Let's Talk Aluminium

Evaluating the Aluminium Stewardship Initiative's Effectiveness and Applicability as a Mechanism in Sustainability Governance from a Multi-Stakeholder Perspective

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Sustainability Studies

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Abstract

Mining bauxite and producing aluminium causes severe sustainability challenges. Although the usage of these non-renewable resource is inherently unsustainable, the global economy fosters an increased use of supposed "eco-friendly" aluminium. German industry is an important user of aluminium and a key player in the aluminium industry. The production of aluminium causes many sustainability challenges, including biodiversity loss and land use change. The Aluminium Stewardship Initiative (ASI) is a voluntary alliance of companies and NGOs; its aim is to establish a certification to decrease the sustainability impacts of aluminium. Despite high expectations, little is known about the motivation for the ASI, its strengths and weaknesses and legitimacy as a governance mechanism.

This thesis analyses the viability of aluminium certification, concentrating specifically on the motivation for the standard, its potential effectiveness and legitimacy as a governance mechanism. To carry out the analysis, I use Germany as a case. Grounded in sustainability science and transdisciplinarity, I used a literature review and in-depth interviews with German stakeholders from the industry, civil society and academia to create solution-oriented knowledge. My research is located in the field of sustainability science, as it expands the field into the realm of sustainability certification and applies a transdisciplinary research. The findings of this study reveal that underlying motivations for the ASI are competitive advantages, risk mitigation and reputation for involved companies. The motivation to increase the sustainability of the production chain is only secondary. Despite the involvement of stakeholders, the actual legitimacy of the ASI is contested, as NGOs lack capacities to engage deeply in such a multi-stakeholder approach. Truly affected stakeholders, such as indigenous people, are only indirectly represented. As there is no functioning alternative to a voluntary certification, the ASI is the only applicable mechanism to tackle cross-border challenges of aluminium. Regardless of the limited legitimacy, the ASI has the potential to improve the sustainability of certain parts of the production chain, and can act as a role model.

Albeit the great expectations on the ASI, a certification alone is not sufficient to solve affiliated sustainability challenges. Additional measures, such as capacity development and the mitigation of corruption, are necessary for less impactful aluminium production systems. In the long run, a transition is needed towards a circular economy that uses only recycled aluminium. Until humanity reaches such a sustainable economy, the ASI is the most promising tool to diminish at least some sustainability challenges of aluminium.

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Acknowledgements

"Wir benützen die Erde, als seien wir die letzte Generation, die auf ihr lebt!"

Heinrich Freiherr von Lersner,

Präsident des Umweltbundesamtes von 1974 bis 1995

"We are depleting our earth as if we were the last generation to live here. "

Heinrich Freiherr von Lersner,

President of the German Federal Environment Agency from 1974 to 1995

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Abbreviations

ASI Aluminium Stewardship Initiative

CO_2 Carbon Dioxide

CS Corporate Sustainability

CSR Corporate Social Responsibility

DIN Deutsches Institut für Normung e.V./German Institute for Standardization

EAA European Aluminium Association

GHG Greenhouse Gas

IAI International Aluminium Institute

ILO International Labour Organization

IUCN International Union for Conservation of Nature

kWh Kilowatt hour

KI Key Informant

KII Key Informant Interview

LCA Life Cycle Assessment

NGO Non-Governmental Organization

OECD Organisation for Economic Co-operation and Development

OEM Original Equipment Manufacturers

R&A Research and Academia

RQ Research Question

SMEs Small and Medium-sized Enterprises

SWOT Strengths, Weaknesses, Opportunities and Threats

UBA Umweltbundesamt (German Federal Environment Agency)

UN United Nations

USA United States of America

USAID United States Agency for International Development

WTO World Trade Organization

WWF World Wildlife Foundation

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Effort for gender-neutral usage of language

In this study, person-related language refers to all forms of gender equally, even if not specified particularly in the text.

Cooperation with the German Federal Environment Agency

This thesis was written in cooperation with the German Federal Environment Agency (UBA) in the department "Resource Conservation, Material Cycles, Minerals and Metal Industry" from 15 January 2015 until 31 May 2015. A brief presentation of the UBA can be found in the Appendix 1 and 2.

This cooperation allowed me to access literature, databases and publications at the UBA and to exchange and discuss my research plan, methodological choices and data analysis with my supervisor and colleagues at the UBA. Considering the transdisciplinary approach of my study, the cooperation with the UBA was a logical step to ensure the involvement of stakeholders outside of academia in my research and eventually led to a mutual learning experience. Regarding the Key Informants who participated in my research, the UBA served as a door opener to get access to those Key Informants. During my stay at the UBA, I did not receive any financial compensation and could freely follow my own research interests.

I declare that I do not have any competing interests.

The contents of this Master Thesis do not necessarily reflect the official opinions of the German Federal Environment Agency.

1 Introduction

Despite the limits of a finite planet, humanity is using resources, especially non-renewable ones like minerals, in unsustainable ways. This leads to the crossing of planetary boundaries and threatens the life on this planet (Rockström et al., 2009). Although mining activities are inherently unsustainable, global economies still rely on metals like aluminium. The time span of creating bauxite via geomorphological processes outreaches by far the anthropogenic extraction of bauxite and conversion into aluminium. Therefore, the usage of primary aluminium as a non-renewable resource, will always be unsustainable. Even though the term "sustainable mining" is used by the industry and even scholars, the mining of non-renewable resources cannot be sustainable (Philips, 2012). A sustainable mining of bauxite is an oxymoron (Mudd, 2007). Even though the process of bauxite mining cannot be changed, it is feasible to create production processes along the aluminium value chain that are as sustainable as possible. I refer to "sustainable aluminium" in this thesis as all attempts to improve the processes of aluminium production along the chain, excluding the aspect of using a non-renewable resource as such.

Countries like Germany, with a strong manufacturing sector, require primary aluminium for example their automotive, packaging and machinery industries. Aluminium and its raw material bauxite cause sustainability challenges. For all too long, the debate on aluminium and sustainability only included recycling. Global measures that move beyond recycling are necessary in order to implement more sustainable practices that minimize environmental, social and economic drawbacks. The Aluminium Stewardship Initiative, an emerging alliance of companies and NGOs, is preparing a global certification scheme for aluminium. The initiative, embedded in Corporate Social Responsibility (CSR), has ambitions to implement more sustainable practices along the aluminium value chain as a governance instrument. It has been created in absence of governmental environmental and socio-economic regulations for aluminium along this complex international value chain. Despite the creation of the ASI, little is known about the motivation for it, its strengths and weaknesses and legitimacy as one governance mechanism out of many to lead to sustainable transformation processes.

Are voluntary certifications legitimate and effective mechanisms to improve the sustainability of this inherently unsustainable resource? What are drawbacks and strong points? How do different stakeholders from the industry, academia and civil society differ in their perception? Is the ASI the only available solution or are there alternative (governance) systems?

There is abundant literature on CSR and approaches to measure environmental impacts of mining, particularly in the form of Life Cycle Assessments (LCA). Little research exists on voluntary sustainability certifications from a sustainability science angle, particularly the case of aluminium lacks research from sustainability scientists. A research gap exists for factors which go beyond the quantifiable environmental impacts of aluminium. The certification of aluminium is a new field of study and the ASI has not been under research yet. The aim of this thesis is not to provide another environmental impact assessment for aluminium. Instead, the aim is to critically examine the usefulness of the ASI standard as a tool in sustainability governance and to analyse the motivation for this initiative and the effectiveness of the ASI.

To accomplish this, I introduce three research questions (RQ):

RQ1: What is the motivation for implementing a sustainability certification scheme for aluminium?

The objective is to understand the motivation for the industry to implement a sustainability standard for aluminium.

RQ2: How do different stakeholders evaluate the related benefits and shortcomings of the ASI standard, its applicability and the possible contribution upon more sustainable aluminium?

The intention is to assess the challenges and opportunities of the ASI standard and to identify the strengths and weaknesses in SWOT tables. These aspects are analysed from the perspective of different stakeholder groups to compare their evaluation of the ASI and to receive a holistic picture. This will help to develop possible recommendations for the debate on aluminium certification.

RQ3: Is the ASI standard a useful and legitimate mechanism for sustainable governance or is there a need for an alternative governance system instead of a voluntary certificate?

The objective is to analyse the legitimacy of the standard, represented by the stakeholder involvement as a proxy, its usefulness from a global perspective and the importance of supporting governance mechanisms for the ASI. Additionally, alternative approaches to a voluntary certification are investigated.

To carry out the analysis, I use the case of aluminium in Germany. I have chosen Germany because it is a representative and major consumer of raw aluminium and manufacturer of aluminium end-products. Furthermore, the German automotive sector is strongly engaged in the ASI design process.

The research is conducted via in-depth semi-structured interviews and a literature review, which are analysed from a sustainability science lens. I apply a transdisciplinary approach and gather qualitative data from Key Informants (KI) from the aluminium sector in Germany to assess the ASI standard from a stakeholder-based, holistic and critical perspective. By applying research on certification systems as a sustainability scientist I aim to expand the field of sustainability science. With the transdisciplinary approach, I aim to generate data together with affected stakeholders and co-create knowledge.

This thesis has the following structure. I first highlight the relevance of aluminium certification. I explain my research design, the theoretical underpinning and chosen methods and data analysis in chapter three. This incorporates research in sustainability science and the transdisciplinary grounding. I then present the significant results of my data in chapter four. In the discussion section (chapter 5), I reflect deeper on the main findings and provide recommendations to develop the ASI standard further. I conclude the chapter with reflections on the research process, study limitations and suggestions for future research.

2 The Importance of Aluminium

2.1 The "Age of Aluminium"[1]

Following steel, aluminium is the second most used metal (Liu and Müller, 2012; Olivieri et al., 2006:269). It is used for automotive, machineries and seemingly "eco-friendly" products like wind turbines (de Schrynmakers, 2009). In 2014, the total primary aluminium production reached a new height of 53 million tons (IAI, 2015). Figure 1 shows the continuous growth of monthly aluminium production over the last 40 years.
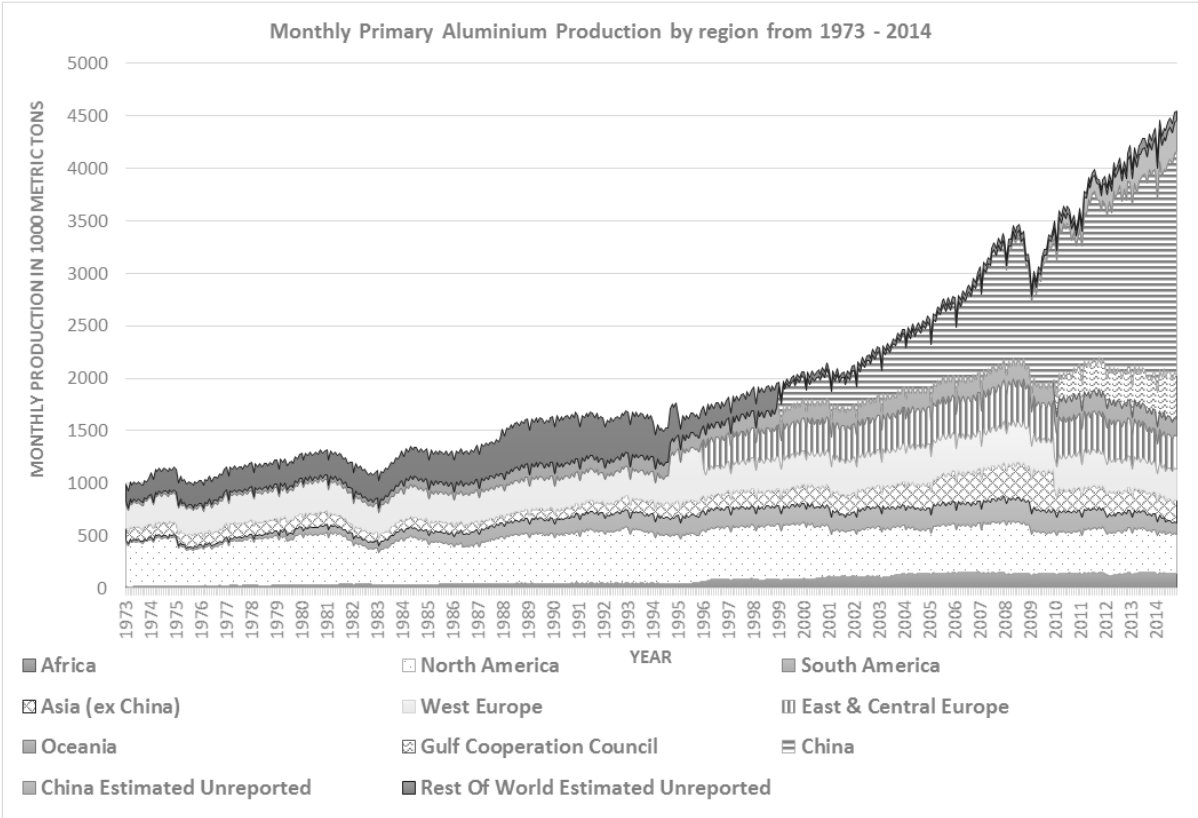
Figure 1 Primary aluminium production. Own illustration based on data from the International Aluminium Institute (IAI, 2015); The graph illustrates the growth of monthly primary aluminium output by region from 1973 till 2014 with an exceptional development of aluminium production in China starting at the end of the 20th century. In 2009, the global financial downturn considerably decreased the global aluminium production, but only for a short period.

The global demand for aluminium is rapidly growing with an expected rate of 3-4.5% per year, mainly driven by China (Bergsdal et al., 2004; Lazarus, 2009). Primary aluminium is derived from mined bauxite, which is a common mineral in the earth crust and can be found primarily in zones of high

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[1] "The Age of Aluminium" is a documentary made by Bert Ehgartner about the health and environmental challenges caused by aluminium. Accessible via http://www.ageofaluminum.com/about-the-film.html (date accessed: 09.03.2015)

temperatures and precipitation, often areas of rainforest such as Brazil and Guinea (IAI, 2012; Olivieri et al., 2006). Figure 2 displays countries with the greatest mining concentration of bauxite.
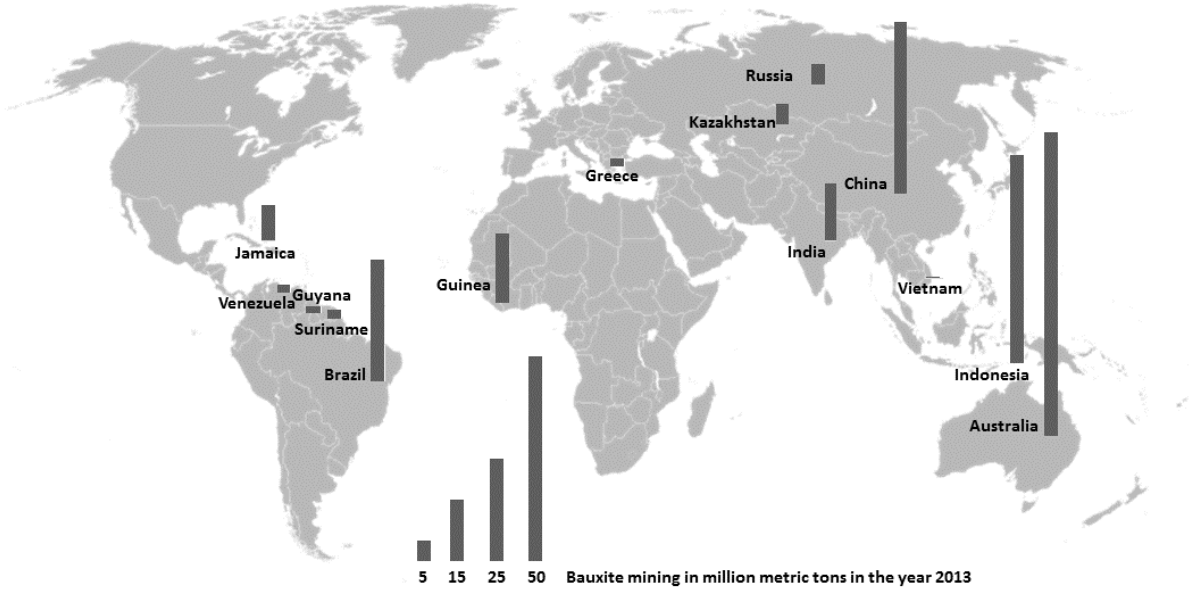
Figure 2 Major countries of bauxite extraction. The map displays the location of bauxite mining on the planet and shows the country output of bauxite in million metric tons in the year 2013. Data derived from the U.S. Geological Survey, Mineral Commodity Summaries, January 2015 (GeologicalSurvey, 2015).

