pyrometers, relays, electrical and thermal controllers.
Mechanical applications	Dials, membranes for acoustic instruments, heart-lung machines, respirators, gaskets for high temperature measurement instruments, lantern windows, fireplaces, unbreakable safety goggles, quarter-wave plates for optical instruments, vision panels in ovens, synthetic optical crystals.
Industrial electrical applications	Corrugated rolls, glue pots, lead baths, devices for local warming, heating elements, soldering irons, thermostats.

Table 2: Applications of mica in electrical devices
Source: Polymers, 2016.[142]

142 Polymers, 2016, Mica/Epoxy-Composites in the Electrical Industry: Applications, Composites for Insulation, and Investigations on Failure Mechanisms for Prospective Optimizations, www.mdpi.com/2073-4360/8/5/201/pdf : Rotter, H.-W. Glimmer & Glimmererzeugnisse: Eigenschaften, Entwicklungen, Anwendungen; Siemens Aktiengesellschaft: Berlin, Germany, 1985; ISBN: 3-8009-1451-4.

6. MICA USED BY THE AUTOMOTIVE INDUSTRY

Source: Pamica.

6.1. INTRODUCTION

It is well established that the automotive industry uses scrap mica in flakes or powered form as a substance in paint. This mica makes car surfaces glitter and glow in the sun, and even change colour depending on the angle from which the car is viewed. Whilst investigating industries that use mica, evidence began to mount that cars also have parts and systems that contain both scrap and sheet mica in addition to the paint on the car's surface. This chapter, which is based on desk research and discussions with experts from the automotive industry, attempts to provide insight into the automotive industry's use of mica.

SOMO contacted 13 multinational automobile companies with questions about where mica might be found in their products. One firm in particular was very forthcoming, and provided most of the information that has been used in this chapter.

6.2. CAR CASE EXAMPLE

One global automobile company told SOMO that it could identify 15,000 different parts containing mica in any one of its cars. This spokesperson told SOMO that it was possible to determine the mica-containing parts through a database search that allows the company to identify the materials used in each of its car brands. It was not necessarily possible however to determine the volume of the material or where it originated. The car expert explained: "The mica amount differs in quantity and could be minimal in one part, while other parts have more [since] mica appears to be a versatile material."[143] The industry expert also explained that the results of the automobile materials database search did not distinguish between the grade of mica - sheet or scrap - used for the different parts.

The car company told SOMO that it could roughly group the 15,000 mica-containing parts into the following 15 clusters:

1. Paints
2. Coatings (including door handles, steering wheels and car paint)
3. Pads (both brake pads and clutch pads)
4. Silencers (acoustic sound silencing)
5. Batteries (high-voltage and lithium)
6. Sinter additives (compound additives)
7. Sealer and sealing compounds (automatic gears in the motor, cylinders)
8. Gaskets (used as sealers and/or insulators)
9. Compressors (to compress air and liquid, including oil)
10. Epoxy powder (for housing, headrests, shock absorbers)
11. Screws
12. LED lamps
13. Pumps
14. Electronic parts (commutators, used to start motors)
15. Electronic parts (radar sensors to detect light, dark, distance, proximity, temperature)

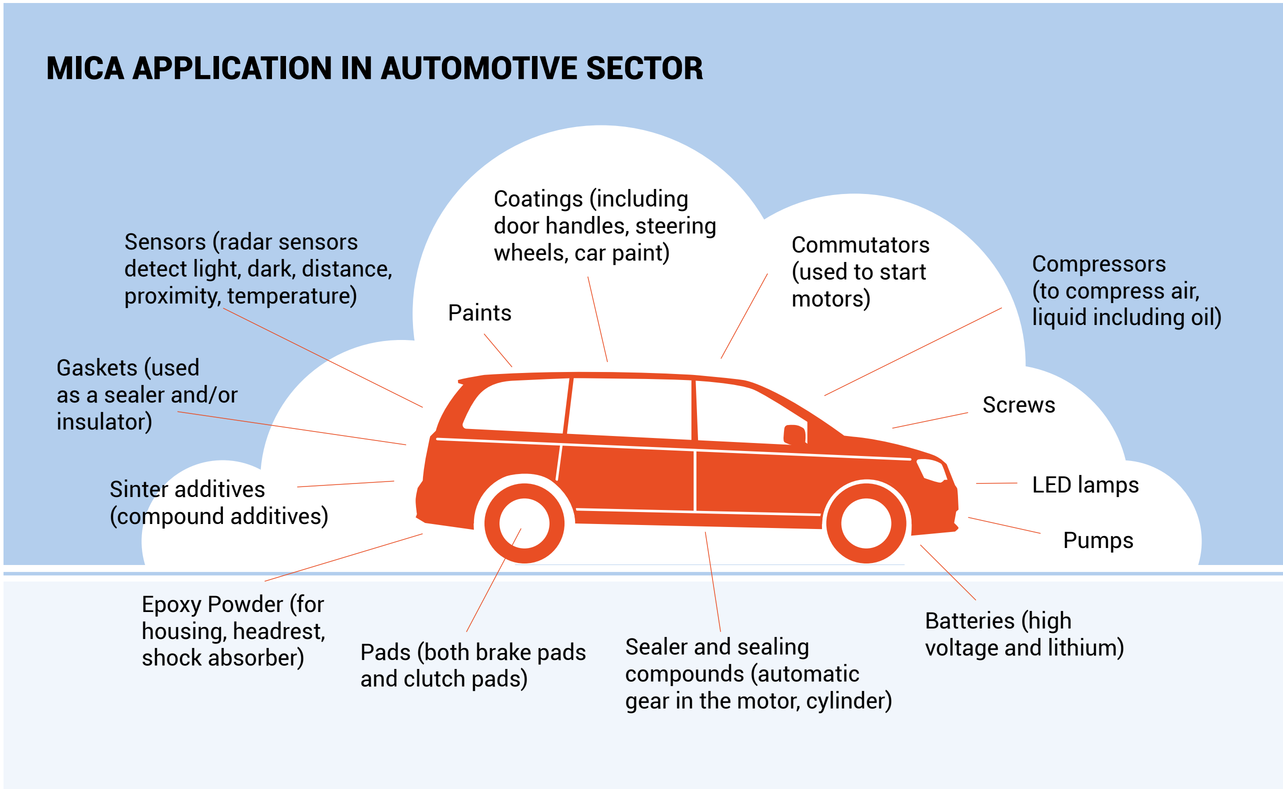
Despite the car expert's remark that the results of its materials database search did not include a differentiation between the types or grades of mica used across the 15 groups, it is clear that both grades of mica can be found in cars. This can be deduced by the breadth of the clusters: paints, coatings and fillers all use scrap mica, for example, and commutators and sensors use sheet mica.

The company that supplied this data was surprised that mica was not found in the car tyres. Upon further investigation, however, it was discovered that mica is used in the manufacturing of the firm's tyres, specifically as a lubricant to help the rubber tyre pop out of the mold after it has been formed.[144]

The use of mica in batteries, capacitors, LEDs, as insulation and for acoustics is explained in Chapter 5 on electronics and electrical systems. Below, the role of mica in a few technical, but very important, car parts are explained.

Explanation for number 14 'commutators'
Mica is also used for starting car and truck engines (see number 14 in the overview of the 15 clusters). Mica pieces are bonded with an epoxy resin to form a mica commutator sheet,[145] which can then be used as an insulator and/or a dielectric in commutators,[146] the mechanical devices that are used to start car and truck motors.[147]

Explanation for number 15 'sensors'
Two of the most common automotive applications for capacitance-based sensors that may use mica include proximity sensing and position sensing (see number 15 in the overview of the 15 clusters). A proximity sensor in a car is used to detect the presence of nearby objects through the emission of an electromagnetic or electrostatic field. The sensor is able to detect any change in the field or return signal. A position sensor in a car is



143 Industry expert communications on 12 December 2017 and 20 December 2017.

144 Company expert interview on 16 January 2018.
145 Pamica, Mica Commutator Sheet, http://www.pamica.com/mica-products/Mica-Sheet/Mica-Sheet.html (15 December 2017).
146 Toledo Commutator Company, Mica Molded Commutators, https://www.toledocommutator.com/mica-molded-commutators (15 December 2017).
147 Electrical Edition, "Cummutation in DC Machine or Commutation in DC Generating Motor, http://www.electricaledition.com/2016/01/commutator-commutation-in-dc-machine.html (15 December 2017).

used to measure a variety of positions, including fluid level, shaft angle, gear positioning, digital codes and counters, as well as touch screen coordinate systems.[148]

6.3. THE VOLUME OF MICA IN CARS

While data on percentages and volume of mica per component are not available, the RMI relayed to SOMO that its industry member survey confirmed that the total volume of mica contained in an end product for the automotive industry is less than 0.1 percent of the product volume. [149]

This report shows that mica found in cars is used in components and parts that cross many different automotive systems and processes. Uses for mica may be electrical, electronic and mechanical, and it may also function as a lubricant or filler.[150] It is important to note however that mica used as a filler or lubricant in certain car parts might also be chosen for its chemical and physical properties: including its ability to withstand high temperatures, its elasticity and insolubility, and its ability to prevent water from penetrating the car.

This report concludes that given the number of car parts that can contain mica (15,000), the total use of mica in one end product for the automotive industry – a car – is substantial, despite the fact that it represents less than 0.1 per cent of the total volume of the car. 2016 was a record-breaking year for global car sales, with a reported 88 million new cars sold worldwide.[151] As each car uses a substantial amount of mica, total use by the automotive sector is huge.

Although TMR does not include the automotive industry in its mica market analysis, SOMO has concluded that the global demand for mica cannot be understood or quantified without insight and evidence into the many ways the automotive industry uses mica.

It is important to note that the electric car, and the charging station infrastructure necessary to support this nascent industry, has not been included in this report nor in the analysis. However it is important to at least point out that there is the potential that the demand for mica from the growing electric automotive industry could also play a role in the global mica market, if it isn't already.

148 E.Terzic, J. Terzic, R.Nagarajah, M.Alamgir, "Capacitive Sensing Technology," Springer, 21 April 2012, https://link.springer.com/chapter/10.1007/978-1-4471-4060-3_2 (12 December 2017).
149 RIM communications December 2017.
150 Interview with automotive expert on 16 January, 2018.
151 Scutt, "2016 was a record-breaking year for global car sales, and it was almost entirely driven by China," Business Insider, 19 January 2017, http://www.businessinsider.com/2016-was-a-record-breaking-year-for-global-car-sales-and-it-was-almost-entirely-driven-by-china-2017-1?international=true&r=US&IR=T (22 January 2018)

7. DUE DILIGENCE BY THE ELECTRONICS AND AUTOMOTIVE INDUSTRIES

Corporations have a responsibility to prevent the occurrence of child labour in their supply chains. In order to determine the exact nature of this responsibility, it is important to review the treaties and leading international standards that enshrine children's rights. To this end, section 7.1 will outline the relevant non-binding regulations.

The aim of section 7.2 is to describe the current state of affairs around the due diligence efforts of some electronics and automotive companies regarding mica. This chapter does not intend to benchmark or rank companies in their due diligence processes, given that many of them had not even heard of mica until relatively recently and their internal surveys are therefore in the early stages.
Very few companies responded to SOMO's questions concerning their mica due diligence processes, and those that did are probably more advanced than their industry peers. Five electronics companies and two automobile companies were forthcoming and candid with SOMO, and the findings are summarised below. Furthermore, we include the efforts of the Responsible Minerals Initiative, as their mission is to assist their members in the exercise of due diligence over mineral supply chains.[152]

7.1 NON-BINDING REGULATIONS

Human rights standards for companies and states are set out in the UN Guiding Principles on Business and Human Rights (UNGPs) and the OECD Guidelines for Multinational Enterprises (hereinafter the OECD Guidelines). Both are self-regulatory, outline a risk management approach to human rights risks, and are applicable to all states and companies regardless of size, sector, location, ownership and structure. The OECD Guidelines and the UNGPs are not binding instruments, and they lack monitoring mechanisms to measure implementation and evaluate impact.

7.1.1. UN GUIDING PRINCIPLES ON BUSINESS AND HUMAN RIGHTS

The UNGPs provide guidance for states and businesses on how to prevent and address human rights abuses, including in conflict-affected areas. They lay out the corporate responsibility to respect human rights. These Guiding Principles apply to the UN Protect, Respect and Remedy Framework, which rests on three independent but mutually supporting pillars:
- The state's duty to protect against human rights abuses by third parties, including businesses, through appropriate policies, regulation, and adjudication;
- The corporate responsibility to respect human rights, which avoids infringing on the rights of others and addresses the adverse impacts with which a business is involved; and
- The need for greater access by victims to effective remedy, both judicial and nonjudicial.

Although the UNGPs do not focus on children's rights specifically, they elaborate on the responsibility of businesses to respect all human rights, including children's rights.[153]

In summary, businesses should themselves not cause any adverse human rights impacts. They should also prevent or mitigate any such impacts that are directly linked to their operations through business relationships, even when they did not directly contribute to the adverse human rights impact.[154]

152 Communications with industry experts between October 2017 and January 2018.
153 The UN "Protect, Respect and Remedy" Framework for Business and Human Rights, http://www.reports-and-materials.org/sites/default/files/reports-and-materials/Ruggie-protect-respect-remedy-framework.pdf
154 UN, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf

In order to comply with this requirement, businesses are urged to develop and implement policies that ensure respect for human rights.[155] They should also practice human rights due diligence by assessing whether their operations negatively impact human rights. Businesses are thus made responsible for human rights violations in their entire supply chain and should, for example, prevent the occurrence of child labour in all of their suppliers. However, the UNGPs are not in any way binding.

7.1.2. OECD GUIDELINES FOR MULTINATIONAL ENTERPRISES

The OECD Guidelines for Multinational Enterprises outline recommendations from governments to multinational companies operating in or from adhering countries. They provide non-binding principles and standards for responsible business conduct in a global context, which are consistent with applicable laws and internationally recognised standards.