Bauxite reserves are estimated to 29 billion metric tons, which refers to the amount of bauxite that can be mined economically with available technologies and is geological certain (Hydro, 2013:1; IAI, 2012). The demand for aluminium is predicted to double by 2050, which would increase the affiliated sustainability challenges (Bergsdal et al., 2004). Contrary to other minerals and metals, especially *conflict resources*[2], aluminium enjoys a positive reputation in the industry and society while environmental and social consequences of its extraction and use are often overlooked.

2.2. The Global Aluminium Industry

Bauxite mining and aluminium production was controlled by a handful of players for several decades (Nappi, 2013). Today, new companies and countries have entered the sector and lead to a diversification (Nappi, 2013). Ten global players control the most part of the aluminium value chain and therefore shape the market (Olivieri et al., 2006). In 2012, five out of the ten largest aluminium producers were Chinese enterprises (Bell, 2015; Metal Bulletin, 2015). Although the aluminium market is no longer an oligopoly, challenges remain that are linked to its oligopolistic heritage (Olivieri et al.,

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[2] *Conflict resources* (or *conflict minerals*) are natural resources affiliated with the financing of (civil) wars and terrorist groups (Fitzpatrick et al., 2015).

2006). Germany does not mine bauxite and has a declining share of aluminium production; however, it is still an important end-consumer. Automotive being the most important user of aluminium makes Germany a relevant player in the global aluminium sector (Nappi, 2013).

2.3 Sustainability Challenges Caused by the Provision of Aluminium

Bauxite mining and the aluminium production cause considerable environmental and social challenges and create multifaceted economic consequences (Lad and Samant, 2013; Phillips, 2012). Mining generally causes environmental challenges including "deforestation, land damage, visual intrusion and disturbance of hydrological systems, air and water pollution" (Sijinkumar et al., 2014) as well as "biodiversity loss, dust and noise pollution and soil erosion" (Lad and Samant, 2013:1275). The opencast mining of bauxite is an inherently destructive form of mining as it removes all vegetation and the topsoil layer, leading to considerable land use changes (IAI, 2012; Lad and Samant, 2013). Despite efforts to re-cultivate the vegetation, it is unlikely that pristine forests can fully recover (Goodland, 2006; IAI, 2012). During the refining of bauxite, red mud, a highly basic pollutant, is created as a major residue. 60-120 million tons are generated annually without proper ways to further use it or dispose it (Liu and Wu, 2012; Renforth et al., 2012). Spilling of red mud can contaminate water bodies, decrease water quality and eventually affect marine life (Goodland, 2006; Lazarus, 2009). The aluminium industry is one of the greatest energy consumers, approximately using 1% of the total global electricity and releasing 1% of the world's greenhouse gases (IEA, 2009; Liu and Müller, 2012). A considerable amount of electric energy is needed to convert alumina into aluminium, commonly 13.600-15.700 kWh for one ton of aluminium (JointResearchCentre, 2014: Table 4.9).

Raworth (2012) introduced eleven *social boundaries* in order to set the basis for a sustainable societal live of humanity. Mining activities can particularly affect the social boundaries of *income, health care, education, energy, social equity* and *jobs* (Raworth, 2012). A bauxite mining site and an affiliated alumina refining plant can provide rural infrastructure and foster the local economy (Lazarus, 2009; Sijinkumar et al., 2014). Positive side-effects of bauxite mining can be tax revenues, construction of health centres and compensation payments (IAI, 2008). Particularly for indigenous populations, bauxite sites can have an inherent cultural and social value which cannot be compensated by monetary terms (Goodland, 2006; Solomon et al., 2008). Bauxite mining often takes place in political instable and corrupt countries, such as Vietnam, Guinea and Venezuela (BMI, 2007; Transparency International, 2015).

2.4 Sustainability Certification of Aluminium

The certification of aluminium is embedded in a wider CSR context and aims to address the aforementioned sustainability challenges. Within the last decade, CSR and affiliated concepts like Corporate Sustainability (CS) have emerged in the wake of sustainable development defined by the Brundtland Report (Montiel and Delgado-Ceballos, 2014; Pérez et al., 2012; WCED, 1987). CSR remains a contested concept without a clear definition[3] and accepted methodology (Montiel and Delgado-Ceballos, 2014; Turker, 2009). Some scholars even go as far as naming CSR a "tool for sustainable development" (Quiroz-Onate and Aitken, 2007:80). Sustainability certificates are a major tool of CSR (Oosterveer et al., 2014). Since the early 2000s, mining companies thrive for an implementation of sustainable development practices via CSR (Dashwood, 2012; Mudd, 2008). Although a majority of mining companies are officially committed to sustainable development, the implementation of certificates is restricted to a niche market.

Founded in 2012, the ASI is a co-operation between the aluminium industry and NGOs with the goal to establish a global certification for aluminium (ASI, 2014a). It aims to address sustainability challenges from a triple-bottom-line-perspective along the full value chain, ranging from bauxite mining to recycling (ASI, 2014a). Fourteen industry players, including Hydro, Rio Tinto Alcan, Ball Corporation, AUDI and BMW support the ASI in the standard setting and implementation phase (ASI, 2014d). An additional 14 non-industry-representatives from NGOs are involved, including the World Wildlife Fund (WWF) and Transparency International, with the International Union for Conservation of Nature (IUCN) chairing the ASI (ASI, 2015). The decision power is executed on a basis of parity between NGOs and companies. The ASI group has created principles and criteria of the standard as well as a chain of custody report and aims to publish a guideline with indicators in mid 2015 (ASI, 2014c). The ASI consists of eleven principles, which will be supported by indicators, as displayed in Appendix 3.

2.5 Sustainability Certification as Governance

The severity of sustainability challenges demands new forms of governance to initiate a shift towards sustainable pathways (Biermann et al., 2012). There is an ongoing debate on necessary reforms of international environmental governance systems and some voices argue for new institutions to govern sustainability challenges (Kanie et al., 2012). Despite the agreement on a need for change, scholars disagree, which forms of governance[4] could be effective and legitimate (Frantzeskaki et al., 2012; Kanie

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[3] For an extensive summary of definitions of CSR and related concepts, see Montiel & Delgado-Ceballos (2014).
[4] For an extensive analysis of sustainable development and governance systems see Jordan (2008) and Adger (2009).

et al., 2012). Furthermore, the blurred definition of sustainability makes governance approaches towards sustainable development challenging (Frantzeskaki et al., 2012; Jordan, 2008). Voluntary certifications like the ASI are a more recent form of governance to shape and regulate the sustainability impacts of businesses (Oosterveer et al., 2014). The motivation and effectiveness of sustainability certification within CSR is contested in academia (Ness et al., 2009). For some scholars certification schemes initiated by non-state actors can serve as governance systems to fill a governance gap and be a transition towards an economy based on sustainable development (Biermann et al., 2012; Kanie et al., 2012). Few scholars even argue that companies are the primary and only agents of governance that can make this change (Dashwood, 2012; Málovics et al., 2008). Particularly in sectors as mining, sustainability standards could be an important mechanism to lead development in a sustainable direction (Becker et al., 1997). Voluntary standards based on multi-stakeholder processes could be one way to foster the relationship of private and public sectors (Everingham, 2012). But they bear the risk of taking responsibility away from governmental actors, which often have a legitimacy of power, e.g. from democratic votes (Biermann et al., 2012).

3. Research Design

The research in this study is embedded in sustainability science and uses a transdisciplinary approach (Brandt et al., 2013; Jerneck et al., 2011; Lang et al., 2012). The research here responds to one of the seven questions in sustainability science, introduced by Kates et al. (2001:642):

> *"What systems of incentive structures- including markets, rules, norms, and scientific information- can most effectively improve social capacity to guide interactions between nature and society toward more sustainable trajectories?"*

I refer to critical realism and interpretivism as the chosen ontology and epistemology and use a literature review and Key Informant Interviews as my methods.

3.1 Critical Realism

Critical realism takes place at the intersection of the social and natural world. In this context the social world entails the economic system behind the provision of aluminium and the social consequences of those processes, while the natural world represents the environmental challenges (Ewing, 2010). Critical realism recognizes "the reality of the natural order and the events and discourses of the social world" (Bryman, 2012:29). It aims to unravel the layers of truth, hidden relations and reasons for behaviour. The identification of underlying mechanisms can lead to the introduced "changes that can transform the status quo" (Bryman, 2012:29). As sustainability certification schemes are discussed as an entity embedded in CSR as one theory of change, critical realism is a valid ontology. The tools and categories used within critical realism can only be provisional means to grasp a reality (Bryman, 2012). This viewpoint is reflected as interviews can only be a proxy to analyse the reality of sustainability certification. Critical realism rejects the development of knowledge as a linear progress and postulates that knowledge "should be continually critiqued, challenged, and revised as both culture and practice shape the lenses through which we view the world" (Carolan, 2005:2). It can help "to understand our world, our position within it, and the changes needed to make society which is socially, as well as environmentally, sustainable" (Dickens, 2003:104). As critical realism emphasizes the importance of the contextual settings of the study object, I address the sustainability challenge of the provision of aluminium from a holistic viewpoint by including stakeholders (Ewing, 2010). By including stakeholders, taking a German focus, working as a practitioner and conducting a thorough review of aluminium affiliated sustainability challenges, I consider the contextual settings of the research topic.

3.2 Interpretivism

"We live as if the world exists apart from us, but we only know it and understand it through our attempts to meaningfully interpret it, and those attempts at interpretation are in turn influenced by our temporal and cultural location" (Angen, 2000:385; Gadamer, 1994).

From an interpretivist perspective reality is socially constructed and the basis for understanding. Truth can only be achieved by negotiation in a dialogue (Angen, 2000). Interpretivism matches with the transdisciplinary character of this thesis and is compatible with critical realism. Conducting research from a transdisciplinary approach requires "an uncommon willingness of individual scientists to learn and think outside the disciplinary box" (Jahn et al., 2012:8). I do not hold a privileged position as a researcher but aim for an intense cooperation "between the researcher and the researched" (Angen, 2000; Lather, 1986). I follow the assumption of Angen (2000:386f) that "neutrality and impartiality are impossible standards to attain." Instead of seeking objectivity, interpretivism aims to place the discussion of results in a broader scientific debate and does not thrive for an absolute objectivity (Angen, 2000). To reach an adequate quality of my research, I follow the quality criteria for qualitative research by Tracy (2010).

3.3 Research in Sustainability Science

Sustainability deals with complex challenges and aims to identify possible solutions to enable humanity to live in a way that allows the current generation and generations to come to meet their respective needs (WCED, 1987). Already in the 1980s, the idea of a sustainability science was discussed, but only since 2000, sustainability science is gaining popularity within academia (Bettencourt and Kaur, 2011; Kates et al., 2001). It aims to bridge isolated academic disciplines and bring together "theory, practice and policy" in order to analyse and understand the interactions of nature and society (Bettencourt and Kaur, 2011; Jerneck et al., 2011; Kates et al., 2001). Despite the emerging momentum of sustainability science, it is still not considered a complete academic discipline and can rather be described as a "vibrant arena [...] bringing together scholarship and practice" (Clark and Dickson, 2003:8060). Transdisciplinarity is a key component of sustainability science which integrates knowledge across disciplines and actors outside academia to "improve relationships between science and society" (McGreavy et al., 2013:4197; Brandt et al., 2013; Lang et al., 2012).

3.4 Transdisciplinarity

One cornerstone of sustainability science is transdisciplinarity. Transdisciplinary research aims to tackle problems by "improving the understanding of the issue and engaging in deliberation, research

and development" about how to implement change (Hirsch Hadorn et al., 2006:122). Pressing contemporary challenges need to be addressed in a way that bridges scientific disciplines and connects stakeholders from different fields (Dickens, 2003). Transdisciplinarity is an "explicit reaction to these challenges" (Popa et al., 2015:46) and breaks with the established model of isolated, purely academic research within separated disciplines. It addresses the different dimensions, the complexity and the dynamics of sustainability challenges with the aim to show ways of transformation towards more sustainability (Hirsch Hadorn et al., 2006). Researchers within sustainability science are encouraged to "act together with real-world practitioners and take the responsibility to tackle real-world problems" (Brandt et al., 2013:8). In particular, transdisciplinary research should contribute to generate *salient*, *credible* and *legitimate* knowledge, which is closely linked to the aspect of governance, introduced earlier in this thesis (Cash et al., 2003). Transdisciplinarity is not yet a clearly defined approach and lacks a "blueprint" how to apply it (Jahn et al., 2012; Popa et al., 2015). I follow the transdisciplinary approach introduced by Lang et al. (2012) and Jahn et al. (2012), displayed in Figure 3.
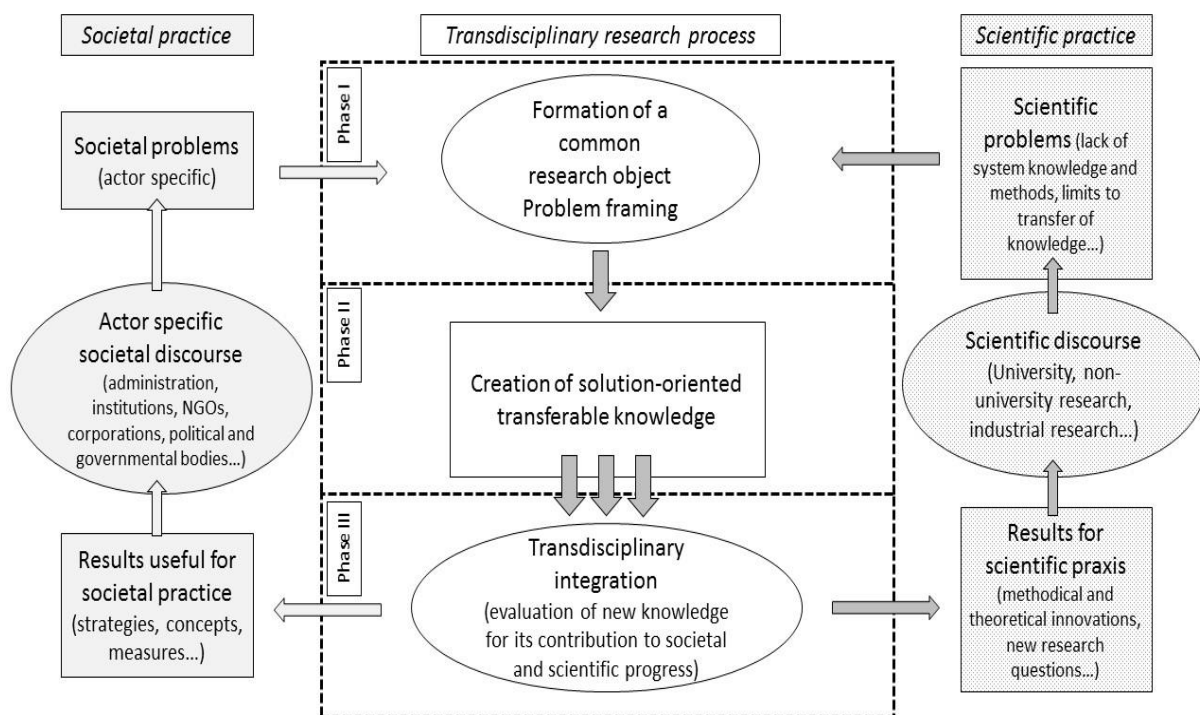
Figure 3 Conceptualization of an ideal transdisciplinary approach (adapted from Jahn et al., 2012; Jahn, 2008, Lang et al., 2012; Bergmann et al., 2005; Bunders et al., 2010). The model describes the process of transdisciplinary research following the three phases: formation of a common research object, creation of solution-oriented transferable knowledge and transdisciplinary integration (boxes in the centre of the model). The column on the left describes the societal processes within transdisciplinary research and how they are

affected by and affect the three phases in the process. The right column refers to the scientific practice and outlines how science is engaged within the levels of transdisciplinary research.

Despite the linear appearance of the model, the process has to be understood as an iterative approach, mirroring the reflectivity of transdisciplinarity (Lang et al., 2012). In the first phase, the worthiness of the ASI as a voluntary certificate and affiliated sustainability challenges of aluminium as a case study are identified as a research topic. Then, the research questions and objectives are formulated and the methodological framework is designed (Lang et al., 2012; Jahn et al., 2012). Together with co-researchers at the UBA, I identified the provision of aluminium as a relevant challenge and framed the objectives and research questions. Two up-front conversations with researchers outside academia helped to refine the methodological approach. The second phase entails the actual research where "different bodies of knowledge" are integrated to generate new knowledge via "goal-oriented collaboration among different disciplines, as well as between researchers and actors from outside academia" (Lang et al., 2012:28; Jahn et al., 2012). This is accomplished by including stakeholders in semi-structured Key Informant Interviews. In a third phase, my results will be integrated into the societal and scientific practice by expanding the literature and providing recommendations for the ASI and decision makers in the industry and NGOs (Lang et al., 2012). By providing the generated data to researchers I aim to steer the scientific debate on sustainable aluminium and trigger new research questions.

3.5 Methods

Neither literature on CSR[5] nor sustainability science suggests a universally accepted method to assess sustainability certificates (Gjølberg, 2009). I use a mixed-method approach consisting of a literature review and qualitative in-depth Key Informant Interviews (KII). The literature review was conducted prior to designing the interview guideline (Kumar, 1989). The outcomes of my literature review are embedded throughout the thesis (Silverman, 2010).

3.5.1 Key Informant Interviews

KIIs are used to gather information and opinions from experts with in-depth insides (Carter and Beaulieu, 1992). It is an appropriate method to unravel the "underlying motivations and attitudes of a target population" (Kumar, 1989:2), regarding their behaviour and understanding of a topic. A qualitative and interpretivist approach is a valid way to achieve an in-depth understanding of the different perceptions on the controversial topic of "sustainable aluminium" (Hirsch Hadorn et al.,

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[5] The discourse on measuring CSR is covered in the academic literature inter alia by Montiel & Delgado-Ceballos (2014), Quiroz-Onate & Aitken (2007) and Korhonen (2003).

2006). I conducted two pre-study interviews with independent scientific experts in the field of resource policy to jointly frame the methodological approach (Manhart and Hütz-Adams, Personal Communication, February 3, 2015). The integration of stakeholders outside academia can lead to a mutual learning experience, eventually leading to shape a pathway for more sustainability (Jahn et al., 2012; Scholz, 2001). By bringing together scientists and practitioners, I aim to strengthen the exchange between stakeholders and produce more "socially robust knowledge" (Brandt et al., 2013:1; Funtowicz and Ravetz, 1993; Tracy, 2010).

3.5.1.1 Preparation of Interview Guideline

The guideline for the interviews consists of open questions to give the experts enough flexibility to "tell their story" (Sherry and Marlow, 1999:4) and to avoid *yes* or *no* answers (Di Ruggiero et al., 2014; Kumar, 1989; Sandelowski, 1993). The interview guideline consists of four major questions and sixteen secondary questions (Kumar, 1989). I started with questions about the present and closed with questions about the future development of the topic (USAID, 1996). At the beginning of an interview I asked for an agreement from the KI whether or not I can audio record the interview. The interview guideline is shown in Appendix 4.

3.5.1.2 Choosing the Experts for the Key Informant Interviews

According to Lang et al. (2012:25), the involvement of actors outside academia is crucial for sustainability science to receive the "best available knowledge" and to "create ownership for the problems and solution options." KIs were chosen deliberately outside academia and from civil society (Takeuchi, 2014). Takeuchi (2014:3) argues that a transdisciplinary approach requires multiple stakeholders, namely "governments, corporations, universities, non-profit organizations, and private citizens". I referred to the groups suggested by Takeuchi (2014) and identified experts with different value orientation to receive a variety of perspectives (Kumar, 1989). I chose experts based on a purposive selection approach with the criteria shown in Table 1 (Bryman, 2012).

Table 1 Requirements and selection criteria for chosen experts.

Overarching requirements	Concrete examples of possible criteria
The expert is exposed to one or multiple topics in a professional manner, e.g. by his job, research, engagement or personal experience.	Topics: corporate social responsibility, aluminium production, resource policy, supply chain management, international sustainability certification schemes, environmental protection and similar.
The expert has a distinct position within his organization that gives him credibility to speak for the organization.	Possible positions (not exhaustive): director for sustainability, research director, environmental manager, head of procurement, contact person for sustainability, supply chain manager, consultant, professor and similar.
The affiliated organization has a significant role in the aluminium chain or has sufficient reputation and authority on the topic.	Possible organizations are: aluminium producers and refiners, big aluminium end-consumers, umbrella organizations, NGOs, consultancies, independent researchers, universities, research agencies and think tanks, governmental institutions, lobby groups and similar.

Chosen experts were encouraged to suggest further experts in a *snowball approach* (Kumar, 1989; Kvale, 1996; Patton, 2002). The total number of experts was 90.

3.5.1.3 Conducting the Key Informant Interviews

On 13 February 2015, invitations were send out via email. An English translation of the invitation letter can be found in the Appendix 5. Twenty-two experts participated, which is a valid number for KII (USAID, 1996; Kumar, 1989). Participants were clustered into the groups *Research and Academia*, *Industry* and *Civil Society* in order to analyse the data for different stakeholder groups' perceptions. The distribution is displayed in a diversity matrix in Appendix 6. The interviews were conducted in German via telephone between February 23 and March 13 2015. One KI participated in written form. In two interviews the KIs brought a colleague, which increased the absolute number to 24 (18 men and 6 women). Eight participants wanted to be anonymous and one person did not want to be recorded. The interviews lasted between 18 and 38 minutes, with an average length of 27 minutes and were conducted by the same interviewer to accomplish consistency (Di Ruggiero et al., 2014). I began each interview with a brief description of myself and the project to establish a trust (Kumar, 1989). During the interviews I followed the interview guideline, asked probing questions and kept a neutral attitude (Kumar, 1989).

3.5.2 Data Analysis

I transcribed the recorded interviews verbatim with the *f4* transcription software (https://www.audiotranskription.de/english/f4.htm). I used the analysis software MAXQDA to store, code and analyse my data (http://www.maxqda.com/). The interviews were not translated into English to avoid losing linguistic nuances (Ryan and Bernard, 2003). I developed my descriptive coding categories after the completion of all interviews which guarantees a sound empirical basis (Kumar, 1989; Ryan and Bernard, 2003). I oriented my search for themes on the key aspects suggested by Ryan and Bernard (2003:89-93): "Repetitions," "Indigenous Typologies or Categories," "Metaphors and Analogies," "Similarities and Differences" and "Missing Data." After the completion of half of my interview data, I tested my initial coding against my data, reorganized the themes and re-coded all interviews (Charmaz, 2006). I analysed the interview data based on an interpretivist perspective by critically assessing the motivation and underlying reasons. I first assigned line-by-line coding to the interview data and later on merged codes to elaborate on key codes (Charmaz, 2006). The final list of coding stripes is displayed in Appendix 7. An example of a transcribed and coded interview text is provided in Appendix 8. I clustered my interview guideline questions to answer my RQs (Ryan and Bernard, 2003).

I use word clouds to display my interview data in order to aggregate and summarize the interview data related to answering RQ 1 and 2. Word clouds consist of mentioned coded interview segments of the corresponding interview question. The word size indicates the relative frequency. Each word cloud is further explained with a summary of interview answers. For answering the second RQ, I use SWOT tables, which consist of the most frequently mentioned coded segments by the interviewees. The SWOT tables summarize the different stakeholder perceptions on strengths, weaknesses, opportunities and threats, which were explicitly mentioned by the KIs. Interesting aspects of qualitative data are the things which are missing or avoided (Ryan and Bernard, 2003). Therefore, I also consider aspects in the discussion, which were not mentioned explicitly by the interviewees.

4. Presentation and Analysis of Results

4.1 Motivation for the ASI Standard

This section provides results for the motivation of companies to implement the ASI within the industry (RQ1). Despite some intersections, the three stakeholder groups greatly differ in their perspective of the reasoning for the ASI.

4.1.1 Motivation from an Industry Perspective

According to the industry, sustainability in the context of aluminium is an old topic, especially regarding CO_2 emissions and energy intensity (Figure 4).

Figure 4 Word cloud on motivation, acceptance and importance of a certification of aluminium from the industry stakeholder perception. For industry stakeholders, sustainability is an old topic for aluminium and the industry is well aware of the sustainability challenges. In the wake of sustainability as a general topic the industry sees the ASI standard as a tool to keep the good reputation of aluminium.

All industry KIs highlighted that the industry is well aware of affiliated sustainability challenges and has an intrinsic motivation to diminish them. A new aspect is that companies nowadays are keen to know the details of their supply chains of bauxite and aluminium. The industry has an interest to quell a possible discussion on "dirty aluminium" before it even emerges. For them, sustainability certification of aluminium is a proactive way to avoid negative reputation. For industry stakeholders, aluminium is a sustainable material with a good image and may not obtain a bad reputation. Efforts for more sustainable aluminium occur in the wake of sustainability as a general topic and due to media coverage on conflict minerals. For the industry, the certification of aluminium is just a part of a larger commitment and CSR strategy. From an industry perspective, companies, especially from the

automotive sector, are the main driver for more sustainability. The certification of aluminium can serve as a strong competitive advantage in a market, which leaves little room for differentiation, making sustainability a "soft success factor." Another motivation for industry KIs is risk mitigation regarding reputation as well as economic losses.

4.1.2 Motivation from a Research and Academia Perspective

For R&A, the general discussion on resources and sustainability in the media and amongst private consumers is slowly affecting aluminium. As shown in Figure 5, the topic is more contested for R&A representatives.

Figure 5 Word cloud on motivation, acceptance and importance of a certification of aluminium from the research and academia perception. For R&A stakeholders, a great variety of reasons lies behind the motivation for the ASI and its applicability in the industry. Media coverage and civil society are the drivers to push the industry towards more responsibility. The industry itself is acting to mitigate its risk and keep its positive image.

Companies become more aware of their accountability and their responsibility for sustainability topics compared to the situation of the mining industry as a "black box" 20 years ago. For R&A KIs the debate on sustainability for aluminium has just recently gained momentum. Greater media coverage of sustainability challenges created a stronger interest amongst consumers. The industry slowly becomes aware of the problem and reacts to the pressure from civil society to avoid a loss of reputation. According to R&A KIs, the German automotive sector wants to achieve a "green" image with products made of aluminium and is a strong driver for a certification. In new market conditions (consumer awareness and sustainability as a topic), manufacturers want to use certified aluminium as a competitive advantage to sell "green" products and increase profits. For R&A KIs, the pressure from civil society and private end-consumers is the main driver for the ASI.

4.1.3 Motivation from a Civil Society Perspective

For civil society, external pressures, such as media coverage of mining catastrophes are pushing companies to engage in sustainability (Figure 6).

Figure 6 Word cloud on motivation and importance of a certification of aluminium from the civil society perspective. For civil society, the media coverage of sustainability challenges of aluminium is pushing companies to react in order to keep their reputation. Overall, the motivation and implementation of the standard is not transparent enough.

Bauxite and aluminium have always been a topic due to the great energy need and the affiliated deforestation and social issues. Too long, the industry merely focused on recycling and neglected consequences related to primary aluminium. KIs from civil society agree that aluminium has a "green" image and companies will do a great effort to keep this reputation. A sustainability certification serves companies as a competitive advantage, especially the automotive sector. By initiating the ASI, companies have surprised civil society with a proactive approach, leaving little time and resources for NGOs to adequately engage in the standard's creation process. Civil society KIs emphasize that governmental initiatives force companies to initiate voluntary standards to anticipate legislation. According to civil society, companies cannot achieve a "green" image as long as they do not become more transparent and minimize sustainability challenges. For all civil society representatives, companies only engage in certification to achieve a good image and minimize risks. The automotive sector is a driver for the increased sustainability of aluminium; however, they in turn are pushed by civil society. For civil society, companies are not the drivers for more sustainability.

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4.2 Shortcomings and Strong Points

How do the different stakeholder groups evaluate the shortcomings and strong points of the ASI standard and its possible contribution upon sustainability? The results show that the three groups differ considerably in their perception of strengths, weaknesses, opportunities and threats of the ASI.

4.2.1 SWOT Analysis for Industry Stakeholders

For industry KIs, the greatest strength of the ASI is the intrinsic motivation of companies to set a high standard by defining their own goals, leading to more creativity and innovation in the design of the standard. Table 2 displays the SWOT analysis for industry KIs.