With regard to child labour, the OECD Guidelines state that businesses should take effective measures to contribute to its abolition.[156] Practical steps are described in the OECD guide *Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains.* [157]

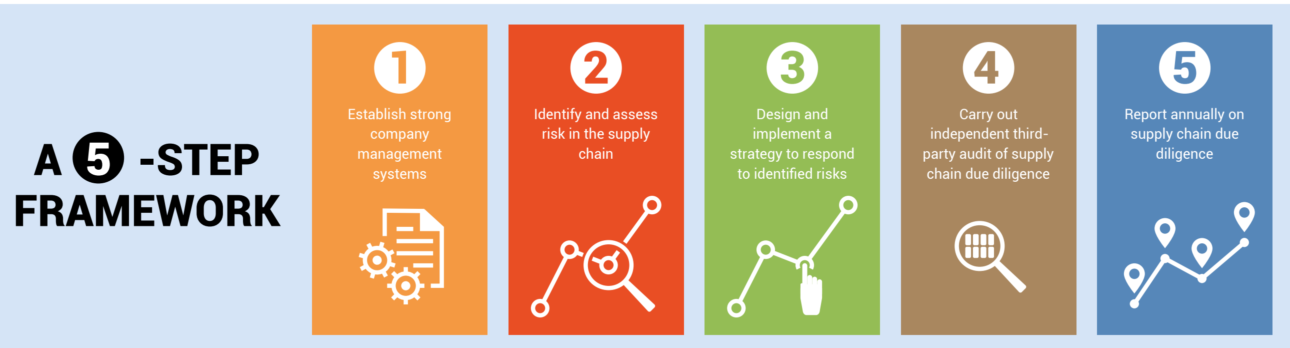
The OECD recommends a five-step framework for minerals in supply chains, which is briefly summarised in the diagram below.

- Step 1: Establish strong company management systems. Companies should adopt and clearly communicate a company policy, structure their internal management, establish a system of controls and transparency, strengthen company engagement with suppliers, and establish a grievance mechanism.
- Step 2: Identify and assess risk in the supply chain, individually or in cooperation.
- Step 3: Design and implement a strategy to respond to identified risks, engage in risk mitigation, and regularly monitor risk mitigation efforts.
- Step 4: Carry out independent third-party audits of supply chain due diligence at identified points in the supply chain.
- Step 5: Report on supply chain due diligence annually, and make the report available at your offices and on your website.

The Guidelines are the only multilaterally agreed and comprehensive code of responsible business conduct that governments have committed to promoting. The OECD is cognisant of the fact that significant exploitation of natural mineral resources is ongoing in conflict-affected and high-risk areas, and that companies sourcing from or directly operating in these areas are at a higher risk of contributing to conflict. As a result, the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas was developed in order to provide a framework for ensuring the responsible supply chain management of minerals, including tin, tantalum, tungsten and gold, as well as all other mineral resources. This Guidance makes it clear that when sourcing from or operating within conflict-affected and high-risk areas, any form of torture or cruel, inhuman or degrading treatment, and any forced or compulsory labour – including the worst forms of child labour and other gross human rights violations and abuses – should not be tolerated.

5-STEP FRAMEWORK FOR MINERALS IN SUPPLY CHAINS

Source: OECD.[158]



155 UN, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf
156 OECD, http://www.oecd.org/daf/inv/mne/48004323.pdf
157 OECD, "Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains", https://mneguidelines.oecd.org/Practical-actions-for-worst-forms-of-child-labour-mining-sector.pdf , (February, 2018).
158 OECD, "OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas", http://mneguidelines.oecd.org/Brochure_OECD-Responsible-Mineral-Supply-Chains.pdf, (25 January 2018).

The OECD Guidelines explain that upstream companies, depending on their position in the supply chain, can have significant actual or potential leverage over the actors who can most effectively and most directly mitigate the substantive risks of adverse impacts in the supply chain. The mitigation efforts of upstream companies should focus on finding ways to constructively engage with relevant stakeholders, as appropriate, with a view to progressively eliminating the adverse impacts within reasonable timeframes.

Downstream companies, on the other hand, are encouraged to build and/or exercise their leverage over upstream suppliers. Downstream companies' mitigation efforts should focus on suppliers' value orientation and capability training, to enable them to conduct and improve due diligence performance. Companies should encourage their industry membership organisations to develop and implement due diligence capability training modules in cooperation with the relevant international organisations, NGOs, stakeholders, and other experts.

During risk mitigation efforts, a company's relationship with a supplier can continue, or be temporarily suspended, or, as a last resort, involve disengagement with the supplier. Disengagement takes place after failed attempts at mitigation, when mitigation is not considered feasible, or due to the severity of the adverse impact. The company should also take into account any potential negative social and economic impacts caused by the decision to disengage (SOMO, 2016). The OECD Guidelines consider disengagement as a measure of 'last resort', stressing the importance of engagement with business partners as the preferred means for multinational companies to prevent and mitigate adverse impacts via business relationships. The term 'disengagement' does not appear in the UN Guiding Principles; they refer instead to "ending the relationship". Like the OECD Guidelines, the UN Guiding Principles outline the company's responsibility to first attempt engagement with a business partner, while using its leverage to address adverse impacts. If the company lacks leverage, it should then consider "ending the relationship". The concept of leverage is thus a crucial factor in both the UN Guiding Principles and the OECD Guidelines when it comes to both mitigation efforts and the decision to discontinue a business relationship. Both sets of standards consider leverage to exist when a company "has the ability to effect change in the wrongful practices of an entity that causes a harm".[159] While the OECD Guidelines clearly state that companies have a responsibility to consider immediate disengagement if mitigation is "not feasible", guidance is not provided on what, in practice, constitutes "feasible".[160]

7.1.3. EUROPEAN UNION CONFLICT MINERALS REGULATION (EU 2017/821)[161]

The European Union (EU) has acknowledged that in politically unstable areas, the minerals trade can be used to finance armed groups, to fuel forced labour and other human rights abuses, and to support corruption and money laundering. The EU has identified and recognised tin, tungsten, tantalum and gold (also referred to as 3TG), as conflict minerals. These conflict minerals are used in everyday products such as mobile phones, cars and jewellery. It is difficult for consumers to know if a certain product is funding violence, human rights abuses, or other crimes overseas. To this end, the EU regulation aims to:

> [...] ensure that EU importers of tin, tungsten, tantalum and gold meet the international responsible sourcing standards set by the Organisation for Economic Co-operation and Development. It also aims to ensure that global and EU smelters and refiners of tin, tungsten, tantalum, and gold source responsibly, to help break the link between conflict

159 UN, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf, page 21.
160 SOMO, "Should I stay or should I go?, Exploring the role of disengagement in human rights due diligence', https://www.somo.nl/should-i-stay-or-should-i-go-2
161 Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas

and the illegal exploitation of minerals. Lastly it aims to put an end to the exploitation and abuse of local communities, including mine workers, and to support local development.[162]

The regulation stipulates that EU importers must put in place internal systems and processes that provide the following information:

1. Importers of minerals should:
   - indicate which country the minerals come from, and
   - indicate the quantities imported and when they were mined.
2. Importers of both minerals and metals should:
   - list the minerals they are importing by trade name and type, and
   - provide the names and addresses of their suppliers.

This must be done as part of the importers internal management system, and supporting documents must be provided.

3. When minerals come from conflict-affected and high-risk areas, importers must provide extra information on:
   - the mine the minerals came from,
   - where the minerals were consolidated, traded and processed, and
   - the taxes, fees, and royalties paid.

7.2. MICA DUE DILIGENCE STATE OF AFFAIRS: THE FRONT RUNNERS

For most companies within the electronics and automotive sectors, mica only came into focus for them in 2017. Therefore, some of the risk-based due diligence steps that have been taken are very recent.

Some of the companies responding to SOMO's questions concerning their mica due diligence processes responded by sending their policies on conflict minerals or the responsible sourcing of raw materials. These did not however include any steps specifically related to mica.

So far, only a few companies have initiated a due diligence process regarding mica. The steps taken by these companies are described below.

1) Contacting (a selection of) suppliers
A first step taken by companies is to contact a selection of their suppliers: the ones that are most likely using mica in their products or components. In making this selection, some companies used the table included by SOMO in the inquiry, with examples of devices known for containing mica. These suppliers, which totalled in the hundreds, were sometimes three levels back in the supply chain. The companies asked the suppliers whether they use mica, and if the answer was positive, asked them to provide the name of the mica-containing component as well as the product code, exporter and mine.

Others companies started by gathering materials declarations from suppliers. These declarations indicate which materials are in the part or product by making use of the Chemical Abstract Service (CAS) code. The CAS code for the mica group of minerals is 12001-26-2. The declarations may state where the mica is used, but do not give exact percentages or volumes per component. They also do not state the source of the various materials, either in raw or processed form.

A different methodology was used by one of the responding car companies. This company reported that it had entered the CAS code into its internal database to identify components containing mica. The database came up with 15,000 hits for components, parts, or supplies that include mica, and these hits were subsequently grouped into 15 clusters (see section 6.2). This company said that it is in the process of trying to create more internal transparency concerning its purchases to help identify its suppliers.

A different company had yet another method for mapping its supply chain back to the mines. It reached out to its affected tier one suppliers, and asked them what they know about mica sustainability issues especially child labour and health and safety issues, the sources of their products containing mica and what due diligence steps they have undertaken. They then asked their tier one suppliers to do the same: cascade the questionnaire and sourcing questions down to their suppliers, and so on.

162 http://ec.europa.eu/trade/policy/in-focus/conflict-minerals-regulation/regulation-explained

Very few of the companies interviewed had actually asked their suppliers about the country of origin of the mica in their products. Most are not that far along in the process. Only three companies could mention a number of countries where the mica in the components they source is mined.

2) Interpretation of the results
The next step taken by the companies in this research was to interpret the results. The companies asked the following questions internally: what are they using mica for? which end products is it found in? and in what volumes? Many of the companies conveyed to SOMO that they basically do not yet know the answers. They also conveyed that they first want to answer the question about how relevant mica is in their supply (i.e. how much of their spending is on mica-containing products) before embarking on a due diligence process specifically for mica.
Most of the companies, save one car firm, downplayed the volumes or amounts of mica in any single parts or component. They even stated that given that the volumes are small, mica might turn out to not be a priority for the company, particularly since it is not categorised as a conflict mineral.

Joining collaborative initiatives for mica due diligence
Companies taking part in this research prefer to join collaborative efforts for mica due diligence, as they feel that this will have a greater impact and be more efficient than solo efforts. Some companies want to help design and implement an industry scheme to maximise their impact and avoid burdening suppliers. An example of this kind of cross-industry collaborative initiative is the Responsible Minerals Initiative (RMI), which partners with the Automotive Industry Action Group (AIAG).

Several electronics companies have joined the European Partnership for Responsible Minerals (EPRM), which is a multi-stakeholder partnership.[163] EPRM has established a working group that is exploring the organisation's scope: whether they want to include cobalt and mica in their projects, for example. At the time of the publication of this report, this decision had not yet been taken.

Steps taken by the Responsible Minerals Initiative
In August 2017, RMI members formed an exploratory workgroup focusing on mica. The workgroup was set up to do some initial sensing research on the application of mica among member industries. The RMI also facilitates engagement with stakeholders, and in line with its mission to assist its members, it coordinated a collective response to SOMO's inquiry. The RMI collected the results of the research conducted by its members on the application of mica in (consumer) electronics and automotive products, and after aggregating and anonymising the results, shared it with SOMO.
The RMI engages on a regular basis with the Responsible Mica Initiative, the multi-stakeholder partnership working to eradicate child labour and implement fair and sustainable mica collection, processing and sourcing in India.

7.3. CHALLENGES EXPERIENCED BY COMPANIES IN THE MICA DUE DILIGENCE PROCESS

Responding companies initially said that they did not know much about mica; that they do not source mica directly; and that the actual incorporation of mica into products happens several steps away. Many said that their immediate suppliers also do not source mica directly, nor do they know much, if anything, about mica. One car company said, “It has been interesting to learn where mica can be found in cars. Actually we didn't have a clue, other than in paints. We weren't aware that there would be other big applications that use mica.”

Some of the companies said that when they requested mica due diligence information from their suppliers they were told that it could take upwards of a year before they would receive any information. In general, the more complex the supply chain, the more difficult it is to get results and the longer it takes. One company explained that they use literally hundreds and sometimes thousands of suppliers, some of which are not very cooperative about disclosing information.

163 European Partnership for Responsible Minerals, https://europeanpartnership-responsibleminerals.eu/member (26 January 2018).

The majority confirmed that for the most part, they have no conclusive information about the volume of the mica they use or even how much they depend on the mineral for their products.

Companies also said that calculating the amount of mica contained in any one product can be complicated. One company explained that when the mica is already incorporated into a coating, the CAS coded material declarations show mica as one of the components of the coating, but do not break down the exact amount or weight per substance. The following is a sample declaration: "Coating, 0.02g, comprised of 2-BUTOXYETHANOL, 2-PROPANOL, AL2O3, BENZENE DIMETHYL, CHROMIUM(III)OXIDE, FUSED SILICA, MICA-GROUP MINERALS, SI". This example serves to illustrate one of the difficulties in calculating the total volume of mica in some of these products, as there is no breakdown for the various components of the coating.

An electronics company also explained that one of the challenges it faces in tracing mica through its suppliers concerns the material safety data sheet code for mica. Mica is harmful to inhale[164] in large quantities, and therefore has a material safety code. However, according to this industry source, once the mica is incorporated into a product it loses the code. This is because once the mica is encapsulated in the product, the hazards no longer exist and precautions for handling the material are no longer required.[165] This industry source said that once the code is lost, it is almost impossible to trace the mica back through the supply chain.

Although some companies questioned the veracity of their suppliers' responses, others trust suppliers that stated that they categorically do not use mica. However, when SOMO checked the datasheets of some of these same suppliers, mica was found in their components.

Based on the research, SOMO concludes that the included companies do have polices and management systems for minerals. However, these policies concern conflict minerals and/or the responsible sourcing of raw materials and do not include any steps specifically related to mica. The companies have not yet decided whether or not it is worthwhile to start a due diligence process specifically for mica. Companies, stakeholders and industry initiatives are undertaking various actions to assist in this decision-making process. Scoping working groups have been formed by the European Partnership for Responsible Minerals and the Responsible Minerals Initiative, and initial sensing research on the application of mica in the member industries has been kicked off.