Table 2 SWOT analysis of the ASI initiative as a sustainability certification of aluminium from an industry perspective. N indicates the frequency of appearing coded segments within the interviews. The total population of coded segments is 347.

Strenghts	N	Weaknesses	N
Intrinsic Motivation of Companies	21	Standard Needs More Members	17
Possibly a High Standard	13	Costs and Resources for Standard Development and Implementation	14
Commitment of Big Players	11	Difficult to Realize for SMEs	12
Stakeholder Involvement	10	Need to Compromise	9
Greater Scope than Mandatory Standards	10	Need for Separate Value Chain	3
Accountability Beyond Legal Compliance	9	Not Mandatory for the Whole Sector	2
Coverage of Full Value Chain	9	Western/European Perspective	2
More Flexibility/Adjustability	8	Lack of Internal Communication and Problem Awareness	2
Easier to Implement on a Global Scale	6	Implementation Needs a Long Time	1
Possibility of NGOs to Engage in the Decision Making	5	Means of Control/Monitoring	1
Opportunities	**N**	**Threats**	**N**
Competitive Advantage	17	Must be Applicable	25
Commitment of the Automotive Sector	9	Competitive Disadvantage for Standard Members	11
Can Become a Role Model	8	Missing Demand	9
Companies fill a Governance Gap	8	Rising Costs of Aluminium	9
High Acceptance Amongst other Companies	6	High Uncertainties	9
Front Runner	5	Missing Supply	8
Intra Company Pressure	5	Difficult Implementation	8
Implement a Sustainability Strategy in Management	4	Transparency not High Enough	5
Creating a Win-Win-Situation	2	Dependency on Aluminium Provision	5
		Acceptance in the Market	3

The ASI can go beyond legal compliance and become a high standard for sustainability certification on a global scale. According to the industry, voluntary standards are stricter than governmental initiatives. The ASI covers the full value chain of the mass material aluminium, which is a novelty for the field of sustainability certification. Another strength for the industry is the stakeholder involvement, which gives credibility to the ASI. For the industry, the ASI can be applied internationally and have a greater impact on sustainability than a governmental legislation.

A weakness for industry KIs is the limited number of members. A difficulty is that some companies are pursuing a "wait and see" approach until the success or failure of the scheme is obvious. Until then, they let the front-runner companies pay for the "trial-and-error" costs. There are always trade-offs: the standard needs to be ambitious enough, but it may also not be too ambitious. A distinct weakness is that SMEs lack the resources to engage in the ASI and to bear the implementation costs.

Industry KIs see several opportunities of the ASI. The standard can become a strong competitive advantage and be a role model for other mass produced materials such as steal or copper. If successful, ASI has the potential to trigger a new wave of certification systems. As more and more companies implement the ASI, it might develop into a quasi-mandatory standard.

Threats seen by the industry are the applicability of the ASI. The standard needs a critical mass of members and certified material. If the certification leads to rising aluminium costs the standard will fail and create a competitive disadvantage. There needs to be an optimum of demand and supply of certified aluminium. The bauxite market is an oligopoly. If a company commits to only buy certified aluminium, it might be dependent on one vendor, which could threaten a secured access to aluminium.

4.2.2 SWOT Analysis for Research and Academia Stakeholders

R&A interviewees agree with the industry that the intrinsic motivation and full value chain coverage are the greatest strengths of the ASI, as shown in Table 3.

Table 3 SWOT analysis of the ASI initiative as a sustainability certification of aluminium from a research and academia perspective. N indicates the frequency of appearing coded segments within the interviews. The total population of coded segments is 322.

Strenghts	N	Weaknesses	N
Intrinsic Motivation for Companies	12	Standard Needs More Members	19
Coverage of full value chain	8	Costs and Resources for Standard Development and Implementation	16
Stakeholder Involvement	7	Need for Separate Value Chain	11
Accountability Beyond Legal Compliance	6	Lack of Internal Communication and Problem Awareness	10
Possibly a High Standard	5	Difficult to Realize for SMEs	9
Independent Monitoring	5	Not Mandatory for the Whole Sector	6
Clear Common Goal	4	Thriving for Economic Growth as a Priority	4
Easier to Implement on a Global Scale	2	Illegal Sector not Addressed	3
More Flexibility/Adjustability	2	Lacking Sanctions	3
Greater Scope than Mandatory Standards	2	Means of Control/Monitoring	2
Opportunities	**N**	**Threats**	**N**
Front Runner	6	Difficult Implementation	15
Can Become a Role Model	4	Oligopoly Market Structure	14
Competitive Advantage	4	Governments do not Take Responsibility	13
Implement a Sustainability Strategy in Management	3	Rising Costs of Aluminium	12
High Acceptance Amongst other Companies	3	Acceptance in the Market	11
Can Create a Win-Win-Situation	3	Companies fill a Governance Gap	8
Commitment of the Automotive Sector	2	Missing Supply	8
Positive Impact on Sustainability Challenges	2	High Uncertainties	8
Intra Company Pressure	1	Lobby Power of the Industry	8
		Missing Visibility of the Standard	7

For R&A interviewees, the involvement of stakeholders is a key aspect of the ASI and offers critical NGOs the possibility to participate in the standard setting process. According to R&A, it will be easier to implement the standard globally, compared to a legislative system and with its greater flexibility, the standard can be re-adjusted and improved on a continuous basis.

R&A KIs also see distinct weaknesses: Certified aluminium requires management, logistics and administrative capacities, eventually even a separate value chain. This can cause high costs, particularly for SMEs. A key aspect is the limited number of members. The commitment of the automotive sector is a good start but it requires gaining bauxite producers on the ground.

For R&A stakeholders, the main opportunities of the ASI lie in the unique chance to implement a standard of a mass material amongst borders and in being a role model for other metals. It could trigger a new way of thinking and understanding sustainability as a priority amongst top managements. This sensitisation for sustainability could improve the willingness of companies to engage in other sustainability efforts beyond the ASI.

Threats seen by R&A KIs are the high uncertainty whether the ASI can gain enough members and really contribute to a more sustainable aluminium provision. The particular threat is that the ASI cannot hold its high promises. Other than the industry KIs, R&A representatives see a threat of companies, which

are filling a governance gap. It is unclear if the aluminium consumers, mainly the automotive sector, will create sufficient demand to push the standard forward and whether the producers can offer enough supply. The lobby power of an oligopoly market could hinder the wider application of the ASI. In the case that big aluminium producers currently not participating in the ASI refuse to become members, companies would simply not be able to buy certified aluminium.

4.2.3 SWOT Analysis for Civil Society Stakeholders

Civil society KIs regard full value chain coverage as the greatest strength. Additional aspects are displayed in Table 4.

Table 4 SWOT analysis of the ASI initiative as a sustainability certification of aluminium from the civil society perspective. N indicates the frequency of appearing coded segments within the interviews. The total population of coded segments is 173.

Strenghts	N	Weaknesses	N
Coverage of Full Value Chain	7	Transparency not High Enough	14
Accountability Beyond Legal Compliance	3	Lack of Internal Communication and Problem Awareness	9
Greater Scope than Mandatory Standards	2	Thriving for Economic Growth as a Priority	8
Certification of a Mass Material	1	Embedded in Existing Economic and Governmental Systems	8
Possibly a High Standard	1	Not Mandatory for the Whole Sector	7
Commitment of Big Players	1	Lacking Sanctions	6
Stakeholder Involvement	1	Means of Control/Monitoring	6
		Possibility of NGOs to Engage in the Decision Making	6
		Missing Compliance with Cartel Law	5
		Standard Needs More Members	4
Opportunities	**N**	**Threats**	**N**
Commitment of the Automotive Sector	3	Insufficient Impact on Sustainability Challenges	12
Companies Become Aware of Sustainability Challenges	3	Governments do not Take Responsibility	10
High Acceptance Amongst other Companies	2	Rising Costs of Aluminium	10
Front Runner	1	Certification of a Status Quo	9
Can Become a Role Model	1	Shifting of Burden	6
		Possible Corruption	5
		High Uncertainties	4
		Difficult Implementation	2
		Missing Demand	2
		Externalisation of Costs	2

Civil society representatives see more weaknesses and threats, mainly lacking transparency. The monitoring capabilities are limited and not necessarily independent. There are no (legal) consequences besides the exclusion of the company from the membership.

Although stakeholders are engaged in the decision making, many NGOs, especially from the Global South do not have the resources to participate. Civil Society KIs appreciate the possibility for NGOs to engage in the ASI, but the current setting makes participation difficult for NGOs with limited resources. The current form of stakeholder involvement is regarded a weakness. If more standards are designed,

NGOs will not be able to engage, while companies have the resources to dominate the process. The ASI might violate cartel law aspects (e.g., WTO and German Antitrust Laws). As the aluminium market is an oligopoly, a certification might lead to price agreements and a discrimination of market actors. Although companies commit to a standard, their ultimate goal and business model are based on the existing capitalist system, which thrives for growth and for continuous mining and production of aluminium. A certification will only give this business model a green coating, but not change the underlying problem of mining.

Civil society KIs see opportunities of the ASI: even if the certification of aluminium will not significantly affect sustainability, the process as such can lead to a greater problem awareness amongst companies, increased communication and a new dialogue with civil society. Again, if the ASI achieves a requisite degree of success, it could quickly be a role model for other mass materials.

Civil society representatives also see important threats: The standard might not cope with its promises and time will tell if it can have a positive impact. A voluntary certification system fills a governance gap as states do not have the capability or are not willing to set a legal framework. Governments do not take the responsibility they should, and partly leave the legislative and executive authority to private companies. So far, the standard is mainly supported by European and industrialized countries, while emerging countries are left out. This might lead to a shifting of burden: instead of processing aluminium in industrialized countries, the burden of production, including the emissions and environmental consequences might shift areas where non-ASI-members operate.

4.2.4 Possible Impact upon Sustainable Development

This aspect is addressed from the answers of all stakeholder groups, as the interview data is limited. As the ASI is not implemented yet, all KIs were careful in their predictions on the standard's effectiveness. Most KIs acknowledged the ambitious goals and are certain that the ASI can have a positive impact on sustainability. For some front-runner companies, the ASI guidelines and possible threshold values are not ambitious enough. For the KIs, energy efficiency, decreased land grabbing, emission reduction and work safety are areas where the ASI could lead to an improvement, whereas social aspects are more difficult to address with the standard. Four KIs mentioned that the ASI cannot be a panacea for all sustainability challenges. It is not curing the problem of mining for limited resources per se but deals with the symptoms. KIs emphasized that the ASI can have a contextual impact but needs additional measures such as capacity building, development aid, additional laws and consumer awareness to have an impact. Sustainability efforts of the ASI might also lead to a problem shifting. Minimizing sustainability challenges by the ASI standard could trigger new challenges, e.g.

caused by hydropower plants used to refine "low emission" aluminium. To some KIs, it still lacks clear goals and monitoring and they emphasize the difficulty to objectively quantify the impact.

4.3 The ASI as a Governance Mechanism

4.3.1 Involvement of Stakeholders in the ASI

Industry representatives attest the ASI a great stakeholder involvement, while R&A KIs see a controversial role and civil society representatives criticize the current form of stakeholder involvement.

4.3.1.1 Industry Perspective on Stakeholder Involvement

For Industry KIs the distribution of power between the NGOs and the industry is balanced and considered very high. There is a fair and constructive discussion between the industry and the civil society. Every indicator and threshold value is decided in agreement with NGO representatives. Companies appreciate the involvement of NGOs if it is constructive and goal oriented. There should be a fair and honest ambience in the discussions. Multi-stakeholder-dialogues help both sides to overcome reservations. Industry stakeholders encourage using the process of stakeholder involvement as an example for other initiatives.

4.3.1.2. Research and Academia Perspective on Stakeholder Involvement

For R&A KIs, the involvement of stakeholders is regarded strong. Compared to the mining industry 20 years ago, the invitation of stakeholders is already a big step to achieve more transparency. For two KIs, the participation is a double-edged sword, as NGOs might lose their reputation if they compromise too much. Eventually the industry has the greater capacities and the final decision to implement the standard. The decision will likely result in a minimal-consensus because both sides have to give up their extreme positions. Whether or not this is beneficial for sustainability is a different question.

4.3.1.3 Civil Society Perspective on Stakeholder Involvement

For civil society representatives the willingness of companies to let NGOs participate in the standard design is a good start and should be fostered. Most NGOs, especially from emerging countries or representing minority groups, do not have sufficient know-how to engage in these multi-stakeholder processes. Civil society KIs emphasize that as more and more standards are created, NGOs get overwhelmed and cannot oversee or criticize them sufficiently. NGOs have a greater possibility to participate than they can use regarding their capacities. In the context of global mining, German NGOs

have a weak position as they do not have a direct link to these challenges and because mining does not have a prominent role in Germany, compared to other topics like rainforest protection.

4.3.2 Importance of supporting Governance Structures for the ASI

I present the importance of supporting governance structures for the ASI from the answers of all stakeholder groups, as the interview data is not sufficient for separate word clouds. For all KIs, governance, especially local governance structures play an important role for the success of a certification, but the picture is diverse (Figure 7).

Figure 7 Importance of governance environment for the success of the ASI from the perspective of all stakeholders. The word cloud does not show a clear tendency of interview answers. Instead, a variety of aspects are important for the relation of governance and the ASI standard.

All stakeholders agree that capacity building should be increased by states and international institutions. A standard alone cannot improve the local governance. Additional measures, such as international development aid, need to support the ASI to have an impact on sustainability. According to the interviewees, capacity building should focus on reducing corruption and foster transparency and access to information. For KIs, explicit activities could be the creation of workers unions, training of auditors and consultancy of local environmental agencies. Functioning local structures in the mining countries are a necessity for the ASI implementation. Without functioning local governance, the risk for corruption and non-transparent processes is high. In many bauxite-mining countries the legislative regulations are low, leaving a great gap for companies to fill. According to the KIs, the influence of companies on local governance is often overestimated and companies can only to a certain extent contribute to building functioning governance systems.

4.3.3 Alternative Governance Systems Instead of a Voluntary Certification of Aluminium

Most of the KIs could not envision an alternative to the strict separation of voluntary certification approaches and governmental legislation. Instead of companies, industry umbrella organizations could set regulatory standards for their members, e.g. via DIN norms. Several KIs suggest a hybrid form based on an extended multi-stakeholder-process where companies, NGOs and governmental bodies jointly develop a system. The debate on more sustainable resource usage is often limited to the separation of voluntary certification or governmental regulations. Three KIs suggest ending this debate and thinking about new forms of business models and legislative concepts. Instead of a certification of aluminium, which does not necessarily change the structures along the value chain, two KIs suggest to foster the global cooperation of governmental bodies to build strong institutions, making a certificate superfluous.

5. Discussion and Concluding Remarks

5.1 Motivation for the ASI Standard

What is the motivation for implementing a sustainability certification scheme for aluminium?