SOMO concludes that the companies in this research, as well as the RMI, have a strong focus on the volumes used and the 'relative importance' of mica within consumer electronics, the part of the electronics sector where they are active. However, it is clear that all companies active in the electronics sector in the broad sense of the definition are users of natural mica, and on this basis alone they should undertake risk-based due diligence processes. This obligation does not depend upon the quantities of mica used, or the 'relative importance' of mica in their products. It rather depends upon risk levels: in the case of mica, the risks of encountering the worst forms of child labour in the supply chain are high, and the impacts of this child labour may be severe and irremediable.

The research done by companies to identify the use of mica in their supply chains fits into step two of the OECD five-step framework. However, as long as companies do not trace the origin of the mica they use, they are not truly able to assess the risks involved.

164 Safety Data Sheet Mica, http://www.igasplc.com/media/29416/MICA-All-Grades-SDS11310.pdf (10 January 2018).
165 Industry expert communications in November 2017.

8. MICA MINING RISK ANALYSIS

This chapter gives an overview of indicators, or red flags, for risks around human rights and children's rights violations related to mica mining. A broader perspective is taken here than in our first study, which investigated child labour in mica mining in two states Indian states. In this chapter, the presence, magnitude and risk of child labour and other human rights violations in the extraction of mica are examined on a global scale.

Chapter 7 outlined the responsibilities for companies regarding the prevention of human rights and children's rights violations (including child labour) in their supply chains by citing the leading international standards of the UN and the OECD.

To effectively identify and assess the risks of human rights and children's rights violations in the mining of mica, SOMO identified certain indicators specifically associated with mica mining.

More general indicators to assess the risks of child labour in mineral supply chains are described in the OECD guide *Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains*.[166] These general risk indicators include the presence of:

- high rates of poverty and unemployment;
- artisanal and small-scale mining;
- informal or illegal mining;
- prevalence of child labour in the country across industry sectors;
- a weak institutional framework;
- and conflict-affected and high-risk areas.

Furthermore, the impacts of mining can subsequently violate children's rights. These subsequent impacts should also be evaluated when assessing mining-related risks:

- The loss of lands leading to displacement and dislocation, and the loss of access to education, healthcare, adequate housing and other facilities (all of which can increase vulnerability to exploitation and abuse).
- Increased morbidity and illnesses: mining children may be affected by pollution (including water, soil and air contamination), as well as other environmental degradations and dangers. Children in mining areas are more vulnerable to hunger and food insecurity, resulting in malnutrition.
- Mining children often lack access to schools, or are forced to drop out of school due to mining-related circumstances.
- Increased migration due to mining; the mining sector often depends on migrant populations, leading to unstable work opportunities for parents, which impacts the security of life for migrant children. An increase in child labour.[167]
- Poor labour conditions for mine workers, including wages below living wage, hazardous working conditions, and lack of social security and/or health insurance. All of these conditions ultimately impact the security of life for the miners' children.

The following sections describe the risk indicators specifically associated with mica mining: sheet mica mining, illegal mica mining, and weak governance and conflict. Finally, the health and safety implications of mica mining for children's rights are described in the final section of this chapter.

8.1. SHEET MICA MINING

Sheet mining is a labour-intensive process, and therefore not considered to be economically viable in countries with high labour costs. It is therefore predominantly done in low-income countries, by the very poor and vulnerable.

166 OECD, Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains, http://mneguidelines.oecd.org/Practical-actions-for-worst-forms-of-child-labour-mining-sector.pdf, (February 2018).
167 India's Childhood in the "pits": A Report on the Impacts of Mining on Children in India, HAQ Centre for Child Rights, 2010

Miners must travel deep into mining shafts, and the work is hard and dangerous. There are no machines, and a significant part of the work of extracting, assessing and preparing crude mica in sheets is done manually and with hammers and scissors. Mica sheets are hand-picked, then placed in boxes or bags for transport to the location where they are graded, split, and cut by hand to various specified sizes for sale.[168]

Sheet miners are paid low wages, are not protected, and are easily exploited. Generally, sheet mining takes place in remote areas where health and education are not on offer. Children thus work to contribute to the family wage.

A Reuters' report from 2016 quotes a mother talking about her 10-year-old son, who had been mining sheet mica since he was seven. She described how he climbed into a so-called 'rat hole' dug into the side of a hill, and descended three meters to pound on the mine wall with a pick-axe in his search for mica. "I know it's dangerous but that's the only work there is. I know Sandeep doesn't want to do this but it is what it is. If he was able to go to school and learn and become something then that's good, but first we need to eat." [169]

8.2. ILLEGAL MICA MINING

During the research on the major mica-producing countries, SOMO found that many of the non-western mica-producing countries have mica export figures that exceed the country's mica production figures. This leads SOMO to assume that illegally-mined mica has been included in the export data, and that illegal mica extraction is widespread.

Illegal mining is especially associated with various socio-economic problems such as child labour, poor health and safety conditions, limited education and health facilities, trafficking, and security issues. Alternatively, in legal mining, a person or company must have a mining license or a permit to mine, and the government must give a person or a company its permission or a lease to mine for a certain period of time. Although a legal mine does not necessarily guarantee good or fair working conditions, legal mines are subject to inspections and certifications. When mining is illegal, the risks relating to working conditions, safety, pollution, (sexual) abuse, exploitation, and displacement will all increase, together with negative impacts for children's rights.

There are different ways to determine whether mica mining is legal or illegal in different countries (see annex for the country profiles), but for the purpose of this report two identifiers have been used:

- The reporting of illegal mines in publicly available documentation, including reports or the press.[170] For example, Indian media have reported on the 'mica mafia' running mines, as well 'mica ghost mines' where the poorest, including children, toil for their livelihoods. In 2017, several children died when mica mines collapsed.[171] SOMO's 2016 report on mica also showed that a vast amount of India's mica mining is illegal. [172]
- Secondly, if a country's mica export figures exceed its mica production figures, it can be assumed that illegally-mined mica has been included in the export data.

SOMO specifically chose for the presence of illegal mining as indicator, and not for the presence of artisanal and small-scale mining. The reason for this choice is to avoid confusion and obfuscation, as there are no clear distinctions between artisanal and small-scale mining and industrial mining as far as mica mining is concerned. Some experts consulted for this report however referred to an industrial mine as using heavy and professional equipment such as excavators, hoists, and trucks that can only be handled by professionals or adults. These experts also associated industrial mining as having a fenced area surrounding the site.[173]

168 https://mineralseducationcoalition.org/minerals-database/mica/
169 N.Bhalla, R.Chandran, A.Nagaraj, " Blood Mica: Deaths of child workers in India's mica ghost mines covered up to keep industry alive," Reuters, 3 August 2016, https://www.reuters.com/article/us-india-mica-children/blood-mica-deaths-of-child-workers-in-indias-mica-ghost-mines-covered-up-to-keep-industry-alive-idUSKCN10D2NA (22 January 2018). W
170 M.Munstermann, C.Werner, "The Mica Children," http://www.spiegel.de/international/tomorrow/a-1152334.html De Spiegel, http://www.spiegel.de/international/tomorrow/a-1152334.html (22 January 2018).
171 N.Bhalla, "In search of sparkle: is corporate inaction on mica condemning Indian children to death?" Reuters, 19 December 2017, https://www.reuters.com/article/us-india-minerals-child-deaths-exclusive/exclusive-in-search-of-sparkle-is-corporate-inaction-on-mica-condemning-indian-children-to-death-idUSKBN1ED16P (22 January 2018).
172 SOMO/Terre des Hommes, "Beauty and a Beast", May 2016, https://www.somo.nl/beauty-and-a-beast/, (20 January 2018).
173 Based on expert interviews.

One of the experts claimed that as ground mica, which is used as filler, is always mined industrially there is no need to investigate accompanying human rights violations and/or child labour. However, the scrap mica from which ground mica is made is often a by-product of sheet mica production or sheet mica mining. Sheet mica is always mined at least in part by hand. Chapter 3 of this report explains that in India, no clear distinction can be made between the mining methods for sheet or scrap mica, as they are interdependent. This is due to the fact that practically all scrap mica is produced during the process of sheet mica mining, and sheet mica mining always requires intensive manual labour with small tools. The extraction of crude mica often takes place in deep shafts where the work is hard and dangerous, and where there are no machines.

It is also relevant to note that industrial mining does not guarantee that there will be no risks related to the loss of lands for mining. Displacement, pollution, safety hazards, exploitation, abuse, poor working conditions and so forth are all possible results. And all of these situations can adversely impact children's lives and rights.

8.3. WEAK GOVERNANCE AND CONFLICT

If the governance in a mica-producing country is weak or non-functioning, or if the state is fragile, corrupt or in a conflict situation, there is a risk that the mica mining industry will have no regulatory oversight. This opens the door for illegal mining, child labour, and the exploitation of the most vulnerable workers by mine operators.

Countries with weak governance often lack the resources to address child labour and children's rights violations. Although SOMO did not include a check on weak governance in the methodology for the country profiles, it did include the presence of 'stop child labour' initiatives and information from the UN Committee on the Rights of the Child in all country profiles.

In the context of conflict-affected and high-risk areas,[174] this report highlights the specific situation in Madagascar:

> Madagascar had a coup in 2009. Despite democratic elections in 2013, the political situation remains fragile, the population is very poor, and the country has become a safe haven for widespread corruption involving illegal activities and businesses, including the alleged involvement of government officials, according to the US State Department.[175] The US government reports killings and mob violence, weak rule of law, intimidation of journalists, and restrictions on freedom of speech, press and assembly.[176]
>
> Since June of 2012, the south of Madagascar, mainly the population of the Androy and Anosy regions, has been repeatedly targeted by police and armed militia. In this part of the country, mineral resources are significant and varied, and include industrial minerals (uranium, mercury, rare earths, mica, coal and ilmenite) in addition to precious and semi-precious stones, gold, very high-quality diamonds and oil.[177]
>
> In December of 2013, a French journalist travelled hundreds of kilometres inland with a mica trader. Their truck journey included the city of Ilakaka and a hamlet near the village of Analamaria in the south of Madagascar. The journalist went with the trader into the village to buy mica mined by the families. There was no electricity, no gas, no running water, no school, no health clinic, and no officials in the village. Poor families, the elderly, children, women and men all work together in the in the bush to mine mica, which they had been collecting for months. The journalist reported that of the 80 children who lived in the village, not one of them ever went to school. Many of the children there were also sick.[178]

174 The OECD defines conflict-affected and high-risk areas as follows: Conflict areas are "Areas identified by the presence of armed conflict, widespread violence, including violence generated by criminal networks, or other risks of serious and widespread harm to people. […] High-risk areas are those where there is a high risk of conflict or of widespread or serious abuses [..] Such areas are often characterised by political instability or repression, institutional weakness, insecurity, collapse of civil infrastructure, widespread violence and violations of national or international law." Source: OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.
175 OSAC, Madagascar 2016 Crime & Safety Report, https://www.osac.gov/pages/ContentReportDetails.aspx?cid=19735
176 US Department of State, Madagascar 2015 Human Rights report, https://www.state.gov/documents/organization/252911.pdf
177 CETIM, Violations of human rights in Madagascar, http://www.cetim.ch/violations-of-human-rights-in-madagascar
178 'Sur la piste du mica de Madagascar', Sud Ouest, 22 Décembre 2013.

The most recent UNICEF child labour statistics (2016) indicate that 23 per cent of all Malagasy children are engaged in child labour.[179] A national survey published in 2012 indicated that 81 per cent of child workers between the ages of five and 17 were engaged in hazardous work. This is equivalent to 1.7 million children.[180]

Since Madagascar is among the world's top mica exporters, an extensive investigation should be carried out in order to assess whether the country's mica can be given the status of a conflict mineral.

Impact of mica mining on health and safety. Among the most intense repercussions of mica mining on children's rights are the health and safety impacts.

It is beyond the scope of this report to thoroughly analyse occupational health and safety risks related to mica mining and processing. However, this report can point to various examples of reported health and safety issues in this sector.

"Abrasions and broken bones are part of daily life in the mica mines. The workers are afraid of scorpions that hide under the rocks - and then there's the quartz dust that they stir up and breathe in. In the evenings, they return home with a rattling cough. Many of the workers contract asthma and black lung disease, which makes them more susceptible to tuberculosis and cancer. Many families subsequently go into debt to pay for medication and hospitalisations."[181]

Occupational hazards include head injuries, cuts and abrasions, skin and respiratory infections like silicosis, tuberculosis and asthma. And the risks from mining in poorly maintained, unregulated mines can also be lethal.[182] In 2016, child protection group BBA's Jharkhand project coordinator Raj Bhushan told Reuters that many children die on a regular basis in mica mines. "Although there are no official figures on child deaths in the mines, as it is all illegal, we hear about them through our networks in the villages where we work. Normally we hear about 10 fatalities on average a month, but in June [2016] we documented over 20 deaths."[183]
And according to a Reuters report, "In some cases, the victims' families are threatened by mine operators or buyers not to report the deaths, or they are given 'blood money' to keep silent so the illicit industry continues."[184]

178 UNICEF global databases, 2016, based on DHS, MICS and other nationally representative surveys (ENSOMD 2012-2013). http://data.unicef.org/topic/child-protection/child-labour

180 International Labour Organization, "Report of the Committee of Experts on the application of Conventions and Recommendations", 5 February 2016, pages 271 - 274, http://bit.ly/1XHQGgO.

181 M.Munstermann, C.Werner, "The Mica Children," De Spiegel, http://www.spiegel.de/international/tomorrow/a-1152334.html (22 January 2018).

182 N.Bhalla, R.Chandran, A.Nagaraj, "Bood Mica: Deaths of child workers in India's mica 'ghost' mines covered up to keep industry alive," Reuters, 3 August 2016, https://www.reuters.com/article/us-india-mica-children/blood-mica-deaths-of-child-workers-in-indias-mica-ghost-mines-covered-up-to-keep-industry-alive-idUSKCN10D2NA (22 January 2018).

183 N.Bhalla, R.Chandran, A.Nagaraj, "Bood Mica: Deaths of child workers in India's mica 'ghost' mines covered up to keep industry alive," Reuters, 3 August 2016, https://www.reuters.com/article/us-india-mica-children/blood-mica-deaths-of-child-workers-in-indias-mica-ghost-mines-covered-up-to-keep-industry-alive-idUSKCN10D2NA (22 January 2018).

184 N.Bhalla, "In Search of Sparkle: is corporate inaction on mica condemning Indian children to death?, " Reuters, 19 December 2017, https://www.reuters.com/article/us-india-minerals-child-deaths-exclusive/exclusive-in-search-of-sparkle-is-corporate-inaction-on-mica-condemning-indian-children-to-death-idUSKBN1ED16P (21 January 2018).

9. GLOBAL SHEET MICA DEPOSITS

This chapter on global sheet mica deposits is included in the report because several risks for human rights violations, including child rights violations, are connected to the locations where sheet mining takes place. It is therefore relevant to know more about these locations.

The previous chapters have shown that natural mica dominates the global market, and that two grades of mica almost equally share the global market in value: ground mica with 53 per cent of the total market, versus 47 per cent for sheet mica. Subsequently, the research ascertained that while the electronics and automotive sectors use both grades of mica, most sheet mica is bought by the electronics sector. Some industries use mainly ground mica, including the paints and coatings, cosmetics and construction industries. However, as was described earlier in this report, scrap mica is often a by-product of sheet mica, and risks are thus not only associated with sheet mica. It is therefore relevant for all industries to investigate whether their mica originates from countries where sheet mica mining takes place.
Mica deposits according to the USGS and UN Comtrade
Over the past one hundred years, sheet mica has been found in many countries. A USGS bulletin published in 1919 lists the following countries as sheet mica producers: the United States, Canada, Brazil, Argentina, Burundi, Rwanda, Malawi, South Africa, Madagascar, India, Sri Lanka, Australia, China and Japan. Smaller quantities were also mentioned in Mexico, Guatemala, Norway and Russia.[185]

In 2010, the USGS expected that the US would increasingly import sheet mica from Brazil, China, India and Russia. It also expected the prices for imported sheet mica to increase, given that good quality sheet mica remained in short supply in their opinion. Although Spain and Belgium are not specifically mentioned by the USGS as having substantial sheet mica deposits, these countries do appear in the UN Comtrade database as among the larger exporters of sheet mica.[186]

A closer examination of the UN Comtrade dataset, which provides export and import data on sheet mica as a separate product category (HS Code 252510), reveals a different picture.

According to this UN database, the top sheet mica exporters *by value* in 2016 were India (US$ 7.6 million), Madagascar (US$ 3.1 million), Brazil (US $2.4 million), China (US$ 2.3 million) and Sri Lanka (US$ 0.6 million), in that order.[187]

However, when examining the actual quantity or *volumes* of sheet mica exported that same year, Madagascar was by far the largest exporter of sheet mica with 15,545 tonnes, followed by India (11,081 tonnes), Norway (6,000 tonnes),[188] China (4,562 tonnes) and Brazil (4,139 tonnes).[189]

In fact, the trade data revealed that Madagascar's 2016 export of sheet mica was, by volume, the biggest export of this product ever recorded in UN statistics. Madagascar exported 30 per cent more sheet mica than India did in 2016[190] (see Figure 10).

185 USGS/Department of the Interior, "Our mineral supplies", Washington, 1919. https://books.google.nl/books?id=Q_pYAAAAYAAJ&pg=PA153&lpg=PA153&dq=sheet+mica+in+Norway&source=bl&ots=v0RBLvFKJm&sig=6C5ApBp3wBMnbWERwY7-pBrm33s&hl=nl&sa=X&ved=0ahUKEwi4iu3km5_VAhWJ2xoKHXGhDbAQ6AEIZTAM#v=onepage&q=sheet%20mica%20in%20Norway&f=false

186 USGS, https://minerals.usgs.gov/minerals/pubs/commodity/mica/mcs-2010-micash.pdf

187 Comtrade database, https://comtrade.un.org/data, (22 January 2018).

188 It should be noted that volumes exported by Norway are not consistent; the reported export volume in 2016 is an anomaly. There is no reported export for 2015, and the reported export for 2014 volume is only 5 percent of the amount reported for 2016 (31 tonnes), Comtrade database.

189 Comtrade database, https://comtrade.un.org/data, (22 January 2018).

190 Comtrade database, https://comtrade.un.org/data, (22 January 2018).

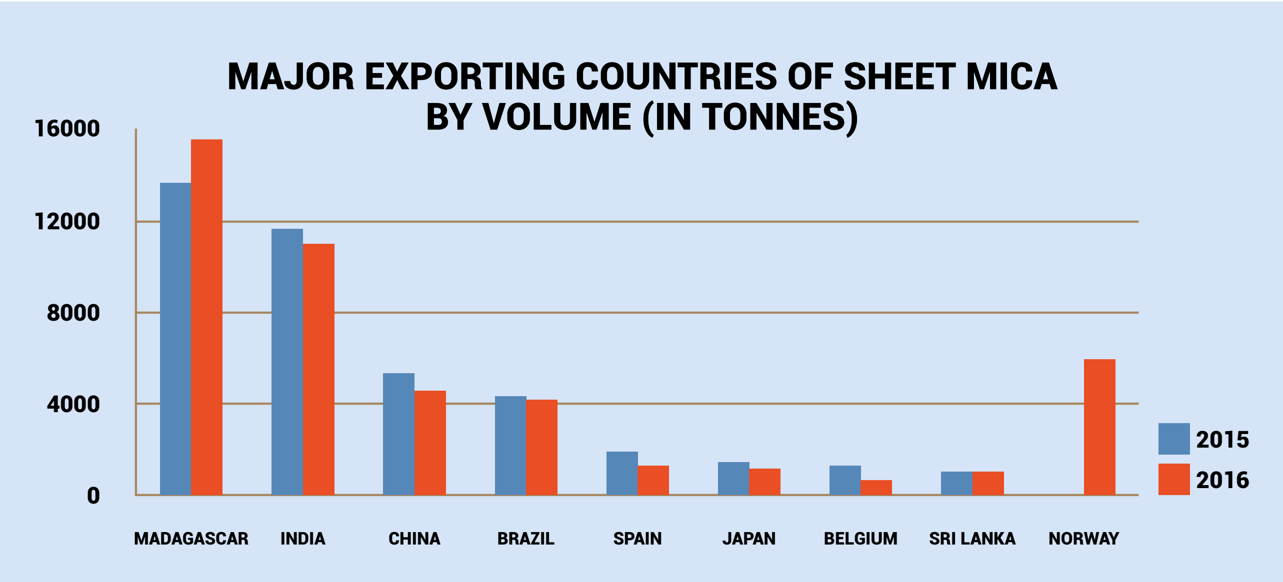


Figure 10: Major exporting countries of sheet mica by volume in tonnes, 2015-2016
Source: UN Comtrade database, graphic compiled by SOMO.

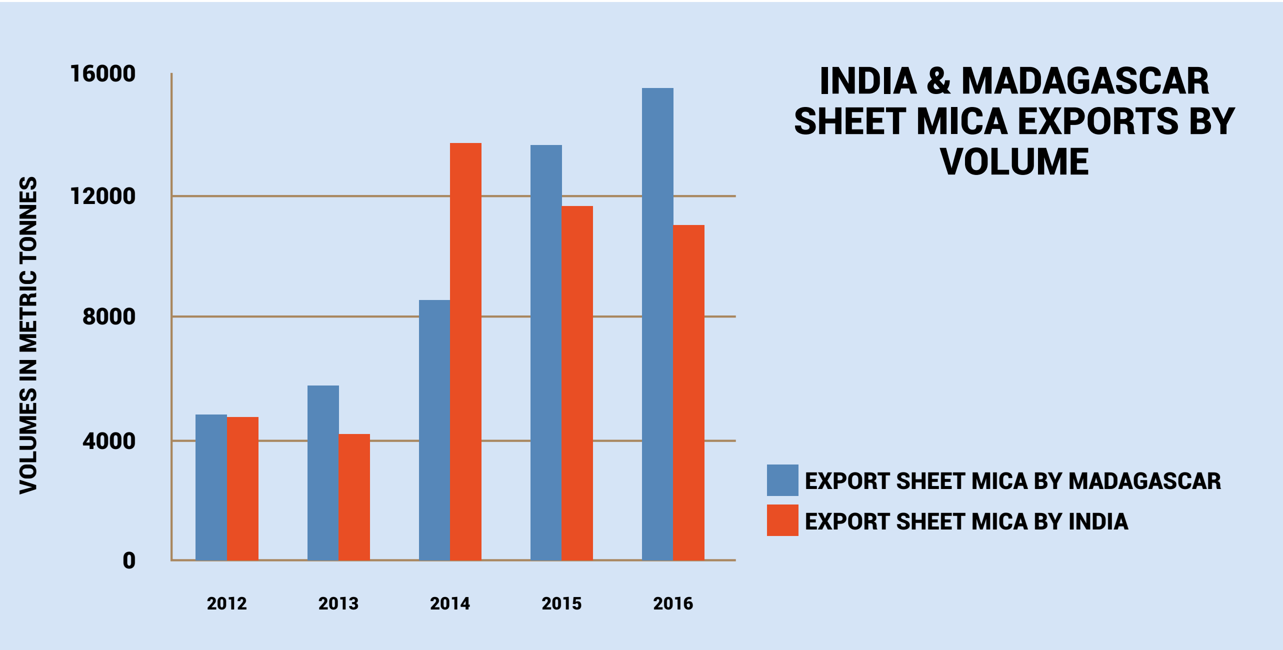


Figure 11: India and Madagascar sheet mica exports by volume, 2012-2016
Data source: UN Comtrade database, graphic made by SOMO.

9.1.1. INDIA AND MADAGASCAR

Although the mica export figures for Madagascar are substantial, the country has no official mica production figures. This is a red flag and points to the illegal mining of mica in Madagascar. It is important to note that Madagascar's sheet mica exports have been steadily growing over the last five years, and that since 2012, Madagascar has been the world's largest exporter of sheet mica.

In recent years, India and Madagascar have dominated the sheet mica export market. The UN Comtrade data in Table 3 reveals that over the past five years, higher sheet mica exports are reported from Madagascar than for India. The only exception is 2014, when India exported more. Madagascar is clearly the current world leader in the export of sheet mica by volume.

The figures show that Indian sheet mica earns more by weight than sheet mica from Madagascar. This might explain why the export of sheet mica from Madagascar is increasing, as it appears to be 3.5 times cheaper than Indian sheet mica. Another important point is that Madagascar's export of sheet mica, as a proportion of its overall mica export, is increasing significantly, to the point that the country hardly exports any scrap mica at all.

Table 4 below demonstrates that since 2013, the majority of Madagascar's mica exports were sheet mica and mica splittings. We can therefore assume that much of these exports were destined for the electronics industry. The data in Table 4 also demonstrates that in 2012, sheet and split mica exports were less than half of Madagascar's total mica export. Since 2013 however, sheet and split have increased to the point that they currently represent 70 per cent of total mica export.

Given that scrap mica is a by-product of the mining, extraction and cutting of mica sheets, it is reasonable to ask what happens to all of the scrap mica that is left behind during Madagascar's sheet mica production.

The UN Comtrade dataset shows that over the last five years, the biggest buyers of Madagascar's sheet mica were China, Russia, Belgium, Japan and South Korea. China was by far the biggest customer.[191]

SHEET MICA EXPORT[192]	MADAGASCAR VOLUME (METRIC TONNES)	MADAGASCAR VALUE	INDIA VOLUME (METRIC TONNES)	INDIA VALUE
2016	15,545	$ 3.06M	11,081	$ 7.6M
2015	13,652	$ 3.04M	11,655	$ 7.7M
2014	8,648	$ 2.03M	13,758	$ 9.1M
2013	6,795	$ 1.5M	4,240	$ 6.1M
2012	4,792	$ 1.6M	4,727	$ 5.7M

Table 3: Exports of sheet mica by India and Madagascar by value and volume, 2012-2016
Data source: UN Comtrade database, table made by SOMO.

MADAGASCAR MICA EXPORT FROM UN COMTRADE	MICA-ALL (TONNES)	SHEET MICA (TONNES)	PERCENTAGE OF SHEET MICA IN THE TOTAL MICA EXPORTS OF MADAGASCAR
2016	22,311	15,545	70%
2015	16,664	13,652	82%
2014	12,280	8,648	70%
2013	9,781	5,795	59%
2012	12,531	4,792	38%

Table 4: Percentage of sheet mica in Madagascar's total mica exports, 2012-2016
Data source: UN Comtrade database, table compiled by SOMO.

191 OEC, http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/mdg/show/252510/2015
192 Comtrade database, https://comtrade.un.org/data, (22 January 2018).