> **The motivation of companies to initiate the ASI is to sustain their business, keep their reputation and achieve a competitive advantage. A contribution to a more sustainable pathway of aluminium production is only a secondary motivation.**

The findings show that a majority of KIs consider a competitive advantage as a major motivation for the ASI. As introduced earlier, the aluminium production of Europe and Germany, at best, remains stable since the 1970s. Only since the beginning of the 2000s, China and Asian countries entered the aluminium sector and almost exponentially increased their output. It might be more than a coincidence that the ASI standard comes at a time when German producers realize their shrinking importance in the aluminium sector. Although the standard aims to be internationally applicable, the findings show that it is mainly discussed in European and Western perspectives. The question has to be raised whether the true motivation for the ASI is a true commitment to sustainability, or, rather, if it is being promulgated to gain competitive advantage, e.g. over China.

The findings show that media coverage and pressure from civil society reached a tipping point where companies need to take actions to keep their reputation. Despite the industry's argument that the ASI emerged from an intrinsic motivation, the findings from civil society and R&A contradicts this and state that the "intrinsic motivation" is based on external factors. Companies are not acting intrinsically but are pushed by external effects. This implies that for other sustainability challenges beyond aluminium production, a critical mass of external power is needed to initiate a change as companies do not have an inherent motivation to contribute to sustainability.

Academia has long assumed that companies only opt for certification schemes in order to avoid governmental regulation (DesJardins, 1998). One outcome of this study is that companies, regardless of their underlying motivation, are willing to accept their responsibility for social and environmental consequences of the aluminium production. This commitment contradicts the long held perception of CSR as a mere compliance with existing laws and is a promising step to re-define CSR and the role of companies (DesJardins, 1998). Regardless whether or not the industry has good intentions to create a sustainability certificate for aluminium, the creation of the ASI can be considered as a good intention.

5.2 Strengths, Weaknesses and the Contribution to Sustainable Development

How do different stakeholders evaluate the related benefits and shortcomings of the ASI standard, its applicability and the possible contribution upon more sustainable aluminium?

5.2.1 Benefits and Shortcomings of the ASI Standard

> **The full value chain coverage, the high ambition of the standard and the possibility to be a role model are distinct are areas of high priority of the ASI. Implementation costs, rising aluminium prices and a small number of members are key shortcomings. The actual impact on sustainability and the level of transparency are highly disputed amongst the stakeholder groups.**

For industry KIs, the greatest strength of the ASI is the intrinsic motivation of companies to set a high standard by defining their own goals, leading to more creativity and innovation in the design of the standard. The ASI can go beyond legal compliance and become a high standard for sustainability certification on a global scale. According to the industry KIs, the ASI as a voluntary standard would be stricter than governmental initiatives. This coincides with previous studies on the effectiveness of voluntary standards: As voluntary standards operate in areas that are often non-regulated by states, it is not surprising that they have stricter guidelines (Ponte and Cheyns, 2013). Since gaining a competitive advantage is a major motivation for establishing a standard, it makes sense for companies to create an ambitious standard, which excludes market competitors. However, the ASI has a distinct weakness, which undermines the high ambitions: The standard is not mandatory and cannot address the illegal production. Furthermore, the scheme lacks monitoring capacities and the possibility to declare sanctions for violations, which makes it unenforceable. If the ASI does not establish an independent third-party monitoring system, the certificate could be accused to be nothing more than "greenwashing" (Blowfield, 2005). The only way to assure the enforcement of the standard is to involve independent auditors or governmental bodies to monitor the compliance with the certificate.

All stakeholders agree that the ASI standard is a front-runner for a certification of a mass material and could be a role model for other industries. It is logical that industry KIs consider the ASI as a role model for other resources, but very surprising that even civil society and R&A interviewees agree on this point. This could be explained by the high ambitions of the ASI and the fact that no other standard for a mass material (like aluminium) exists. The commitment of the automotive sector is highlighted as a key opportunity. There is a high probability that the ASI will be implemented, simply because the supporting automotive sector cannot let it fail. The responses indicated that both industry and R&A stakeholders regard a competitive advantage as a major opportunity of the ASI. This is in line with the

findings of the underlying motivation of companies. Surprisingly, all stakeholders regard a positive sustainability impact only as a minor opportunity. Nevertheless, the ASI could help to mainstream sustainability thinking throughout the life cycle of products (Biermann et al., 2012).

All stakeholders regard possible higher aluminium prices as a potential threat to the implementation of certified aluminium. The stakeholders follow the assumption that minimizing negative sustainability impacts would raise aluminium prices. This implies that the current price for aluminium is not the "right" price from both a sustainability and economic perspective. If the price is too low, it is due to a market failure. The current "cheap" price of aluminium is only possible because other stakeholders bear the true costs for aluminium, e.g. the consequences of environmental destruction, pollution and exploitation of labour (see chapter 2.3). The ASI could help to establish a "right price" of aluminium in the market (Rennings and Wiggering, 1997). I argue that a sustainable certificate for aluminium should go even further and include goals to successively decrease the amount of primary aluminium, e.g. via quotas.

5.2.2 Applicability of the ASI Standard in the Aluminium Industry

A feasible applicability of the standard is a key success factor for a market penetration. SMEs are particularly important as implementers, but are not sufficiently supported. It remains questionable whether the aluminium market structure will facilitate or hinder the standard's implementation.

The aluminium market is an oligopoly and the supply chains of a mass material can be monitored (see chapter 2.2). Therefore, the monitoring of aluminium should at first sight not be a great challenge. Surprisingly, the data shows that there is a variety of difficulties to implement this standard in the market. Currently, the initiative is driven by a handful of large global aluminium players. However, the majority of companies, which might implement the standard are SMEs with lacking capacities to comply with the standard. It is crucial for the standard's success to consider the special needs of SMEs and to integrate them in the ASI. The oligopoly aluminium market is a double-edged sword. On the one hand, this structure might simplify and accelerate the implementation globally. On the other hand, the sheer market power of some aluminium players, especially outside Europe could prevent an implementation.

5.2.3 Contribution of the ASI upon a More Sustainable Processing of Aluminium

> **It is uncertain to what extent the ASI can contribute to sustainability. Despite possible negative side effects, the ASI could have a positive impact along the aluminium value chain. Most importantly, additional supporting governance mechanisms are needed to make it an effective tool.**

The creation of a standard and the fulfilment of the standard's objectives can be used to assess the effectiveness of the ASI (von Geibler, 2013). As the ASI is still in the design phase, this thesis only refers to a possible impact and effectiveness. The data shows that a majority of KIs regard the ASI as a role model for more sustainability and reveals the great hopes lying on the standard. Nevertheless it is necessary to be realistic on the actual impact. One has to keep in mind that aluminium is only one element and a fraction of the global economy. Aluminium is only one component of manufactured goods, e.g. cars. In a worst case, products stamped "sustainable aluminium" could be produced in miserable working conditions and create considerable environmental consequences. A certificate will not solve all global sustainability challenges but might be effective in its niche (Biermann et al., 2012). The aluminium industry should understand the ASI standard as one tool out of many necessary actions to reach a sustainable development pathway. All KIs demand additional involvement and resources from actors outside the ASI, such as governments and consumers. Companies should not assume that compliance with a standard will automatically make their business sustainable (Székely and Knirsch, 2005). A deeper commitment to sustainable development throughout the business culture is needed, including top management. More communication amongst different departments is necessary and sustainability approaches should not be a niche in the CSR department.

This findings concur with other studies on sustainability standards that certificates need to be embedded and supported by political and development cooperation measures (von Geibler, 2013). The effectiveness of the ASI could be increased by creating a general strategy for sustainability amongst companies and organizations to create a holistic approach. The ASI would be just one mechanism out of many for such a strategy. Supporting measures such as development aid and capacity building, e.g. by the UN, need to set the basis for a successful implementation of the ASI. More precisely, this should entail the generation of workers' unions, environmental agencies in bauxite extracting countries and strong governmental institutions.

Stakeholders from civil society R&A imply that the standard could also negatively affect sustainability. The Porter Hypothesis, a theory in environmental economics, claims that strict environmental regulations can increase the competitiveness of companies via efficiency and innovation (Montiel and Delgado-Ceballos, 2014). The Jevons paradox (also called rebound effect) could in turn lead to higher

overall usage of resources due to more efficiency (Málovics et al., 2008). These two effects cannot be transferred directly to a certification, but the ASI standard will likely lead to a perceived better reputation of aluminium. It is debatable whether or not an improved reputation of aluminium would lead to an increase in overall aluminium demand. However, there the ASI does not aim to decrease the total aluminium consumption but merely fosters a shift to certified aluminium. Assuming the ASI standard would be implemented in a majority of industrialized countries where environmental regulations are already sound, it might lead to a production shift. Companies, which do not want to comply might relocate production facilities to countries with lower environmental standards than Germany. This is a mayor pitfall of the voluntary aspect of a certificate. In sum, higher sustainability standards might come at the cost of an absolute negative impact on sustainability due to shifting origins (Pepper, 1998).

The interview analysis reveals a growing awareness of all stakeholders on the importance of sustainability. The certification of aluminium can be seen as a development of the product rather than an attempt to increase the demand. To a certain extent this notion contradicts with the established economic model of maximizing profits, most often achieved by increasing the production output. The certification could be understood as an approach within the de-growth idea, as absolute quantitative aluminium production is replaced by a qualitative development of the product. Therefore the ASI could (maybe unintentionally) lead to a paradigm shift from market economics to economic sustainability (DesJardins, 1998).

The ASI standard can be a front-runner for new incentive systems for companies where e.g. sustainability criteria supplement economic and performance criteria (Málovics et al., 2008). Front-runners are crucial for the success of certificates in a broader perspective, in this case minerals in general, because they inspire weaker standards to follow the high ambitions, e.g. of the ASI (Derkx and Glasbergen, 2014). Incentives, which acknowledge the natural capital and environmental consequences of aluminium are one piece of the sustainable development puzzle. The actual achievement of the ASI could be to mainstream a vision of sustainable development in the field of CSR (Rennings and Wiggering, 1997).

5.3 Usefulness of the ASI Standard as a Governance Mechanism

Is the ASI standard a useful and legitimate mechanism for sustainable governance or is there a need for an alternative governance system instead of a voluntary certificate?

5.3.1 Legitimacy and Stakeholder Involvement

> **The ASI offers a great possibility for stakeholders to engage in the standard setting and decision-making processes. However, many NGOs do not have the capacities to engage in such multi-stakeholder-processes. NGOs only indirectly represent affected stakeholders and the ASI per se is not a legitimate mechanism from a democratic perspective. The legitimacy of the ASI is debatable as greater effectiveness might come at the cost of lower legitimacy.**

An ideal governance system for sustainability respects the planetary boundaries and provides "legitimate and effective policy responses to potential changes to natural systems" (Kanie et al., 2012:297; Rockström et al., 2009). Actors and institutions within an ideal system need to adapt and learn in an environment of change, involve multiple stakeholders and disciplines and co-operate with global institutions (Kanie et al., 2012). By principle, all KIs agree that the ASI offers a great possibility to stakeholders to engage. Stakeholder inclusiveness, including a "system of checks and balances" (Kanie et al., 2012:298) as well as transparent decision making, is a key success factor for sustainability governance. However, the ASI needs to be a functioning decision making body and simultaneously incorporate the voices of truly affected stakeholders. Hence the involvement of stakeholders can be contested.

A key finding is that many NGOs do not have the capacity and resources to participate in multi-stakeholder-processes. This is not a particular weakness of the ASI but an inherent issue of all multi-stakeholder-processes. If not all invited parties have the adequate means to participate, the credibility of the certificate will likely suffer. In order to stay independent, NGOs cannot receive compensations from the certification initiative. Therefore, third-party actors, e.g. the UN or governmental bodies should provide funding for NGOs to facilitate participation. NGOs are only a proxy to represent stakeholders which are directly affected by aluminium affiliated challenges. Even NGOs which represent indigenous people are only the second best solution to give these people a voice in international negotiations like the ASI. It is questionable if NGOs are a legitimate form of representation for affected stakeholders and how they receive their legitimacy (Reiser and Kelly, 2010).

The debate on stakeholder involvement may not neglect stakeholders with an immense power: private consumers. Not companies but private consumers demand aluminium products. It is not the responsibility of the ASI to question the system of growth but to decrease negative sustainability consequences along the aluminium lifecycle. It would be presumptuous to assume that a certification could encourage consumers to use less aluminium. It is the responsibility of each consumer to decide

whether or not to buy more aluminium-based products. A certificate for aluminium will not take away responsibility from consumers. Málovics et al. (2008) argue that consumers demand low prices and a commitment to sustainability from companies. Most likely consumers will not forego aluminium. But if consumers are willing to "pay for sustainability" the standard could at least diminish some negative impacts. In this regard, the ASI might increase the awareness of a wider public on the topic.

Similar to other certificates, an inherent weakness of the ASI is that it does not have the same legitimacy as a governmental legislation (von Geibler, 2013). The ASI is not a democratically legitimized object in a strict democracy policy sense (von Geibler, 2013). As the ASI is a non-state governance mechanism, it can primarily gain legitimacy via its output and effectiveness (Keohane and Nye, 2003; von Geibler, 2013). Despite the need for a pragmatic level of participation, the ASI should thrive for a greater inclusiveness of stakeholders on the ground in a two-way communication process (Kanie et al., 2012). Biermann et al. (2012:56) argue that "[e]nvironmental problems are inherently political in nature" and policies should therefore be "both equitable and effective". Legitimate governmental bodies would be an equitable but likely ineffective approach, whereas the ASI standard might compensate legitimacy, from a classical understanding of power, with an effective contribution towards sustainability. Therefore, new forms of hybrid-governance (public-private-initiatives) need to be implemented to combine the legitimacy of governmental bodies with the greater scope and effectiveness of voluntary certificates (Ponte and Daugbjerg, 2015). In such hybrid forms, companies could provide system management, set indicators and promote the standard, while governmental bodies would monitor the system and sanction violations (Ponte and Daugbjerg, 2015).

Transparency is one of the key prerequisites for a legitimate sustainability standard (von Geibler, 2013). For the ASI, the findings show a contested role of transparency. While industry KIs praise the strong transparency of the ASI, civil society interviewees see a lacking transparency as the greatest weakness of the standard. It is crucial for the ASI to improve its own transparency in order to become a legitimate and credible standard.

The certification of aluminium is embedded in a Western worldview. The ASI recognizes indigenous rights and values in its catalogue of principles. However, it is formed within a capitalist economic system and tries to impose a certification system in a local context, which might have different institutional settings. A concept of monetizing natural resources with a certificate might be contested for people living in systems without monetary values for natural resources, or land rights and where land and resources might have cultural and social values that cannot be expressed in monetary terms (Banks et al., 2013; Thondhlana and Shackleton, 2015). It is therefore questionable to what extent the standard can be legitimate in different cultural and societal settings.

The question of usefulness and legitimacy also refers to costs and benefits. Who will bear the costs for certified aluminium? Even the most ambitious standard will fail if local (governance) structures are insufficient and the market does not value certified aluminium. Will the ASI enforce the "polluter-pays-principle" or will the costs be transferred to end-consumers? To what extent would this standard be legitimate if companies would simply shift the full costs to consumers? In order to have a fair and legitimate distribution of financial burdens, the actors in the aluminium value chain with the greatest value-adding steps, most likely OEMs, would need to bear the lion's share of the additional certification costs.