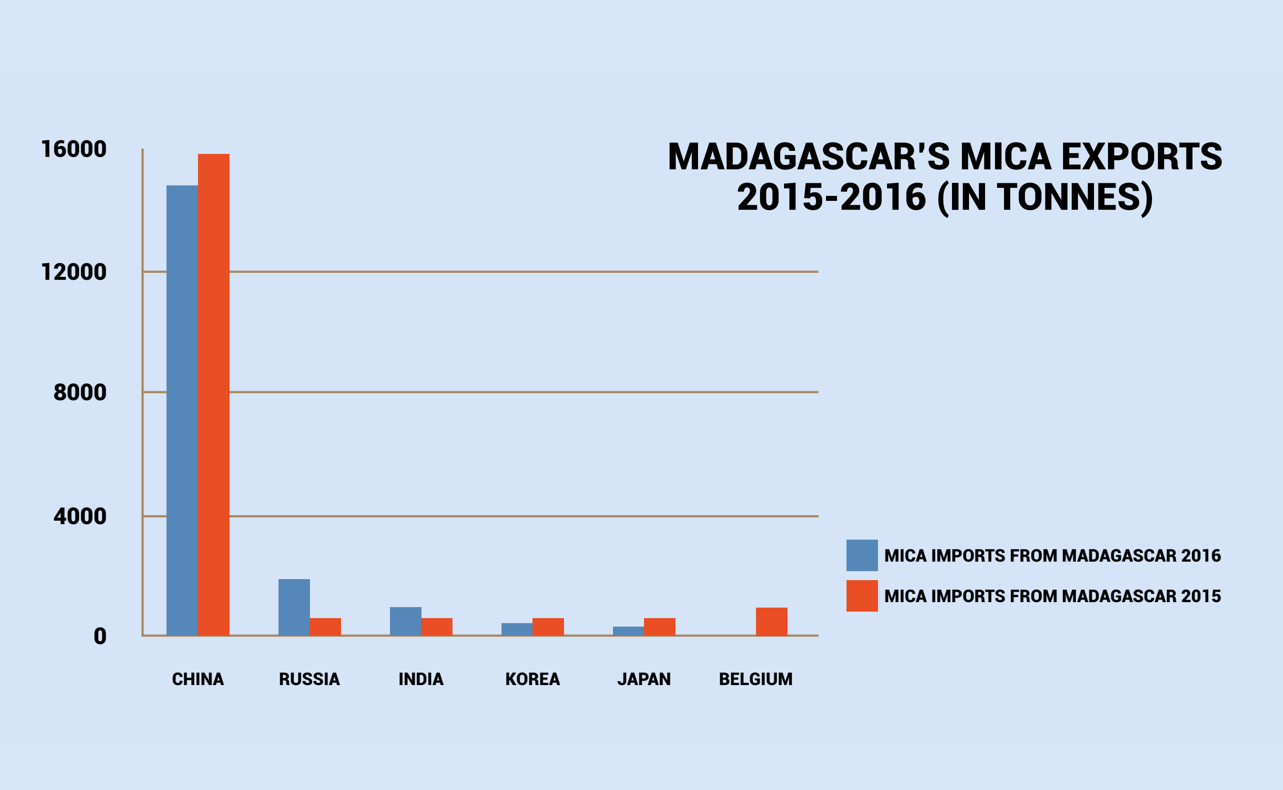


Figure 12: Madagascar's mica exports, 2015-2016
Data source: UN Comtrade database, graphic made by SOMO.

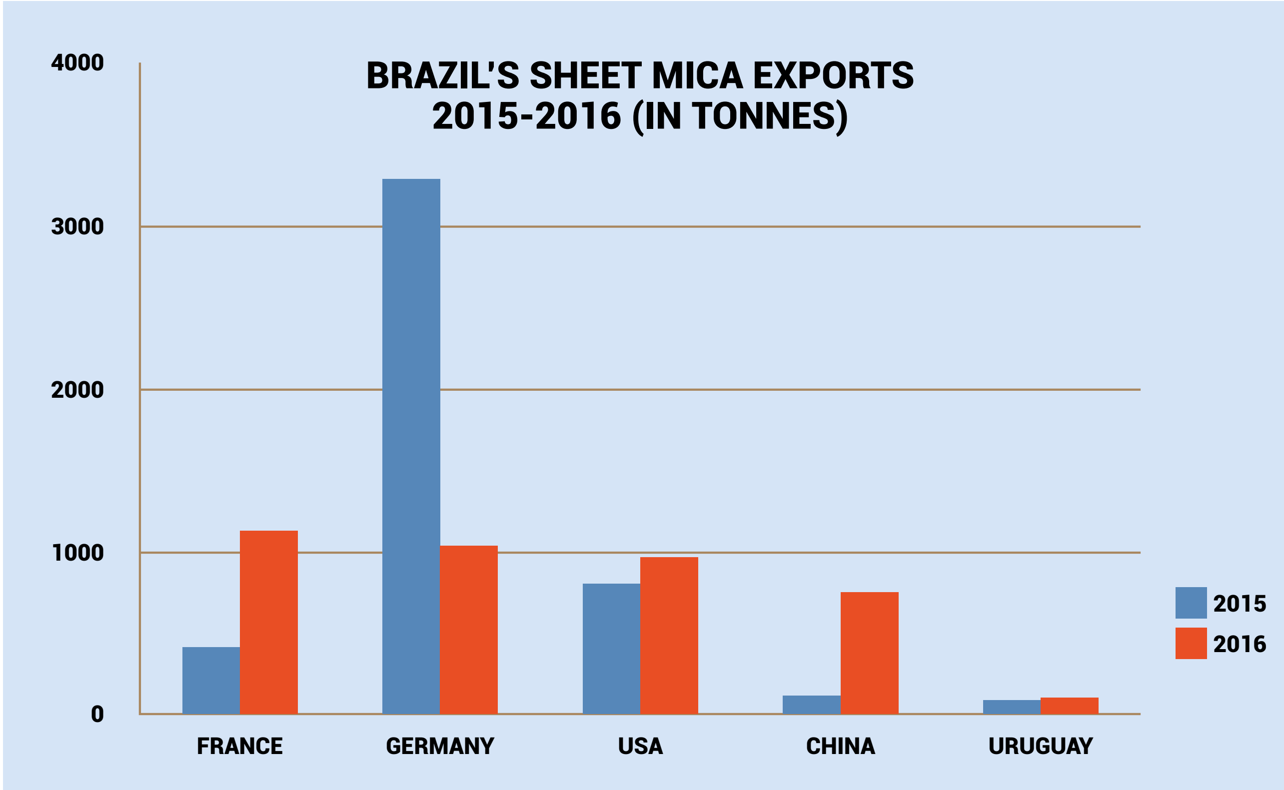


Figure 13: Brazil's mica exports, 2015-2016
Data source: UN Comtrade database, graphic made by SOMO.

9.1.2. CHINA

China is a major producer, importer and exporter of mica, both in sheet and ground form. China rivals India as far as the volume of mica it exports; this holds for all forms but particularly for mica powder (HS252520). Trade data shows that China exported more mica powder by volume between 2014 and 2016 than India did over the same period.[193]

The quantity of China's sheet mica exports dropped between 2012 (6,270 tonnes) and 2016 (4,462 tonnes). During this same period, the value of sheet mica exports rose from US$ 1.8 million to US$ 2.3 million. This indicates that China's sheet mica prices have risen approximately 80 per cent since 2012. As Figure 12 shows, China buys the bulk of Madagascar's mica, most of which is sheet mica.

193 UN Comtrade, https://comtrade.un.org/data (22 January 2018).

9.1.3. BRAZIL

The UN Comtrade dataset notes that Brazil exports almost exclusively sheet mica. For example, in 2016 Brazil reported overall mica volumes of 4,241 metric tonnes, of which 4,139 metric tonnes are registered in the Comtrade data as sheet mica.[194]

Over the past five years, Brazil exported around the same amount of sheet mica annually, between 3,742 and 5,590 metric tonnes each year.[195] According to UN Comtrade data, in 2016 Brazil exported 28 per cent of its sheet mica to France, 26 per cent to Germany, 24 per cent to the US, 19 per cent to China and 3 per cent to Uruguay. In 2015, 69 percent of Brazil's sheet mica was exported to Germany.

194 Un Comtrade, https://comtrade.un.org/data
195 UN Copmtrade, https://comtrade.un.org/data

10. RISK CLASSIFICATION OF MICA-PRODUCING COUNTRIES

10.1. INTRODUCTION

This chapter provides an analysis of the collected country data, which can be found in the annex with all the country profiles. A risk classification of these countries regarding the sourcing of mica is also provided.

Important risk indicators selected by SOMO for this classification are the presence of sheet mica mining and the presence of illegal mining (see explanation in Chapter 8). The presence of child labour in mica mining, or the presence of child labour in activities comparable to mica mining such as the mining of other minerals in the country or even in the vicinity of the mica mining, are also taken into account.

The aim of classifying the main mica-producing and mica-exporting countries is to broaden the discussion around the responsible mining of mica: beyond the Indian states of Jharkhand and Bihar, and beyond child labour. The research ultimately identifies high-risk countries, moderate-risk countries, lynchpin countries, and inconclusive countries (see Chapter 11: Conclusions and Recommendations).

The twenty countries selected for this analysis were Argentina, Brazil, Canada, China, Finland, France, India (other regions), Iran, South Korea, Madagascar, Malaysia, Pakistan, Peru, Russia, South Africa, Spain, Sri Lanka, Sudan, Taiwan and the United States.

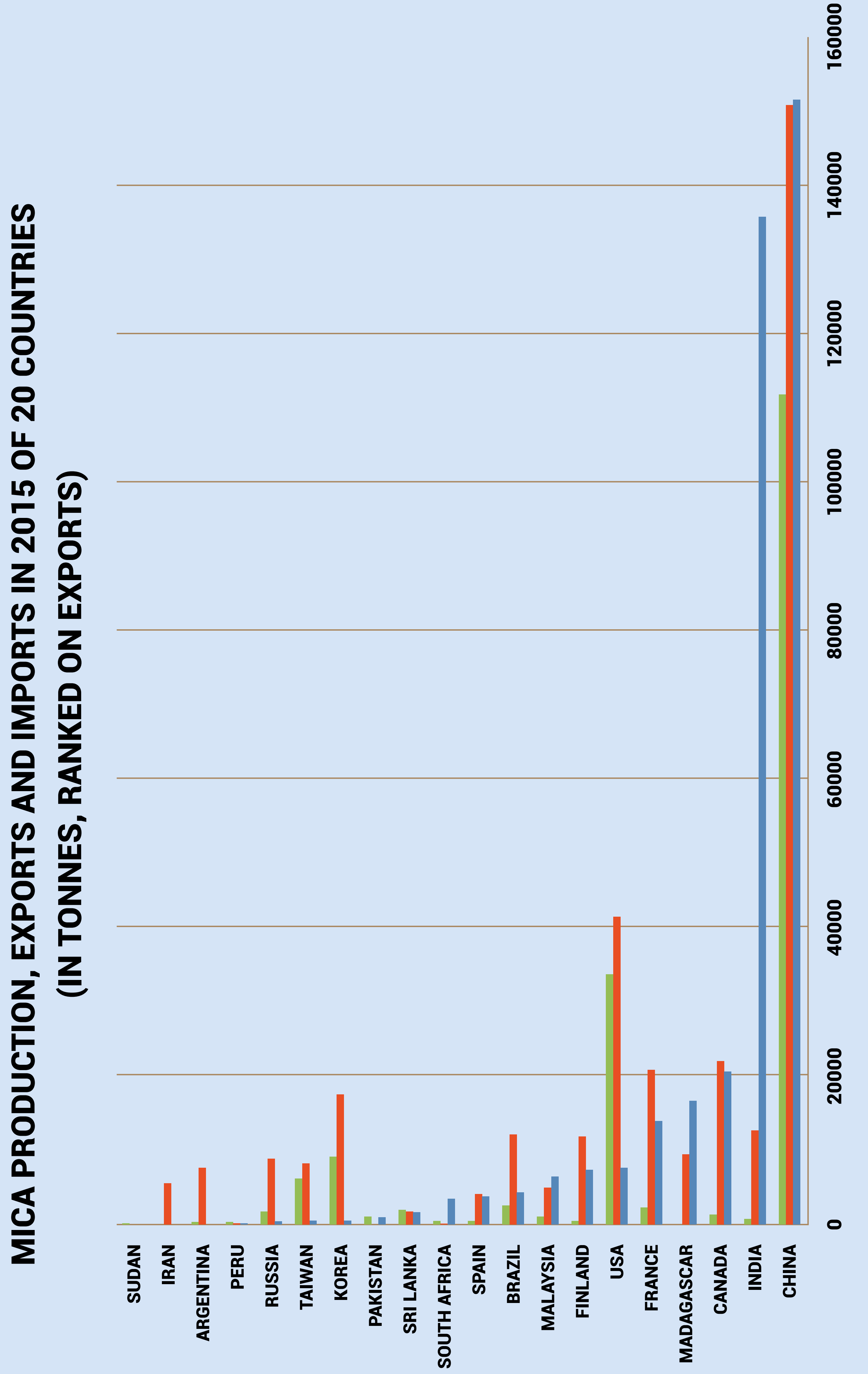
The individual country analyses cover the following aspects:

- What are the details of the mica mining? What are the production, export and import data for mica?
- Who are the key industry players?
- What are the human rights risks related to mica mining in this country?
- What are the possible impacts on children in this context (excluding the western countries)?
- Are there reported children's rights violations and/or reports of child labour (excluding the western countries)? Are there initiatives in this country to stop child labour (excluding the western countries)?
- What did the UN Committee on the Rights of the Child report on this country?

Each country profile ends with a brief analysis of the most important points revealed in the research, as well as an indication of red flags and outstanding questions.

Figure 14: Mica production, exports and imports in 2015 of 20 countries (in tonnes, ranked on export)
Sources: Unless otherwise indicated, the export and import data in this report is based on UN Comtrade sources, and the production data comes from BGS sources. The export figures for Iran and Taiwan are based on TMR sources. Sudan's production and export stopped after 2013. BGS's estimates for mica production in China are based on exports and therefore more conservative than other often-cited sources. India's production is based on government data. Peru's production is based on TMR data. Brazil's production is based on USGS data, as the BGS figure for Brazil appears to be a mistake.[196] Russia's often-cited mica production is 100,000 tonnes according to the USGS, however BGS estimates are much more conservative.

196 The figure appears to be mistakenly reported at 450,000.



	China	India	Canada	Mada gascar	France	USA	Finland	Malay-sia	Brazil	Spain	South Africa	Sri Lanka	Paki-stan	Korea	Taiwan	Mica	Mica	Mica	Mica	Mica
Import of Mica in 2016	112019	851	1296	0	2149	33542	211	945	2356	197	479	1839	944	9092	6086	1646	240	333	0	32
Mica Production 2016	151000	12491	22000	9400	20700	41500	11836	4788	12000	4000	29	1500	0	17405	8267	9000	90	7500	5600	0
Mica Export 2015	151586	135919	20483	16664	13891	7676	7226	6320	4401	3557	3518	1544	896	532	393	354	37	17	3	0

10.2. ANALYSIS

The end result of compiling and analysing the company profiles, studying the market reports, conducting expert interviews, and digging into the production and trade datasets was five explicit red flag indicators. These red flags designate a country as a high-risk area for mica mining and a liability for children's rights violations.

The red flag indicators that emerged from the research are as follows:

1. **Countries 'guilty' of child labour in mica mining.** The use of child labour in mica mining is documented in these countries.
2. **Countries 'suspected' of child labour in mica mining.** The use of child labour in mica mining is suspected in these countries based on the fact that there is evidence of child labour in other mining activities in the country, often in the same vicinity as the mica deposits.
3. **Countries 'suspected' of illegal mica mining.** Illegal mica mining is suspected in these countries, which is associated with extremely low wages, poor and unsafe working conditions, child labour, limited education and health facilities, pollution, abuse, exploitation and displacement. All of these factors increase the risk of negative impacts on the rights of children living in the vicinity or otherwise connected to the area.
4. **Countries with substantial production of sheet mica.** The mining of sheet mica is only done in low-wage countries, where impoverished people are willing to carry out this harsh and dangerous work for little money. The risks are connected to the poor labour conditions, including wages below the living wage, and the lack of social security and health insurance. All of these factors impact children's rights negatively.
5. **Countries with significant imports of mica mined with child labour.** These countries import substantial amounts of mica from countries 'guilty' of using child labour in their mica mines, and subsequently export large amounts of finished or semi-finished products containing mica mined with child labour.

1. Countries 'guilty' of child labour in mica mining

India: Illegal mining and the presence of child labour in the mica mines in the Jharkhand and Bihar regions has been widely reported. Investigators have also reported child labour in mica mines in Rajasthan. Reports about Andhra Pradesh are however not clear. The fact that there is also substantial illegal mica mining in Andhra Pradesh makes it plausible that child labour also takes place there. Investigating other regions in India is not interesting, since less than 1 per cent of total Indian mica production comes from outside of the above-mentioned regions.

Madagascar: Mica mining conditions in Madagascar are quite similar to those in Jharkhand and Bihar, and include the use of child labour. The human rights violations that are described as taking place in Madagascar – especially in the south – to enable mining development projects including mica mines, are having a grave impact on children and children's rights. Although there are no official mica production figures for Madagascar, it is known that the country exported 22,311 tonnes of mica in 2016. This means that at least the equivalent amount of mica was produced. The UN Comtrade data figures show that Madagascar's export figures have been rising between 25 per cent and 35 per cent annually since 2013. This is striking, as since 2013 the majority of the country's mica exports have been mica sheets (82 per cent in 2015). It can therefore be assumed that this mica is largely destined for the electronics sector.

In 2015, Madagascar's biggest customers for its exported mica sheet were China, Belgium/Luxembourg and Russia. Madagascar earns roughly 3.5 times less than India and less than half of what the Chinese and Brazilians fetch for their mica exports. Such low prices for Malagasy mica points to the likelihood of terrible working conditions and meagre earnings for the miners.

2. Countries 'suspected' of child labour in mica mining

In a number of the selected countries, there is evidence of child labour in mining, mining-related activities, or activities around mining sites. Regardless of what is being mined, these countries should be considered high-risk countries given that other mineral-rich deposits are sometimes in the same vicinity as the mica deposits. For example, gold and mica are in the same region in **Peru**, while talc and mica are in the same region in **Brazil**. Child labour is reported in the gold, talc and granite mines in these countries. This is a red flag, and means that the possibility of child labour in nearby mica mines cannot be excluded.

In **Pakistan**, it is reported that children's work includes producing bricks; mining coal, salt, and gemstones; and quarrying and crushing stone, including gypsum. The worst forms of child labour in Pakistan concern forced work in brickmaking, carpet weaving, agriculture, manufacturing glass bangles, and coal mining.

It is also reported that children are working in the gem mines of **Sri Lanka**, while child labour in **China**, including in gold mines, is a documented problem.

In **Sudan**, children work in the thriving artisanal gold mining sector; in terms of mica export, however, Sudan is off the radar given that production has now completely ceased according to BSG.[197] This development could not however be verified by other sources. **Peru** has such low export volumes that the relevance for the global market is minimal, but there are reports that the country wants to ramp up mining in general, so mica output could increase in the future.

The high-risk countries in the context of suspected child mining are therefore: **Brazil, China, Pakistan, Peru, Sri Lanka** and **Sudan**.

3. Countries 'suspected' of illegal mica mining

An important red flag appears when analysing the discrepancies between mica production figures and trade figures, including export and import statistics. When for example the official mica export figure exceeds the official mica production figure, a red flag appears. This is due to the fact that if the mica is being exported, it must also have been produced (taking the imports into account). Somehow, the unofficial mica ends up in the national export statistics, pointing to the likelihood of illegal small-scale and artisanal mica mining.

Illegal mining is associated with many socio-economic problems including child labour, poor health and safety conditions, limited education and health facilities, trafficking, and security issues.

Note however that both production and export figures are derived from so-called 'official' data sources, provided in part by national governments. This indicates that national authorities must be aware of the discrepancy between export figures and illegal mining output.

Countries with greater exports of mica than reported mica production include **India, Madagascar, Malaysia, Pakistan, Sri Lanka** and **South Africa**. Any mica exported to the world market from these countries is a red flag, given that some of this mica will have been illegally mined. This illegal mining is associated with rights violations, including children's rights violations, and therefore requires further scrutiny and investigation.

4. Countries with substantial production of sheet mica

Non-western countries with a substantial proportion of sheet mica production are also red flag countries. This is due to the fact that sheet mining is associated with labour-intensive work using small tools under harsh and dangerous labour conditions. This report has demonstrated that sheet mica is, in fact, only being mined in low-wage countries where impoverished people are willing to undertake hard and dangerous work for little money. There are consequently high levels of risk related to the mine workers' labour conditions, including wages below living wage, and a lack of social security and health insurance. These deficient working conditions also impact the security of life for the miners' children.

When scrap mica is recovered as by-product of sheet mining, which is the case in India and also likely in all countries with a substantial proportion of sheet mica production, the mentioned risks for sheet mining must also be taken into account. In these countries, sheet mica mining and scrap mica mining are interdependent. The red flag countries in this context are **Madagascar, India, China, Brazil** and **Sri Lanka**.

197 Email June 2, 2017, Teresa Brown, Mineral Commodity Geologist, British Geological Survey.

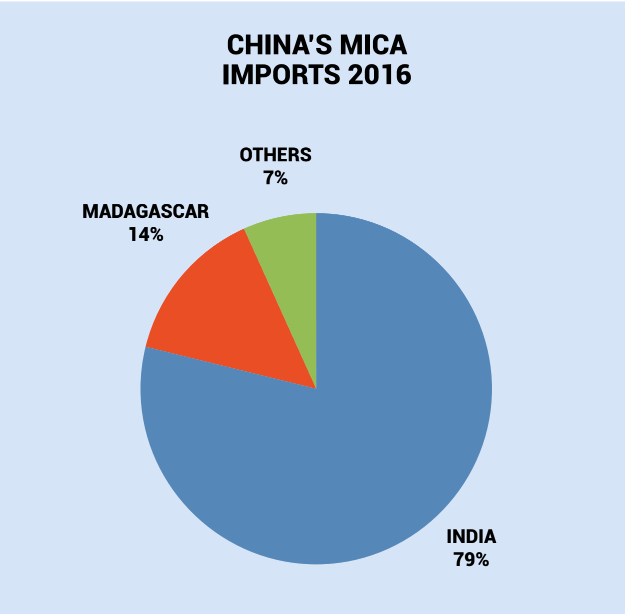


Figure 15: China's mica imports 2016
Source: UN Comtrade, graphic made by SOMO.

5. Countries with high imports of mica mined with child labour

Some countries use large volumes of mica for their industries. They are thus major importers from the countries 'guilty' of using child labour in mica mining, including India and Madagascar. When looking at the countries that import mica, it is also important to consider what grade of mica they import, and how much of it is sheet mica versus ground mica, since sheet mica mining contains higher levels of risk.

The countries that are significant mica importers from 'guilty' countries deserve their own red flag category, and should be included in the due diligence efforts of companies sourcing from these countries. For example, among the countries that are included in this research, **Russia, South Korea** and **China** import substantial amounts of mica from India and Madagascar. They subsequently export large amounts of semi-finished and finished products containing mica from 'guilty' countries.

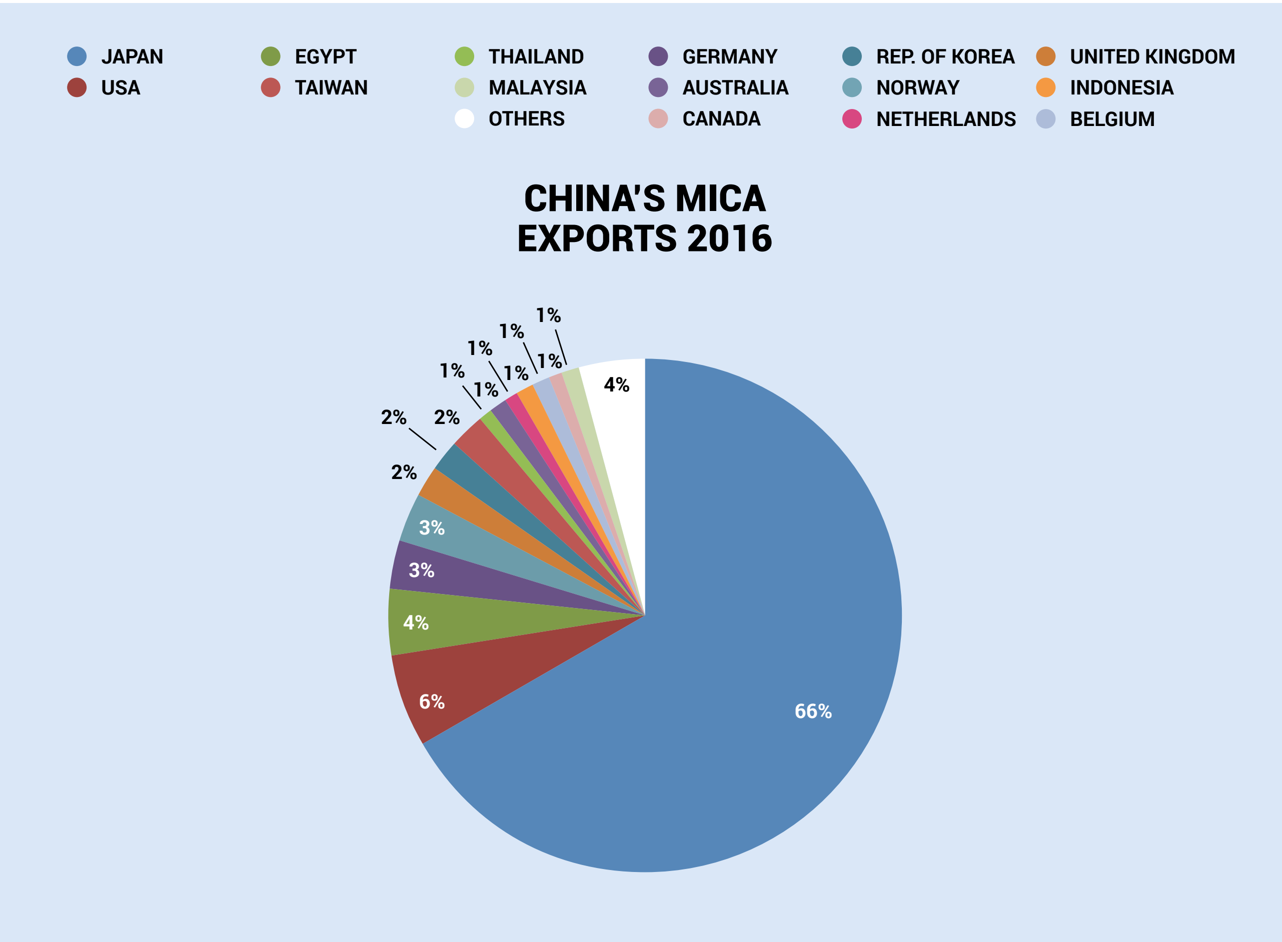


Figure 16: China's mica exports 2016
Source: UN Comtrade, graphic made by SOMO.

China exports mica and products containing mica to many countries. Most goes to Japan (66 per cent), and other large importers include the US, Egypt, Germany, South Korea, the UK, the Netherlands and Taiwan (also see Figure 16).

South Korea also imports mica from China and India, and given that the country is a manufacturing powerhouse within the global electronics industry, further scrutiny should be focused on South Korean mica imports.

Taiwan is a small exporter of mica in the world market, and according to TMR it imports more than it produces or exports. There is no data from the USGS, BGS or UN Comtrade on Taiwan mica production or trade, but some commercial websites confirm that the country imports mica from India.[198] Taiwan is a very large producer of electronics for the global market, and like other countries manufacturing electrical and electronic products, should be further investigated.

COUNTRIES	GUILTY OF CHILD LABOUR IN MICA MINING	SUSPECTED OF CHILD LABOUR IN MICA MINING	SUSPECTED OF ILLEGAL MICA MINING	SUBSTANTIAL SHEET MICA PRODUCTION	HIGH USAGE OF MICA MINED WITH CHILD LABOUR
Argentina					
Brazil		X		X	
China		X		X	X
India	X		X	X	
Iran					
South Korea					X
Madagascar	X		X	X	
Malaysia			X		
Pakistan		X	X		
Peru		X			
Russia					X
South Africa			X		
Sri Lanka		X	X	X	
Sudan		X			
Taiwan					X

Table 5: Countries classified by risk and red flags *Not included in this table are the western countries: Canada, Finland, France, Spain and the US. There are no red flags identified for Argentina or Iran.*

198 http://connect2india.com/global/bf-mica-import-from-port-Taiwan/1

Figure 17 shows the major mica exporters among the non-western countries. China is a black box, as the country has by far the highest import of mica as well as the highest export. The graphic does show the significance of India as a mica exporter (in volume) compared to other non-western countries.