5.3.2 Alternatives to a Voluntary Certification

> **Within the dominant economic system, there are no functioning alternative approaches besides a voluntary and a legislative regulation. Due to the complexity of the aluminium chain, governmental bodies are unlikely to set a global legislative framework and instead leave this task to voluntary certificates.**

Although a few KIs suggest possible hybrid forms, a majority claims that either governmental or company initiatives will determine the pathway of sustainability regulation. Within the prevailing economic neo-liberal paradigm, there is a strong inclination towards market self-regulation via sustainability certification. The choice is limited to voluntary or legislative approaches for more sustainability. Regarding the findings, it is indisputable that there is a global governance gap on resource regulation (Ponte and Daugbjerg, 2015). One group of KIs sees the ASI standard as a necessary instrument to fill this gap while the opponents claim that companies impose this governance system to take away power and responsibility from states. It is too easy to accuse states of not filling this governance gap with regulations. As bauxite extraction and aluminium refinement are cross-border issues, a variety of affected states would need to come to a binding agreement. Setting such agreements is a slow and difficult process, as the climate change summits show. Even if a regulative framework would be implemented and monitoring capacities existed, it would be unclear where to set the boundaries and where to allocate responsibilities. Should aluminium-consuming-countries like Germany financially support such a regulation? Should they actively monitor the compliance in other countries? It is not necessarily the case that governments do not want to regulate aluminium, but they might not be capable due to the complexity of the value chain (Ponte and Daugbjerg, 2015). A voluntary certification is currently the only feasible way to address sustainability challenges of aluminium along the entire value chain. Even if the ASI standard might have a lower legitimacy than a mandatory state legislation, it is currently the only mechanism that is applicable. This leads back to the

CSR based debate on the general responsibility of companies. A majority of KIs appreciate that companies try to fill a governance gap with a voluntary standard. This is in line with previous studies, which state regulatory gaps can be filled easier by voluntary standards than governmental legislations (Derkx and Glasbergen, 2014).

I argue that the ASI standard should serve as a supplementary governance framework and be the first step towards a more binding system. It does not have the legitimacy to withdraw authority from legal governmental entities. Ideally, the ASI standard should be improved in a way that it can reinforce statehood of governmental institutions (von Geibler, 2013). Eventually, the coexisting of certification systems and governmental legislations could lead to an improved state of checks and balances for both systems (Ponte and Daugbjerg, 2015).

5.3.3 A System Shift towards Sustainable Economics

> **In regard of pressing sustainability challenges, a voluntary certification is the only promising approach within the given economic and political system. In the long run there is a need for a system shift towards a circular economy that replaces growth with qualitative development.**

The ASI is grounded in a capitalist paradigm, which implies that the system of unlimited production of aluminium shall be sustained (Pepper, 1998). It is contested whether sustainable development can be achieved within the current economic system or if a completely new system is needed (Biermann et al., 2012). For a majority of KIs it is not a contradiction that CSR and the ASI are embedded within the dominant neo-liberal economic system. Hardly any of the KIs mentioned that the system of unlimited mining will not work endlessly. The mining of natural resources is inherently unsustainable and the ASI standard will not change the process of mining. Therefore, the ASI might be a threat to sustainable development as it sustains the unsustainable process of mining and does not question the necessity of further extracting non-renewable-resources. Instead, I argue that CSR measures and sustainability certification should be based on a "model of sustainable economics" (DesJardins, 1998). Economic growth is a key element of today's economic system and a certification of aluminium accepts the "moral legitimacy of economic growth" (DesJardins, 1998). In the words of one KI, certifications are "*only a remedy that fights symptoms of the disease*." The ASI might even prolong the necessary shift to an economy that uses fewer resources and eventually manages to de-couple prosperity in certain industries from quantitative growth to qualitative development.

The most effective way to diminish negative impacts is to reduce usage of aluminium and increase recycling. Although the ASI standard includes recycling and a full lifecycle approach, it fosters the

extraction of bauxite and production of primary aluminium. Minimizing the usage of aluminium would be contrary to company interests of profit maximization and increasing production (Pepper, 1998). A concept is needed with long term goals to reduce the dependence on aluminium and the intention to reach a circular economy. However, this may not lead to a simple replacement of aluminium with e.g. copper, which would cause a problem shifting to other sustainability challenges. The establishment of a closed loop of aluminium should be fostered, where there is no need to extract additional bauxite. Sine qua non for a closed loop system is an economy without physical growth or even declining material needs, taking into account thermodynamically inevitable material losses (Georgescu-Roegen, 1975). It is unlikely that a global paradigm shift towards a sustainable economic system or a pre-industrialized state will occur (DesJardins, 1998). The ASI will not be the panacea to solve all sustainability challenges along the way to an alternative economic system. However, it is the most promising and realistic approach to make the best out of the current unsustainable provision of aluminium until a system transformation takes place.

5.4 Practical Implications

I derive succinct recommendations for the future development of the ASI and the debate on sustainability certification from the discussion of my findings: Capabilities of SMEs to implement the ASI must be improved in order to achieve a greater market penetration instead of mainly aiming to convince the big aluminium players. A successful market acceptance is crucial for the standard's success to make a change towards more sustainable practices. Supporting governance structures need to be improved to set the basis for the success of the ASI. This includes mitigation of corruption, capacity development, building of functioning institutions for monitoring and sanctions, as well as strong workers unions and environmental agencies. The ASI should be used as a front-runner and role model to inspire more standards and eventually lead to the implementation of more sustainable practices along the full life-cycle of products. State actors need to be involved in the ASI to increase its legitimacy. Networks should be established to allow stakeholders to communicate and further exchange ideas for more sustainable aluminium. Truly affected stakeholders, such as indigenous people or workers need to be further involved in the decision making processes. International organizations, like the UN, need to provide funding and resources to NGOs to further engage in multi-stakeholder processes like the ASI. New approaches besides governmental and voluntary systems for more sustainability must be created and evaluated. This entails new hybrid forms, which combine the effectiveness of voluntary standards with the legitimacy of governmental approaches. A certification system like the ASI can only be one governance level to improve the way aluminium is refined. Larger policy measures on a higher governance level are necessary to decrease overall resource usage and to

initiate a shift towards a closed-loop economy. A shift from a capitalist economic system, relying on continuous growth and exploitation of non-renewable resources towards a system of qualitative development and circular material loops is needed. Figure 8 summarizes my recommendations.
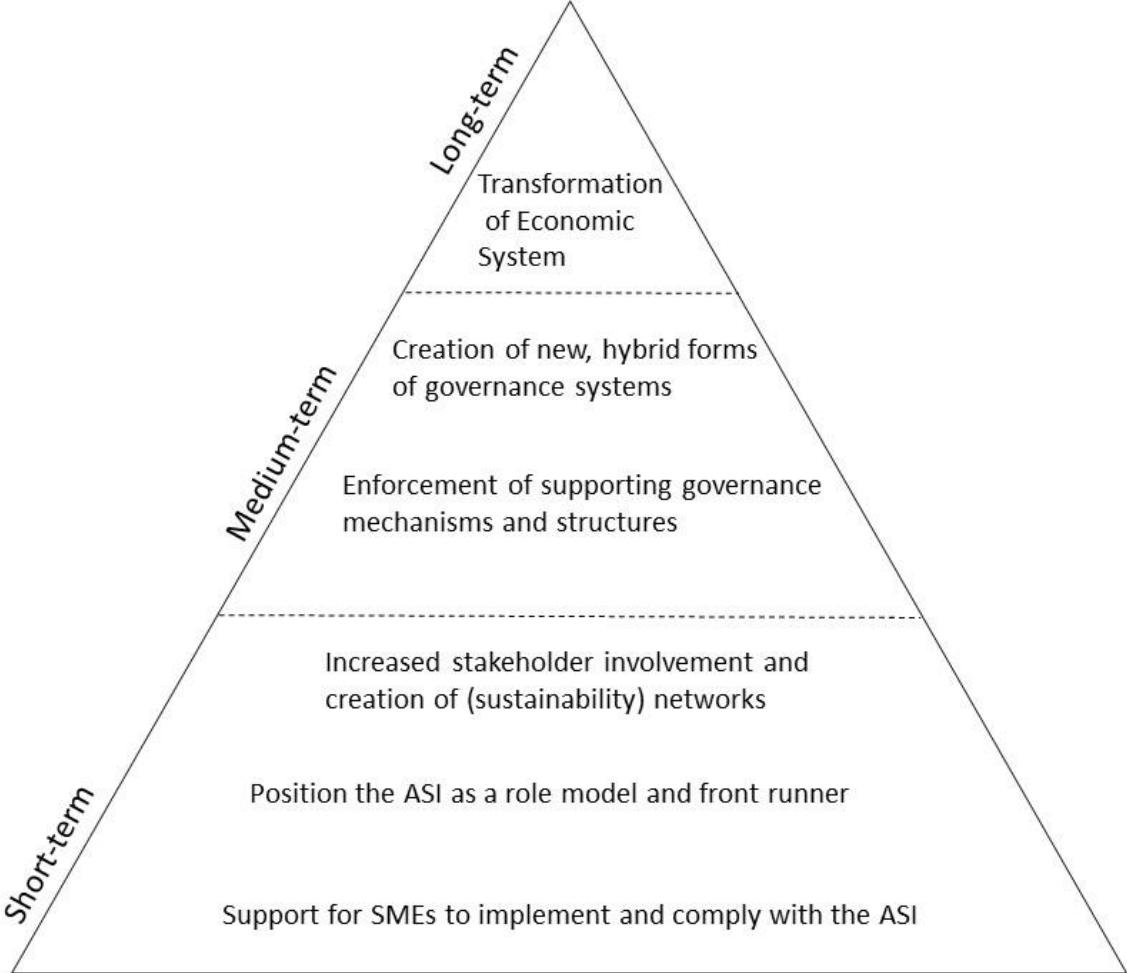

Figure 8 Conceptualization of recommendations for the improvement of the ASI standard and the debate on more sustainable aluminium provision, clustered according to their implementation horizon.

Together with the discussion section, these recommendations will help practitioners to adjust the ASI and take necessary measures beyond the ASI certification to contribute to a more sustainable aluminium provision.

5.5 Reflection on the Research Process

As self-reflexivity is a key step to ensure quality of a qualitative study, I discuss the shortcomings and possibilities for improving my research (Tracy, 2010). Even though the thesis was conducted in cooperation with the UBA, to my knowledge this has not negatively affected my freedom of research. Instead, this collaboration lead to emerging discussions, scientific exchange and a peer review process,

which is important for transdisciplinary research. As a researcher I have done my best to maintain a neutral and open attitude in the interview process and research design, as well as in the data processing even though I personally disagree with some interviewee responses. For the analysis, interpretation and discussion of my data, I kept my critical realist and interpretivist grounding and a sustainability science lens. I therefore do not see any ethical or moral concerns.

5.5.1 Transdisciplinarity in Sustainability Science Research

In my research I broadly followed the transdisciplinary research approach suggested by Jahn et al. (2012). The experience form this study shows the usefulness of this transdisciplinarity model but also revealed limitations to the implementation. I accomplished a transdisciplinary setting in the first phase of transdisciplinary research by merging a societal problem (sustainability challenges of aluminium) and a scientific research gap (lacking research on certification governance) together with co-researchers and stakeholders outside academia. A transdisciplinary setting was beneficial to form a common research object and frame the problem. Combining both scientific literature as well as knowledge generated across disciplines and stakeholder groups created the basis for solution-oriented knowledge. Without involving affected stakeholders, a study on the ASI would be insufficient and probably less credible. Including the expert knowledge from stakeholders outside academia was a useful approach for this thesis as the topic of aluminium certification is primarily embedded in the industry.

The transdisciplinary approach faced several obstacles, such as the confidentiality of industry stakeholders and a limited exchange between the KIs beyond the study. The actual involvement of non-academia stakeholders is restricted by the contextual setting and the feasibility and willingness of stakeholders to engage. The level of stakeholder participation in this study can be framed as consultation and collaboration, meaning that stakeholders are engaged in a two-way communication process and are in a position to influence the outcome of the study (Brandt et al., 2013). To improve the exchange of ideas between stakeholders, the Delphi method and stakeholder meetings could be applied to create a platform for stakeholder communication. The involvement of stakeholders is insufficiently realized during the data analysis section. For practical reasons, I analysed and coded the data by myself. To comply with an ideal transdisciplinary approach, the data should be analysed by multiple researchers who independently code the data and later on merge their findings.

The third phase (transdisciplinary integration of knowledge) is not completed yet, but is certainly challenging. The discussion of my findings and the suggested recommendations can serve as the basis for strategies for practitioners. Regarding the contribution to scientific praxis, I provide new research

questions and encourage researchers from sustainability science to further engage. Although my findings cannot be generalized, the research process can be transferred to a different context, particularly in the field of natural resources (Tracy, 2010). Even though I share my results, this will not guarantee an effect on the further development of the ASI. Despite the imperfectness of my transdisciplinary approach, I argue that transdisciplinarity is valuable to conduct research within sustainability science and should be fostered (Brandt et al., 2013). Initiating more transdisciplinary-based studies could bring the field of CSR and sustainability science closer together despite their methodological and theoretical differences. There is an ongoing debate on who defines CSR and whether practitioners or scholars should design standards (Montiel and Delgado-Ceballos, 2014). My findings reveal that currently practitioners set the indicators of sustainability certification. I argue that researchers from the field of sustainability science should also engage in this process and actively contribute to setting standards. For too long the debate on CSR and sustainability standards nested amongst practitioners, such as company sustainability managers, and within economic journals. Certificates are pushing sustainability aspects into mainstream economic processes (Ponte and Cheyns, 2013). Therefore, it is crucial to understand the governance mechanisms behind those certificates. Sustainability certification is a topic that touches several disciplines and involves a variety of stakeholders. By using frameworks, concepts and tools to conduct research on certificates, sustainability science can help to both contribute to solution-oriented knowledge for wicked sustainability challenges and to understand the governance mechanisms of certificates. Therefore, sustainability science should include certificates and CSR in its research agenda.

5.5.2 Limitations of the Conducted Research

I could not include stakeholders directly affected from the implementation of a certification, such as indigenous people or workers in bauxite mines. Telephone interviews limited the level of personal interaction with KIs. For some interview questions, such as the importance of local governance, I could not derive sufficient responses from the KIs in order to analyse the answers from different perspectives. As the indicators of the ASI standard are still under development, KIs could only estimate the impact on sustainability. In order to judge the real contribution towards more sustainable aluminium, a follow-up study including quantitative analysis should be conducted in 3-5 years.

5.5.3 Entry Points for Future Research

More research is needed on the real contribution of the ASI to sustainable development. As soon as the standard has "hard criteria", quantitative studies should be conducted to reveal the measurable impact on sustainability. Emerging from the interpretivist perspective of this thesis, I argue that my

findings should be reinterpreted by other researchers in an ongoing debate (Angen, 2000; Kvale, 1996). The research process, data analysis and discussion lead to a variety of emerging new research questions. To what extent can the ASI be a role model for other sustainability standards? What will be the implications of a growing number of multi-stakeholder-processes for participating NGOs and civil society and how can these processes be improved and streamlined? How do stakeholders outside Germany, e.g. from Asian countries, evaluate the ASI standard from their cultural, political and economic perspective?

5.6 Concluding Remarks

The extraction and production of aluminium as a non-renewable resource is inherently un-sustainable. As humanity is not willing to forgo aluminium, mechanism are necessary to transform processes along the aluminium value chain in a way that is as sustainable as possible. The ASI standard aims to accomplish this with a certificate. I conducted this study to critically analyse the topic of aluminium certification from a sustainability science perspective. Therefore, I assessed the underlying motivation for the ASI, weak and strong points of the standard, the possible contribution upon sustainability and the legitimacy of the standard as a governance mechanism. By involving different German stakeholders, I gained a holistic and salient picture on the standard. More specifically, I used a literature review and in-depth interviews to analyse the standard. My theoretical basis of critical realism and interpretivism enabled me to critically assess the data and discuss the findings as a sustainability scientist. I followed a transdisciplinary research approach, which involved stakeholders outside academia. Despite certain shortcomings, this approach was useful for the outcomes of the study and should be fostered in sustainability science. I generated solution-oriented knowledge that will serve practitioners and academia and eventually influence the standard setting process of the ASI. This study emphasizes the relevance of the topic and generated new research questions. Further research is needed to assess the quantifiable contribution of the standard upon sustainability and to improve the stakeholder involvement and transparency of the ASI.

The underlying motivation of the industry for a certification is to get a competitive advantage and keep a good reputation. A possible contribution to sustainability is only a secondary motivation. Nevertheless, the standard is ambitious and could positively contribute to diminish the sustainability challenges of aluminium. The legitimacy of the standard as a global sustainability governance mechanism is debatable. Stakeholder involvement and transparency need to be increased and the standard may not replace governmental responsibilities. Facing wicked challenges, an aluminium certification will not be enough to improve the situation and lead to sustainable development, as it will

not stop the inherently unsustainable process of mining. The ASI has limitations regarding its legitimacy, applicability and transparency and is no panacea that will solve all sustainability challenges. It would be simple to blame the aluminium industry for all sustainability challenges. However, every consumer must take responsibility to rethink the necessity of a growing aluminium demand. Civil society, governments and the consumer need to contribute to a more responsible usage of aluminium. Since a system shift to a sustainable development economy cannot be expected soon, the ASI is currently the best mechanism to decrease the sustainability impact of aluminium in the given economic system.

6. References

Adger, N.W. (2009) Governing Sustainability, 2009 ed. Cambridge University Press.

Angen, M.J. (2000) Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue. Qualitative health research 10, 378-395.

Banks, G., Kuir-Ayious, D., Kombako, D., Sagir, B. (2013) Conceptualizing mining impacts, livelihoods and corporate community development in Melanesia. Community Development Journal 48 (3), 484-500

Becker, E., Jahn, T., Stiess, I., Wehling, P., (1997) Sustainability: A cross-disciplinary concept for social transformations. Unesco, pp. 1-57.

Bergmann, M., Brohmann, B., Hoffmann, E., Loibl, M., Rehaag, R., Schramm, E., Voß, J.-P., (2005) Quality criteria of transdisciplinary research. A guide for the formative evaluation of research projects., ISOE Studientexte. ISOE, Frankfurt am Main.

Bergsdal, H., Strømman, A.H., Hertwich, E.G. (2004) The aluminium industry-environment, technology and production. Reports and Working Papers from Norwegian University of Science and Technology 8, 1-56.

Bettencourt, L.M.A., Kaur, J. (2011) Evolution and structure of sustainability science. Proceedings of the National Academy of Sciences 108, 19540-19545.

Biermann, F., Abbott, K., Andresen, S., Bäckstrand, K., Bernstein, S., Betsill, M.M., Bulkeley, H., Cashore, B., Clapp, J., Folke, C., Gupta, A., Gupta, J., Haas, P.M., Jordan, A., Kanie, N., Kluvánková-Oravská, T., Lebel, L., Liverman, D., Meadowcroft, J., Mitchell, R.B., Newell, P., Oberthür, S., Olsson, L., Pattberg, P., Sánchez-Rodríguez, R., Schroeder, H., Underdal, A., Vieira, S.C., Vogel, C., Young, O.R., Brock, A., Zondervan, R. (2012) Transforming governance and institutions for global sustainability: key insights from the Earth System Governance Project. Current Opinion in Environmental Sustainability 4, 51-60.

Blowfield, M. (2005) Corporate Social Responsibility – The failing discipline and why it matters for international relations. International Relations, 19 (2), 173-191

BMI, (2007) High Potential, High Risk, Business Monitor International, pp. 1-1.

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D.J., Newig, J., Reinert, F., Abson, D.J., von Wehrden, H. (2013) A review of transdisciplinary research in sustainability science. Ecological Economics 92, 1-15.

Bryman, A. (2012) Social Research Methods, 4 ed. Oxford University Press.

Bunders, J.F.G., Broerse, J.E.W., Keil, F., et al., 2010. How can transdisiplinary research contribute to knowledge democracy? In: in't Veld, R.J. (Ed.), Knowledge Democracy. Consequences for Science, Politics, and Media. Springer, Berlin Heidelberg, pp.125-152.

Carolan, M.S. (2005) Realism without reductionism: Toward an ecologically embedded sociology. Human Ecology Review 12, 1-20.

Carter, K.A., Beaulieu, L.J., (1992) Conducting a community needs assessment: Primary data collection techniques. Florida Cooperative Extension Service, pp. 1-9.

Cash, D.W., et al., Knowledge systems for sustainable development. Proceedings of the National Academy of Sciences, 2003. 100(14): p. 8086-8091.

Charmaz, K. (2006) Constructing grounded theory. A practical guide through qualitative analysis. Sage, Thousand Oaks.

Clark, W.C., Dickson, N.M. (2003) Sustainability science: The emerging research program. Proceedings of the National Academy of Sciences 100, 8059-8061.

Dashwood, H.S. (2012) The Rise of Global Corporate Social Responsibility: Mining and the Spread of Global Norms (Business and Public Policy), 2012 ed. Cambridge University Press.

Derkx, B., Glasbergen, P. (2014) Elaborating global private meta-governance: An inventory in the realm of voluntary sustainability standards. Global Environmental Change, 27, 41-50

de Schrynmakers, P. (2009) Life cycle thinking in the aluminium industry. The International Journal of Life Cycle Assessment 14, 2-5.

DesJardins, J. (1998) Corporate environmental responsibility. Journal of Business Ethics 17, 825-838.

Di Ruggiero, E., Cohen, J., Cole, D. (2014) The politics of agenda setting at the global level: key informant interviews regarding the International Labour Organization Decent Work Agenda. Globalization and Health 10, 56.

Dickens, P. (2003) Changing our environment, changing ourselves: critical realism and transdisciplinary research. Interdisciplinary Science Reviews 28, 95-105.

Everingham, J.-A. (2012) Towards Social Sustainability of Mining. Greener Management International 2007, 91-103.

Ewing, J.J. (2010) A way in the wilderness: Using critical realism to navigate environmental security's methodological terrain. International journal of interdisciplinary social sciences 5, 305-316.

Fitzpatrick, C., Olivetti, E., Miller, T.R., Roth, R., Kirchain, R. (2015) Conflict Minerals in the Compute Sector: Estimating Extent of Tin, Tantalum, Tungsten, and Gold Use in ICT Products. Environmental science & technology 49, 974-981.

Frantzeskaki, N., Loorbach, D., Meadowcroft, J. (2012) Governing societal transitions to sustainability. International journal of sustainable development 15, 19-36.

Funtowicz, S.O., Ravetz, J.R. (1993) Science for the post normal age. FUTURES September, 739-755.

Gadamer, H.G. (1994) Truth and Method.

Georgescu-Roegen, N. (1975) Energy and Economic Myths. Southern Economic Journal, 41(3), 347-381

Gjølberg, M. (2009) Measuring the immeasurable?: Constructing an index of CSR practices and CSR performance in 20 countries. Scandinavian Journal of Management 25, 10-22.

Goodland, R., (2006) Suriname: Environmental and Social Reconnaissance

Hilson, G., (2002) Small-scale mining and its socio-economic impact in developing countries, Natural Resources Forum. Wiley Online Library, pp. 3-13.

Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., Wiesmann, U. (2006) Implications of transdisciplinarity for sustainability research. Ecological Economics 60, 119-128.

IEA (2009) Energy technology transitions for industry: strategies for the next industrial revolution. OECD Publishing, Paris.

Jahn, T., 2005. Soziale Ökologie, kognitive Integration und Transdisziplinarität. Technikfolgenabschätzung – Theorie und Praxis 14 (2), 32-38.

Jahn, T., Bergmann, M., Keil, F. (2012) Transdisciplinarity: Between mainstreaming and marginalization. Ecological Economics 79, 1-10.

Jerneck, A., Olsson, L., Ness, B., Anderberg, S., Baier, M., Clark, E., Hickler, T., Hornborg, A., Kronsell, A., Lövbrand, E., Persson, J. (2011) Structuring sustainability science. Sustainability Science 6, 69-82.

JointResearchCentre (2014) Best available Techniques (BAT) Reference Document for the Non-Ferrous Metals Industries. Industrial Emissions Directive 2010/75/EU, 1-1242.

Jordan, A. (2008) The governance of sustainable development: taking stock and looking forwards. Environment and Planning C: Government and Policy 26, 17-33.

Kanie, N., Betsill, M.M., Zondervan, R., Biermann, F., Young, O.R. (2012) A CHARTER MOMENT: RESTRUCTURING GOVERNANCE FOR SUSTAINABILITY. Public Administration and Development 32, 292-304.

Kates, R., Clark, W.C., Hall, J.M., Jaeger, C., Lowe, I., McCarthy, J.J., Schellnhuber, H.J., Bolin, B., Dickson, N.M., Faucheux, S. (2001) Sustainability science. Science 292, 641-642.

Keohane, R.O., Nye, J. (2003) Redifining accountability for global governance. In: Kahler, M., Lake, D.A. (Eds.), Global Governance in a Global Economy, Political Authority in Transition, Princeton University Press, Princeton, Oxford, pp. 386-411

Korhonen, J. (2003) Should we measure corporate social responsibility? Corporate Social Responsibility and Environmental Management 10, 25-39.

Kumar, K., (1989) Conducting key informant interviews in developing countries. Agency for International Development Washington DC, pp. 1-40.

Kvale, S., (1996) The plurality of interpretations, Interviews: An introduction to Qualitative Research Interviewing. Sage Publications, pp. 210-228.

Lad, R.J., Samant, J.S. (2013) Environmental impact of bauxite mining in the western ghats in south maharashtra, india. International Journal of Recent Scientific Research 4, 1275-1281.

Lang, D.J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., Thomas, C.J. (2012) Transdisciplinary research in sustainability science: practice, principles, and challenges. Sustainability Science 7, 25-43.

Lather, P. (1986) Issues of validity in openly ideological research: Between a rock and a soft place. Interchange 17, 63-84.

Lazarus, K.M. (2009) In search of aluminum: China's role in the Mekong region. Heinrich Böll Stiftung Cambodia.

Liu, D.-Y., Wu, C.-S. (2012) Stockpiling and Comprehensive Utilization of Red Mud Research Progress. Materials 5, 1232-1246.

Liu, G., Müller, D.B. (2012) Addressing sustainability in the aluminum industry: a critical review of life cycle assessments. Journal of Cleaner Production 35, 108-117.

Málovics, G., Csigéné, N.N., Kraus, S. (2008) The role of corporate social responsibility in strong sustainability. The Journal of Socio-Economics 37, 907-918.

McGreavy, B., Hutchins, K., Smith, H., Lindenfeld, L., Silka, L. (2013) Addressing the Complexities of Boundary Work in Sustainability Science through Communication. Sustainability 5, 4195-4221.

Montiel, I., Delgado-Ceballos, J. (2014) Defining and Measuring Corporate Sustainability: Are We There Yet? Organization & Environment 27, 113-139.

Mudd, G. (2007) Sustainable mining – an oxymoron? TCE: The Chemical Engineer 798/799, 27-29

Mudd, G. (2008) Sustainability Reporting and Water Resources: a Preliminary Assessment of Embodied Water and Sustainable Mining. Mine Water and the Environment 27, 136-144.

Naftalin, A. (1973) Confrontation: Part 1 Measuring social responsibility: Chimera or Reality? 2, 5-11.

Nappi, C., (2013) The global aluminium industry 40 years from 1972. International Aluminium Institute, London, pp. 1-27.

Ness, B., Brogaard, S., Anderberg, S., Olsson, L., (2009) The African land-grab: creating equitable governance strategies through codes-of-conduct and certification schemes. Centre for Sustainability Studies, Lund University (LUCSUS), pp. 1-19.

Olivieri, G., Romani, A., Neri, P. (2006) Environmental and economic analysis of aluminium recycling through life cycle assessment. International Journal of Sustainable Development & World Ecology 13, 269-276.

Oosterveer, P., Adjei, B.E., Vellema, S., Slingerland, M. (2014) Global sustainability standards and food security: Exploring unintended effects of voluntary certification in palm oil. Global Food Security 3, 220-226.

Patton, M., (2002) Qualitative designs and data collection, Qualitative Research & Evaluation Methods. Sage Publications, Thousand Oaks, pp. 207-257.

Pepper, D. (1998) Sustainable development and ecological modernization: A radical homocentric perspective. Sustainable development 6, 1-7.

Pérez, A., Martínez, P., Rodríguez del Bosque, I. (2012) The development of a stakeholder-based scale for measuring corporate social responsibility in the banking industry. Service Business 7, 459-481.

Petrova, S., Marinova, D. (2013) Social impacts of mining: Changes within the local social landscape. Rural Society 22, 153-165.

Phillips, J. (2012) Using a mathematical model to assess the sustainability of proposed bauxite mining in Andhra Pradesh, India from a quantitative-based environmental impact assessment. Environmental Earth Sciences 67, 1587-1603.

Ponte, S., Cheyns, E. (2013) Voluntary standards, expert knowledge and the governance of sustainability networks. Global Networks 13, 4 (2013) 459-477

Ponte, S., Daugbjerg, C. (2015) Biofule sustainability and the formation of transnational hybrid governance. Environmental Policits, 24, 96-114

Popa, F., Guillermin, M., Dedeurwaerdere, T. (2015) A pragmatist approach to transdisciplinarity in sustainability research: From complex systems theory to reflexive science. FUTURES 65, 45-56.

Quiroz-Onate, D., Aitken, M. (2007) Business and human rights: A critical assessment of the notion of CSR and measurement. Journal of International Trade Law and Policy 6, 79-90.

Raworth, K. (2012) A safe and just space for humanity Can we live within the doughnut? Oxfam Discussion Papers, 1-26.

Reiser, D. B., Kelly, C. R. (2010) Linking NGO Accountability and the Legitimacy of Global Governance. Brooklyn Journal of International Law, 36 (3), 1011-1074

Renforth, P., Mayes, W.M., Jarvis, A.P., Burke, I.T., Manning, D.A.C., Gruiz, K. (2012) Contaminant mobility and carbon sequestration downstream of the Ajka (Hungary) red mud spill: The effects of gypsum dosing. Science of The Total Environment 421–422, 253-259.

Rennings, K., Wiggering, H. (1997) Steps towards indicators of sustainable development: linking economic and ecological concepts. Ecological Economics 20, 25-36.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J.A. (2009) A safe operating space for humanity. Nature 461, 472-475.

Ryan, G.W., Bernard, H.R. (2003) Techniques to Identify Themes. Field Methods 15, 85-109.

Sandelowski, M. (1993) Theory unmasked: The uses and guises of theory in qualitative research. Research in nursing & health 16, 213-218.

Scholz, R.W., (2001) The mutual learning sessions, in: Thompsen-Klein, J., Grossenbacher-Mansuy, W., Häberli, R., Bill, A., Scholz, R.W., Welti, M. (Eds.), Transdisciplinarity: Joint Problem Solving among Science, Technology and Society. An Effective Way for Managing Complexity, 2001 ed. Birkhäuser Verlag, Basel, Boston, Berlin, pp. 117-129.

Sherry, S.T., Marlow, A., (1999) Getting the lay of the land on health: A guide for using interviews to gather information (key informant interviews), pp. 1-19.

Sijinkumar, A.V., Sandeep, K., Shinu, N., Megha, V., Shyamini, C., Sreeni, K.R., Suvarna, K. (2014) A preliminary assessment of environmental impacts due to bauxit and laterite mining in karindalam and kinanur, Southern India. International Journal of Conservation Science 5, 235-242.

Silverman, D. (2010) Doing Qualitative Research, 4 ed. Sage Publications.

Solomon, F., Katz, E., Lovel, R. (2008) Social dimensions of mining: Research, policy and practice challenges for the minerals industry in Australia. Resources Policy 33, 142-149.

Székely, F., Knirsch, M. (2005) Responsible Leadership and Corporate Social Responsibility:: Metrics for Sustainable Performance. European Management Journal 23, 628-647.

Takeuchi, K. (2014) The ideal form of transdisciplinary research as seen from the perspective of sustainability science, considering the future development of IATSS. IATSS Research 38, 2-6.

Thondhlana, G., Shackleton, S. (2015) Cultural values of natural resources among the San people neighbouring Kgalagadi Transfrontier Park, South Africa. Local Environment 20 (1), 18-33

Tracy, S.J. (2010) Qualitative Quality: Eight "Big-Tent" Criteria for Excellent Qualitative Research. Qualitative Inquiry 16, 837-851.

Turker, D. (2009) Measuring Corporate Social Responsibility: A Scale Development Study. Journal of Business Ethics 85, 411-427.

USAID (1996) Conducting Key Informant Interviews. Performance Monitoring and Evaluation Tips. USAID Center for Development Information and Evaluation 2, 1-4.

Von Geibler, J. (2013) Market-based governance for sustainability in value chains: conditions for successful standard setting in the palm oil sector. Journal of Cleaner Production 56, 39-53

WCED (1987) Report of the World Commission on Environment and Development: Our Common Future. Oxford University Press, New York.

6.1 Online References

ASI, (2014a) ASI Overview. Aluminium Stewardship Initiative. Retrieved from: http://aluminium-stewardship.org/about-asi/asi-overview/. Date accessed: 08.04.2015

ASI, (2014b) Supporting Companies. Aluminium Stewardship Initiative. Retrieved from: http://aluminium-stewardship.org/about-asi/supporting-companies/. Date accessed: 08.04.2015

ASI, (2014c) Standard Setting Process Overview. Aluminium Stewardship Initiative. Retrieved from: http://aluminium-stewardship.org/standard-setting-process/process-overview/. Date accessed: 08.04.2015

ASI, (2014d) Supporting Companies. Aluminium Stewardship Initiative. Retrieved from: http://aluminium-stewardship.org/asi-standard/asi-performance-standard/. Date accessed: 08.04.2015

ASI, (2015) ASI Announces new Executive Director: Dr Fiona Solomon. ASI press release. Aluminium Stewardship Initiative. Retrieved from: http://aluminium-stewardship.org/news/. Date accessed: 08.04.2015

Bell, T., (2015) The 10 Biggest Aluminum Producers 2012, about money.com. Retrieved from: http://metals.about.com/od/Top-10-Producers/tp/The-10-Biggest-Aluminum-Producers-2012.htm. Date accessed: 14.04.2015

GeologicalSurvey, (2015) U.S. Geological Survey, Mineral Commodity Summaries, January 2015. Bauxite and Alumina. Retrieved from: http://minerals.usgs.gov/minerals/pubs/commodity/bauxite/mcs-2015-bauxi.pdf. Date accessed: 07.03.2015

Hydro, (2013) Bauxite mining. North Hydro ASA. Retrieved from: http://www.hydro.com/en/About-aluminium/Aluminium-life-cycle/Bauxite-mining/. Date accessed: 09.03.2015

IAI, (2008) Fourth sustainable Bauxite Mining Report. International Aluminium Institute, pp. 1-16. Retrieved from: http://www.world-aluminium.org/publications/. Data accessed: 20.03.2015

IAI, (2012) The International Aluminium Institute. Mining Process. International Aluminium Institute. Retrieved from: http://bauxite.world-aluminium.org/mining/process.htm. Date accessed: 08.03.2015

IAI, (2015) The International Aluminium Institute. Primary Aluminium Production. Global Data for 1974 to 2015. Issued 25 February 2015. International Aluminium Institute. Retrieved from: http://www.world-aluminium.org/statistics/#data. Date accessed: 13.03.2015

MetalBulletin, (2015) Company Database Report Rank Companies. Euromoney Global Limited. Retrieved from: http://www.mbdatabase.com/RankCompanies/Report#0B8841E4-2115-2857-3C9B-308207E8CE2E. Date accessed: 14.04.2015

Transparency International (2015) Corruption perceptions index 2014:results. Retrieved from

http://www.transparency.org/cpi2014/results. Date accessed: 11.03.2015

UBA (2006) Introduction of the Federal Environment Agency, Broschüren/Faltblätter. Retrieved from

http://www.umweltbundesamt.de/en/publikationen/federal-environment-agency-

umweltbundesamt. Date accessed: 07.03.2015

Appendix

Appendix 1: Presentation of the German Federal Environment Agency

Our credo: a Federal Environment Agency for people and the environment

Who we are

The Federal Environment Agency is the scientific environmental authority that comes within the remit of the Federal Ministry of the Environment, Nature Conservation and Reactor Safety (BMU) and it deals with a wide and varied range of subjects. We believe that we have a re-sponsibility to protect the environment and human beings from harmful environmental influences. We represent all necessary specialist areas and forms of qualification. The standing en-joyed by our analyses and our recommendations for political action, together with the fact that we are independent of any individual interests, give us a unique position in Germany as an environmental institution.

What we seek to achieve

Our objectives are

- to protect and nurture the natural basis for life now and for future generations,
- to work to promote sustainable development,
- to encourage everyone to consider environmental protection as a matter of course in all their thoughts and deeds,

What we provide

- We investigate, describe and assess the state of the environment in order to be able to identify to their full extent any threats to human beings or the environment.
- It is the task of the various departments and divisions to produce technical concepts and submit proposals for effective measures to the Federal Ministry of the Environment and other federal ministries.
- We also advise other state, municipal and private sector institutions.
- We are actively involved in informing the public and the media, in a clearly understandable way, about the causes of the problems affecting the environment, and we also suggest suitable remedies.
- Through our participation in many international committees and conferences we play an active part in the continuing efforts to protect health and the environment.
- Our knowledge and experience are made available nationally and internationally.
- Our services are delivered punctually and with a due awareness of costs.

How we operate

- The Federal Environment Agency, i.e. all its staff:
- We work together with an awareness of our own responsibilities and commitment, applying flexible and co-operative working methods.
- We respect the views of others and their achievements too.
- Our executives in particular are responsible for ensuring a good working atmosphere where creativity and specialist knowledge can work together with positive results.
- Our decision-making processes are clearly understandable; we practice self-criticism and are also receptive to criticism from outside.
- We rely on our own capabilities and observe the rules of good scientific practice in order to provide services that have a solid basis, can be easily understood at every stage, are effective, and capable of practical implementation.
- Our findings are obtained from our own research, from research contracts, practical trials and an evaluation of the results of our work.
- Statements by the agency are arrived at following an opinion-forming process which takes all technical aspects into consideration.

Source: (UBA, 2006)

Appendix 2: Presentation of the Department III 2 at the UBA

Sustainable production and products
(Examples of work carried out by Department III 2)

Industrial production in Germany, Europe and around the world is still a major source of pollutants which are hazardous to health and the environment. Environmental standards can differ widely from one country to another, leading to the transfer of production and the ensuing environmental pollution to countries with less exacting environmental standards. Production in these countries is cheaper on account of their comparatively lax environmental protection requirements. As a result jobs are lost in Germany and competition is distorted. The Federal Environment Agency is committed to ensuring that, through international environmental protection agreements, environmental standards are harmonised at a high level on the basis of the *best available techniques* (BAT), which corresponds in German law to the *state of the art*.

The Federal Environment Agency suggests further developments, at a national, European and international level, to production-integrated environmental protection for industrial sectors, encompassing numerous media and protection targets. The main aims include the intelligent use of resources (the key word being: resource efficiency) in order to maintain environmental viability and stability.

Taking a comprehensive view of the flows of materials helps to identify environmental and health hazards, referred to as *"ecological backpacks"*, throughout the entire added-value chain, making them more transparent. The Federal Environment Agency uses analyses of the flows of materials as a means of locating ecological weak points and of finding the best ways of making improvements, as well as developing solutions and proposing environmental policy measures.

The Federal Environment Agency also provides these services for product-integrated environmental protection in industry, trade and the home. The aim is to reduce the hazards to the environment and health, especially during the production and disposal stages. One of the main focuses is on optimising the recycling and recovery of products and, in this same context, to prevent pollutants from entering the cycle.

Source: (UBA, 2006)

Appendix 3: Overview of principles and criteria of the ASI standard.

Own illustration based on the ASI Performance Standard Part I: Principles and Criteria (ASI, 2014b):

ASI Principles	ASI Criteria
Governance	
1. Business Integrity	Compliance, Anti-Corruption, Code of Conduct
2. Policy and Management	Environmental, social and governance policy, Leadership, Environmental and social management systems, Responsible sourcing, Impact assessments, Emergency response plan, Mergers and acquisitions, Closure, decommissioning and divestment
3. Transparency	Sustainability reporting, Stakeholder complaints, grievances and request for information, Non-compliance and liabilities, Payments to governments
Environment	
4. Material Stewardship	Environmental Life Cycle Assessment, Collaboration, Product design, Collection and recycling of products at end-of-life
5. Greenhouse Gas Emissions	Disclosure of GHG emissions and energy use, GHG emissions reductions
6. Emissions, Effluents and Waste	Emissions to air, Discharges to water, Assessment and management of spills and leakages, Waste management and reporting, Bauxite residue, Spent Pot lining, Dross
7. Water	Water assessment and reporting, Water management
8. Biodiversity	Biodiversity assessment, Biodiversity management, Alien species
Social	
9. Human Rights	Human rights due diligence, Women's rights, Indigenous people, Free, prior and informed consent, Cultural and sacred heritage, Resettlements, Local communities, Local communities' livelihoods, Conflict affected and high risk areas, Security practice, Remediation of adverse impacts
10. Labour Rights	Freedom of association and right to collective bargaining, Child labour, Forced or compulsory labour, Non-discrimination, Communication and engagement, Disciplinary practices, Remuneration, Working time
11. Occupational Health and Safety	Occupational health and safety policy, Management system, Employee engagement on health and safety, Performance

Appendix 4: Guideline Scheme for Semi-structured Interviews with Key Informants

Contact person:

Jens Heidingsfelder

Umweltbundesamt

Wörlitzer Platz 1

06844 Dessau-Roßlau

telephone: +49 (0) 340 2103-2594

jens.heidingsfelder@uba.de

Contact details on key informant:

Name:_____

Organization:_____

Date of interview:_____

Beginning:_____ End: _____

I would like to thank you upfront for your willingness to participate in this study and for allocating your time for a key informant interview with me

Would you like to that your name and/or the name of your organization will be anonymized? ◯ yes ◯ no

Do you agree that this interview gets recorded with an audio type?

◯ yes ◯ no

This interview is composed of open questions to give you as an expert the freedom to express your opinion and tell your expertise at the highest degree possible.

As a reminder: The aim of this research study is to holistically analyse and discuss the strengths and weaknesses as well as possible opportunities and threats of a sustainability certification of aluminium in order to assess the likely impact of a certification scheme upon less unsustainable aluminium production.

1. Overarching question: What factors shape the acceptability and applicability for implementing a sustainability certification scheme for the value chain of aluminium such as the Aluminium Stewardship Initiative (ASI) standard?

- Why is the discussion on more sustainable aluminium recently gaining more momentum within the aluminium sector?
- Who are the drivers for more sustainability within the aluminium production sector and the aluminium end consumer section from your perspective?
- What is the underlying motivation for companies to foster more sustainable practices within the aluminium value chain?
- Where can you identify/name obstacles for the acceptance and implementation of a sustainability certification scheme for aluminium within the aluminium value chain (in particular the ASI standard)? Obstacles could e.g. include legal frameworks, conflicts of objectives, non-disclosure agreements, lack of information and knowledge, insufficient management structures and so forth.
  - Which external obstacles can you identify?
  - Which internal obstacles can you identify within a company?

2. Overarching question: what are the strengths and weaknesses of a voluntary sustainability certification scheme, such as the ASI standard?

- What are the strengths of a voluntary sustainability certification scheme for the aluminium value chain, such as the ASI standard?
- What are the shortcomings of a voluntary sustainability certification scheme for the aluminium value chain, such as the ASI standard?
- What are the strengths and weaknesses of a legally binding, governmental approach to certify/regulate the aluminium value chain towards more sustainable practices within the aluminium value chain?

3. Overarching question: How do different stakeholders differ in their perception of the possible contribution of a sustainability certification scheme for aluminium, particularly the ASI standard, to a more sustainable provision of aluminium?

- How do you evaluate the influence of different stakeholders (e.g. the industry, NGOs, governmental bodies, researchers and so forth) upon the design process of a sustainability certification scheme for aluminium/the ASI standard in the aluminium sector?[6]
- To what extent can a sustainability certification scheme for aluminium/the ASI standard really contribute to more sustainability within the aluminium value chain?
    - Regarding ecological consequences of the aluminium production?
    - Regarding social consequences of the aluminium production?
    - Regarding economic consequences of the aluminium production?

- Which factors do significantly influence a positive impact upon the global bauxite and aluminium production? Which role does the aspect of governance, respectively the political stability play in the countries where bauxite is mined?

4. Outlook and closing remarks

- How do you see the future development of sustainability certification within the aluminium sector?
- To what extent can a sustainability certification for aluminium/the ASI standard become a role model for other metal and natural resources?
- What recommendation, claim or wish do you have for the debate on sustainability in the aluminium sector