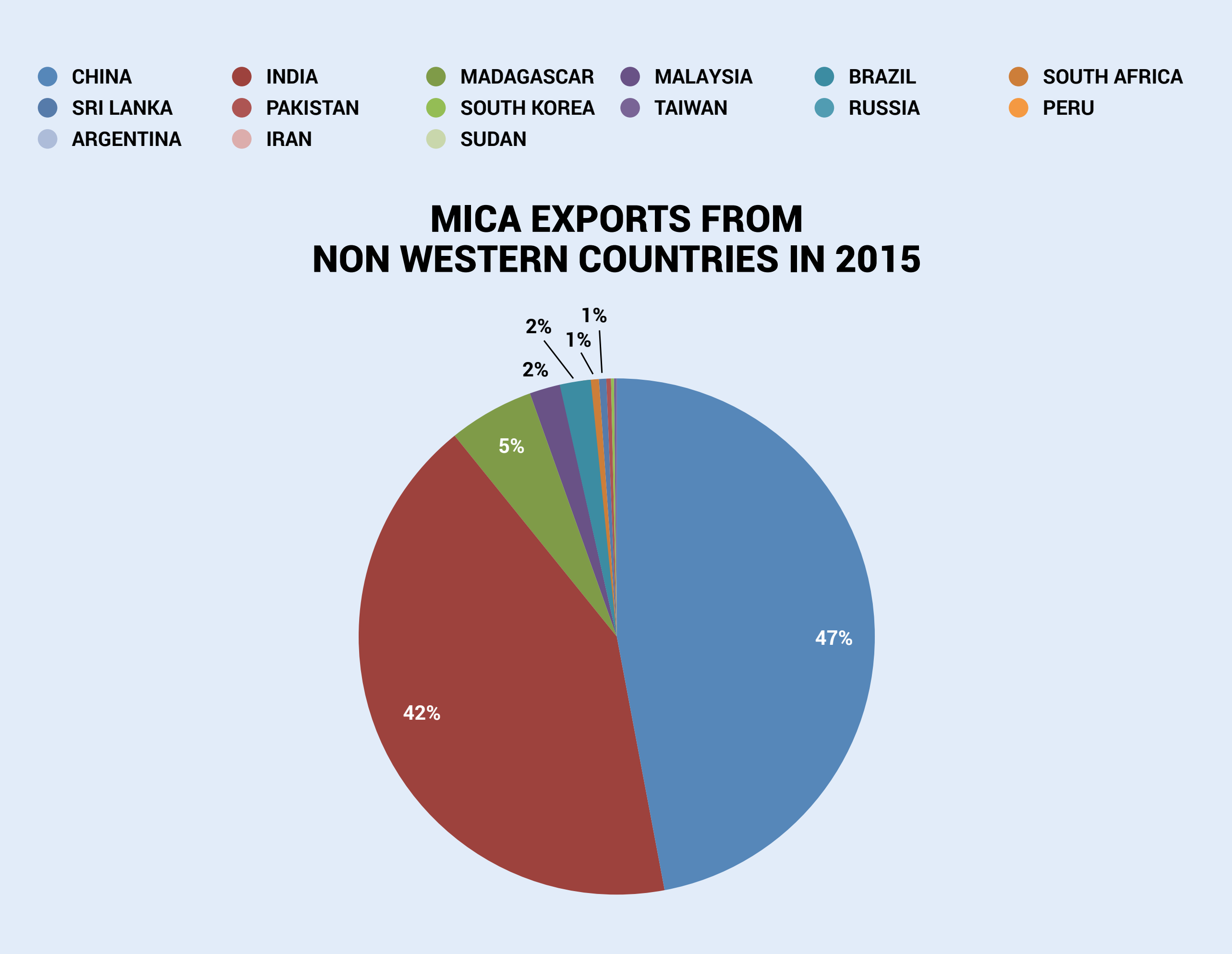


Figure 17: Mica exports from non-western countries in 2015
Sources: The export data is based on UN Comtrade, unless otherwise indicated. Iran and Taiwan's export is based on TMR sources. Sudan's production and export stopped after 2013.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1. CONCLUSIONS

The conclusions have been clustered into five groups: the global market and end-users, risk indicators, due diligence, the risk countries and general conclusions. The recommendations follow, and are grouped into four categories: recommendations for companies, for governments and the EU, for NGOs and for the public.

11.1.1. CONCLUSIONS ON THE GLOBAL MICA MARKET AND END-USERS

Industries that use mica are dependent on mined mica; synthetic mica is a niche market
This report concludes that natural mica is not being replaced with synthetic mica or non-mica substrates in any market-changing way, nor is the synthetic mica market growing very quickly. The main users of synthetic mica are cosmetics companies. Market reports estimate that natural mica accounted for about 90 per cent of the market share in 2015, while the remaining 10 per cent consisted of synthetic mica. In ten years, analysts estimate that the increase in the market share for synthetic mica will be negligible (a mere 2 per cent). The total market for natural mica is expected to continue to grow, due to increasing demand by the main end-user industries.

India remains one of the most important sources of natural mica
The research confirms that India, including the regions Andhra Pradesh and Rajasthan, remains one of the most important suppliers of natural mica for many companies. Several companies confirmed that India is their most important source of natural mica, and said that other mica-producing countries could not currently meet the demand (either due to the lack of capacity to ramp up production, or simply due to not having the volume or quality of mica needed to bypass India as a supplier). In 2015, India was the second largest exporter of mica after China.

Madagascar is the biggest global exporter of sheet mica and needs further scrutiny
The research concludes that Madagascar has become increasingly important as an exporter of mica. The country is the fourth largest mica exporter worldwide, and has been the biggest global exporter of sheet mica since 2015. Most of Madagascar's mica is sold to China, and the rest goes to Russia, Belgium, Japan and South Korea. There are no official or governmental mica production figures for Madagascar, but trade data show that mica exports have increased between 25 and 35 per cent annually since 2013. Mica from Madagascar is roughly 3.5 times cheaper than Indian mica, and twice as cheap as Chinese and Brazilian mica.

Madagascar's state is weak, the political context is fragile, violence and corruption are commonplace, and extreme poverty and child labour are widespread. This all points to a very high-risk source country that demands further scrutiny.

The industries that use sheet mica face added complications and risks
Sheet mica is predominantly mined by hand, since mica sheets must be carefully extracted from rock to prevent damage to the crystals and to keep the sheets intact. The work is labour intensive, time consuming and often dangerous, and as this report concludes is often done by impoverished, vulnerable workers – including children – in poor countries. Sheet mica is also the most valuable grade of mica, and the large exporters are Madagascar, India, China, Brazil and Sri Lanka. In these sheet mica mining countries, and particularly in India and Madagascar, illegal mining is common as well as related criminal activity, weak governance, poverty, and health and safety issues. The most important end-markets for sheet mica include the electronics and automotive sectors.

The electronics industry uses much more mica than previously understood
The electronics industry drives the demand for mica. It uses both sheet and scrap mica in various components for electrical and electronic devices, at levels far higher than previously realised. Due to mica's qualities – including its perfect cleavage, flexibility and elasticity; its chemical inertness, infusibility, low thermal and electrical conductivity; and its high dielectric strength – it is a key mineral for the electronics industry. Market reports indicate that the electronics industry accounted for 26 per cent of the global mica market in terms of value in 2015, which makes this sector the main buyer of mica worldwide. However, SOMO concludes that a 26 per cent market share is most likely an underestimate, due in part to the fact that these industries use both sheet and scrap mica. The awareness of the broad and extensive use of mica in electronics and electrical devices was (and still is) very low among industry and supply chain experts.

Any electronic or electrical device can contain mica
Every electronic device – including computers, printers, televisions, stereos, digital clocks, remote controls, gaming devices, and microwave ovens, to name a few – has a printed circuit board (PCB). The typical components that are mounted on PCBs – capacitors, resistors and insulators – can all contain mica in some form. Electronics companies participating in the research confirmed that their internal investigations revealed that some of their products include mica capacitors, mica resistors and insulators that use mica.

Many components that are widely used in the electronics industry have also been identified in this research as containing mica. These include the following: semiconductor systems, various high-voltage and lithium batteries, sensors, displays, LEDs, adaptors, card sockets, DRAM, encoders, keypads, power modules, SSDs, and wires, cables and computer housing. It should be noted that the presented list in this report of components containing mica must be interpreted as possibly containing mica. All these components are found containing mica, however, mica is not necessarily present in every such component. Nor does the list represent a complete overview, as it is only the result of initial investigations. However, the conclusion is that any electronic device can contain mica, both in sheet and in processed form. The electronic sector therefore face the significant risk of negatively affecting children in their supply chains due to their considerable use of mica, and especially of sheet mica, which poses extra risks.

The automotive industry uses massive amounts of mica
This report concludes that the car industry uses far more mica than was previously understood, and that mica is not only used for paints and coatings. Given the number of car parts that can contain mica (one company identified 15,000 possibilities), the total use of mica in one end product for the automotive industry – a car – is substantial. Given that 88 million new cars were sold in 2016 alone, the overall use of mica by the automotive sector is enormous.

11.1.2. CONCLUSIONS ON RISK INDICATORS

Terms including 'industrial' and 'industrial grade mica' obscure the reality
The terms 'industrially mined mica' and 'industrial grade mica' (ground mica) are often used by industry to describe mica that is mined or processed using heavy equipment, and that cannot, by definition, be mined by children. However, in non-western countries, especially in those countries where sheet mica is mined, there is no clear distinction between industrial and artisanal mining. 'Industrial grade mica' (or ground mica) is often a by-product of sheet mining, and countries with sheet mica mining also often have illegal mining and related criminal activity, weak governance, poverty, and health and safety issues.

This report therefore concludes that companies cannot claim that they need not perform due diligence when the mica they source is 'industrially mined' or 'industrial grade mica'. Due diligence should rather be conducted based on mica's country of origin, as well as whether sheet mica is used.

Also, if industrial mining is involved, companies must verify that it is not related to the loss of lands leading to displacement, pollution, safety issues, exploitation, abuse and poor working conditions. All of these issues can impact children's rights negatively.

Weak states increase the risk of illegal mica mining and children's rights violations
This report concludes that weak governments, with no oversight or authority over illegal mica mines, black markets and mica mafias, increase the risk that children's rights will be violated.
Governance structures and the authority of the state must be taken into account when assessing the risk levels of mica mining for children. Factors that must be considered include the robustness or fragility of the state and the local authority where the mining takes place; internal conflicts; the capacity for inspections; the remoteness of the mines; and the existence of corruption.

11.1.3. CONCLUSIONS ON DUE DILIGENCE EFFORTS

Initial sensing research in the electronics and automotive industries has been carried out by the frontrunners in order to facilitate a decision about starting up a due diligence trajectory regarding mica
So far, the due diligence efforts that have taken place are very recent and in an exploratory stage. Based on this research, SOMO concludes that the included companies do have policies and management systems for minerals. These policies however concern conflict minerals and/or the responsible sourcing of raw materials, and do not include any steps specifically related to mica. Few front-runner companies have launched initial sensing research on the application of mica in their supply chains.

The companies involved in this research have not yet decided whether it is worthwhile to start a due diligence process specifically for mica. However, this report concludes that companies in the researched industries are at high risk of being involved in the worst forms of child labour through their supply chains. According to the OECD's Due Diligence Guidance, they should not tolerate, profit from, contribute to, assist with, or facilitate the grave abuses associated with the extraction, transport or trade of minerals in the course of doing business. Moreover, they should commit to eradicating the worst forms of child labour from their supply chains.[199]

The research done by companies to identify the use of mica in their supply chains fits into step two of the OECD five-step framework. However, as long as the companies do not trace the origin of the mica they use, they are not really assessing the involved risks.

11.1.4. CONCLUSIONS ON THE COUNTRY RISK ANALYSIS

One of the central questions underlying this research is: beyond the previously identified Indian states of Jharkhand and Bihar, in which other mica-producing regions and countries does mica mining negatively impact children's rights?[200]

This research has identified five red flag indicators that designate a country as a high-risk area for mica mining and a liability for children's rights violations.

1. Countries 'guilty' of child labour in mica mining.
2. Countries 'suspected' of child labour in mica mining.
3. Countries 'suspected' of illegal mica mining.
4. Countries with substantial production of sheet mica.
5. Countries with significant imports of mica mined with child labour.

India, Madagascar, China, Sri Lanka, Pakistan and Brazil are high-risk countries
The research shows that there is a high risk in India, Madagascar, China, Sri Lanka, Pakistan and Brazil that children's rights are being impacted by mica mining.

India is a high-risk country, scoring three red flags. Firstly, India is guilty of child labour in mica mining; secondly, illegal mining is suspected in the country due to its having greater export figures than production figures; and finally because it is a significant producer of sheet mica. It has already been proven that children work in mica mines in Jharkhand and Bihar; however, this report demonstrates that there are also illegal mica mines in Andhra Pradesh and Rajasthan where children are reportedly (Rajasthan) and possibly (Andhra Pradesh) working.

Madagascar is another very high-risk country, scoring three red flags. First of all, Madagascar is guilty of using children to mine mica; secondly it is suspected of illegal mica mining; and finally, the country produces substantial amounts of sheet mica. In fact, over the last five years Madagascar has become the world's biggest sheet mica supplier by volume, although it earns less for its sheet mica than other sheet mica supplying countries including India, China and Brazil. The country is also known for political instability and violence, and poverty and corruption are rife.

China is a high-risk country, scoring three red flags. Firstly, due to its suspected use of child labour in mica mining; secondly due to its production of a significant amount of sheet mica; and finally because it imports a significant amount of mica from high-risk countries that are known to use child mica miners, namely India and Madagascar.

199 OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.
200 To have a basic understanding of the child rights situation in the countries that were subject to this research, the country specific recommendations of the UN CRC were reviewed. These country specific recommendations are part of the Annex to this research.

Sri Lanka is a high-risk country, scoring three red flags. First of all due to the suspicion that the country has child mica miners; secondly due to the presence of illegal mica mining; and finally because it is a substantial producer of sheet mica, which is always mined in a labour intensive way.

Pakistan is a high-risk country, scoring two red flags. The first flag is for the suspected use of child labour in mica mining in the country, and the second is for the suspicion that the mica mining operations are illegal.

Brazil is a high-risk country, scoring two red flags. These are due to the suspected use of child labour in mica mining, as well as for the existence of substantial sheet mica mining.

South Africa and Malaysia are moderate-risk countries
There is a moderate risk in South Africa and Malaysia that children's rights are being impacted by mica mining. South Africa and Malaysia each scored one red flag, due to the suspicion that mica mining in these countries is illegal. Where illegal mining occurs, children's rights are threatened.

China, South Korea, Taiwan and Russia are lynchpin countries
China, South Korea, Taiwan and Russia are lynchpins between the mica-producing countries and the global market. These countries import mica from countries where children's rights are negatively affected in the mining process. The mica is used to manufacture goods, which are then exported around the world. Industries in these countries have the responsibility to conduct supply chain due diligence when they import mica from countries where there are known or suspected violations of children's rights in the context of mica mining. Although Japan has not featured in this investigation, it is important to note that 66 per cent of China's mica exports are destined for Japan. This means that Japanese companies must also address their importation of goods made from mica from high-risk countries.

Iran, Peru and Sudan are inconclusive countries
Iran, Peru and Sudan do not report exporting significant quantities of mica, and very little of the mica mined in these countries ends up on the world market. Although there is evidence of child labour in all three of these countries, including in the mining sectors, there are no reported or conclusive links to mica mines. It is important to note that each of these countries is rich in minerals, however, and could expand their mining capacities more generally in the future.

11.1.5. GENERAL CONCLUSIONS ON MICA

Datasets vary considerably, and this is indicative of wide gaps in knowledge and lack of oversight and authority connected with mica markets
All of the available data on mica production varies considerably, and must be accepted as estimates and indications. At the national level, several countries lack data. The lack of data for China is especially problematic, given that the country not only produces, exports and imports mica, but that it is a manufacturing powerhouse for many mica-containing products including electrical and electronic components and devices, paints, coatings, cosmetics and automobile parts.

Mica is an undervalued and underreported commodity
This report concludes that mica is a massively undervalued commodity, since it has a much wider use across more industrial sectors than previously understood. In particular, this includes the automotive and electronics sectors. There is virtually no literature or analysis available on the global mica market, and no real interest from financial or commodity markets given the mineral's low profile and the steady, reliable supply of low-cost, high-grade mica from non-western countries. There is also no real authority on the matter, and even geological experts know very little about production figures or mining conditions.

11.2. RECOMMENDATIONS

11.2.1. RECOMMENDATIONS FOR COMPANIES

This report shows that the electronics and automotive industries use significant amounts of both sheet and scrap mica; much more than previously understood and in many different components. Other substantial mica users are the paints and coatings, construction, cosmetics, plastics and ink, oil well drilling, and rubber industries.

The report concludes that companies in these industries are at high risk of being involved in the worst forms of child labour through their supply chains. They should not tolerate, profit from, contribute to, assist with or facilitate this situation in the course of doing business. Moreover, they should commit to eradicating the worst forms of child labour from their supply chains.[201]

A risk-based due diligence approach, according to the OECD Guidelines and the UN Guiding Principles, implies that efforts of companies to (i) identify, (ii) prevent or mitigate, and (iii) account for actual and potential adverse impacts should be proportional to the risks and severity of the (potential) impacts. In the case of mica, the risks of contributing to the worst forms of child labour are high, and the impacts of child labour are severe and irremediable. Therefore, companies in these sectors should scale up their due diligence efforts concerning mica in their supply chains, regardless of the volumes used, thus even if a company uses only a small amount of mica.

The leading standard in this respect is the OECD publication *"Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains"* (2017).[202]
Companies are recommended to use the five-step framework in this publication for their due diligence processes related to mica. The following steps are advised:

1. Establish strong company management systems.
2. Identify and assess risk in the supply chain.
3. Design and implement a strategy to respond to identified risks.
4. Carry out independent third-party audits of supply chain due diligence.
5. Report on supply chain due diligence annually.

Companies are not safeguarded from child labour in their supply chains when using only ground mica (sometimes referred to as industrial mica), or when they are assured by suppliers that the mica they use is solely industrially mined. The reason for this is that ground mica is often a by-product of sheet mica, and the risks of child labour are especially linked to sheet mica mining. Furthermore, there is no clear distinction between industrial mining and artisanal mining in non-western countries. Therefore, when assessing risks in the supply chain related to the use of mica, companies should first and foremost identify the country of origin of the mica they are using for their products. The countries identified by SOMO's research with the highest risks include India, Madagascar, Brazil, China, Pakistan and Sri Lanka, and to a slightly lesser extent South Africa and Malaysia.

In relation to the due diligence process, it is recommended that companies:

- Make a public commitment to respect human rights. This includes acknowledging the responsibility to respect child rights related to mica in their supply chains, and developing and implementing policies that reflect this commitment;
- Provide transparency about the origin of their materials, and account for the steps that they have taken to identify and avoid adverse impacts in their own operations and along their supply chains.
- Develop a risk-based due diligence approach in line with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights. This process should be developed through meaningful stakeholder engagement and should involve public accounting for how risks are identified and addressed.
- Use their leverage, both to address risks concerning child rights, and to ultimately put an end to child labour. Upstream companies can have significant actual or potential leverage over the actors who can most effectively and most directly mitigate the substantive risks of adverse impacts in the supply chain. Downstream companies, on the other hand, are encouraged to build and/or exercise their leverage over upstream suppliers. Downstream companies' mitigation efforts should focus on suppliers' value orientation and capability training, to enable them to conduct and improve due diligence performance. Companies should encourage their industry membership organisations to develop and implement due diligence capability training modules in cooperation with the relevant international organisations, NGOs, stakeholders and other experts.

Companies should refrain from the tendency to avoid all risks. They should choose to use their leverage, rather than simply leaving a high-risk situation or opting out by using synthetic mica. The UN Guiding Principles on Businesses and Human Rights promote constructive engagement and the enabling of responsible trade in high-risk areas.

201 OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.
202 OECD (2017), Practical actions for companies to identify and address the worst forms of child labour in mineral supply chains, https://mneguidelines.oecd.org/Practical-actions-for-worst-forms-of-child-labour-mining-sector.pdf, (February, 2017).

During risk mitigation efforts, a company's relationship with a supplier can continue, or be temporarily suspended, or, as a last resort, involve disengagement with the supplier. When the latter is the case, after failed attempts at mitigation, or when mitigation is not considered feasible, or due to the severity of the adverse impact, the company should also take into account any potential negative social and economic impacts caused by the decision to disengage.[203]

When companies feel they have low leverage – because they are not sourcing directly or because the mica application is done several tiers away – it is recommended that they engage in strategic multi-stakeholder partnerships with civil society organisations to end child labour in the global value chain of mica. For example, companies can get involved in the multistakeholder Responsible Mica Initiative (RMI) partnership. Members of this initiative focus their collaborative efforts on the due diligence responsibilities of companies, as well as investing in empowerment initiatives on the ground. It is also important to connect to the collaborative efforts of other companies and/or industry initiatives regarding responsible minerals including mica, as encouraged by the OECD's Due Diligence Guidance. An example of such a collaborative initiative is the mica workgroup of the Responsible Minerals Initiative (established by the Responsible Business Alliance and the Automotive Industry Action Group).

Companies are recommended to engage in social empowerment programmes that address the root causes of child labour. To give an example: Terre des Hommes is implementing a holistic programme against child labour in Jharkand and Bihar, India. In partnership with local organisations, Terre des Hommes engages with children, their families, and communities to establish cooperatives for fair prices, and child-friendly villages to address adverse social norms and direct children to school. Part of this work involves the sensitisation of local duty bearers, by encouraging them to strengthen child protection systems and enforce child labour laws. Most mining is illegal, which leaves (adult) workers without the legal means to earn a livelihood. Terre des Hommes advocates for the legalisation of this mining, thus enabling the miners to earn a living wage.

In this respect, companies should balance their investments. Supply chain assessments can be very costly and will not directly reduce child labour, while money spent to address the issues on the ground has the potential to directly improve the situation. It is essential to note that these programmes cannot substitute for measures addressing the negative human rights impacts related to the operations and business relationships of companies.

11.2.2. RECOMMENDATIONS FOR GOVERNMENTS AND THE EU

Mica-producing countries
Governments should enforce ILO conventions 138 and 182, national labour laws, and child protection laws in order to end child labour in mica mines. Governments should develop parallel social policies such as cash transfer programmes to support families; capacity building at the local government level; building and strengthening existing child protection systems; sensitisation and awareness raising targeting all stakeholders; birth registration and school inspections; free and compulsory (quality) education; labour inspections; social protection programmes for families and communities; fair prices and decent wages; and the setting up of cooperatives. Governments should ensure that their education systems are sufficiently staffed and funded, and that welfare schemes for poor families are promoted and well executed.

India
India-specific recommendations concern the legalisation of mines. Most mica mining in India is illegal, which leaves (adult) workers without the legal means to earn a livelihood. The legalisation of mica mining will enable miners to earn a living wage. The Indian government should continue to implement welfare and development schemes in the Jharkhand and Bihar mica mining areas, as well as in Andhra Pradesh and Rajasthan. They should also ensure that every child between the ages of six and fourteen receives free and compulsory education in a neighbourhood school. It is recommended that the Indian Government increase the minimum wage for workers legally mining and processing mica.

203 SOMO, "Should I stay or should I go", https://www.somo.nl/should-i-stay-or-should-i-go-2

Governments of importing countries
Governments should increase their knowledge about the UN Guiding Principles on Business and Human Rights and the OECD Guidelines for Multinational Enterprises, and develop laws on supply chain due diligence. Governments should enforce CSR regulations, and should support the contribution of NGOs to independent assessments of child rights violations in the sourcing of mica.

Governments (for example the United States and the EU)[204] have identified and recognised tin, tungsten, tantalum and gold (also referred to as 3TG), as conflict minerals in their legislations. An extensive investigation should be done with the goal of assessing political volatility, corruption, conflict and violence in Madagascar in order to ascertain if any of the mica mined there is traded illegally to finance fighting. This would justify giving mica the status of a conflict mineral.

The Dutch government should include the issue of child labour related to the mining of mica in the covenant that is currently being drafted for the electronics sector.

11.2.3. RECOMMENDATIONS FOR NGOS

To eradicate child labour in any given community and country, NGOs, in partnership with local organisations, should engage with children, their families and communities to address adverse social norms and direct children to school. Part of this work involves the sensitisation of local duty bearers, encouraging them to strengthen child protection systems and enforce child labour laws. NGOs should support the establishment of cooperatives for fair prices and living wages.
It is unequivocal that for many companies, India is by far the most important country for their natural mica supplies. NGOs should remain vigilant on the situation in India, but expand their focus to include the States of Andhra Pradesh and Rajasthan.

NGO strategies to make end-users accountable for contributing to the worst forms of child labour when using mica in their products were initially focused on cosmetics companies and the pearlescent pigment producers supplying the cosmetics industry. This research shows that it is equally important to focus on other sectors. It is recommended that strategies be developed towards the electronics and automotive sectors, for which mica is an essential and massively used mineral. These sectors are also the main buyers of sheet mica, which carries high risks in relation to human rights impacts. All major end-markets, including paints and coatings (24 per cent market share), electronics (26 per cent), construction (20 per cent), and cosmetics (18 per cent), should be targeted and the origins of their mica should be identified.

It is recommended that NGOs also broaden their country targets for inclusion in the responsible mica sourcing initiatives. More research needs to be done on the red flag countries, with China, Brazil, Madagascar Pakistan and Sri Lanka having top priority, followed by South Africa and Malaysia. There is currently no priority for more research on Sudan, Iran and Peru given their minimal mica outputs.

NGOs should develop a strategy to have mica recognised as a conflict mineral. Although it is beyond the scope of this report to conclude that mica from Madagascar is a conflict mineral, this urgently warrants further investigation. Such an investigation should be carried out to assess the political volatility, corruption, conflict and violence in Madagascar in order to ascertain if any mica sourced there is traded illegally to finance conflict and violence.

11.2.4. RECOMMENDATIONS FOR THE PUBLIC

Mica is not a mineral that can or should be avoided by consumers. Consumers can raise awareness and demand transparency and accountability in different ways: for example by asking companies directly about child labour and labour conditions for parents, and calling for fair prices and decent wages when dealing with products that contain mica. Furthermore, consumers can sign petitions, support social programmes, and join NGO media campaigns. Finally, citizens can demand that their governments introduce risk-based due diligence regulations regarding child labour in their supply chains.

204 The European Union Conflict Minerals Regulation (EU 2017/821).

APPENDIX: CLASSIFICATION CODES FOR MICA

The Harmonised Commodity Description and Coding System, or HS Code, is an internationally recognised method of coding commodities, used to classify products that are traded around the world. The various mica codes are noted below. Note that the main mica code is HS 2525.

Harmonised System Codes (HS)[205]
HS Code group 2525: Mica, including splittings; mica waste

252510: HS Codes for crude mica and mica rifted into sheets or splittings

HS CODE: 25251010	HS Code for mica blocks
HS CODE: 25251020	HS Code for condenser films trimmed but not cut to shape
HS CODE: 25251030	HS Code for mica splittings, book form
HS CODE: 25251040	HS Code for mica splittings, loose
HS CODE: 25251090	HS Code for other

252520: HS Codes for mica powder

HS CODE: 25252010	HS Code for mica flakes, 2.20 mesh
HS CODE: 25252020	HS Code for mica powder, dry ground
HS CODE: 25252030	HS Code for mica powder, micronised
HS CODE: 25252040	HS Code for mica powder, wet ground
HS CODE: 25252050	HS Code for mica powder, calcined
HS CODE: 25252090	HS Code for other

252530: HS Codes for mica waste

HS CODE: 25253010	HS Code for mica mine scrap and waste
HS CODE: 25253020	HS Code for mica factory scrap
HS CODE: 25253030	HS Code for mica cuttings book form
HS CODE: 25253090	HS Code for other

205 The Harmonized System or simply "HS" is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). HS Codes are used by customs authorities, statistical agencies, and other government regulatory bodies, to monitor and control the import and export of commodities. The system is used by more than 200 countries and economies. http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx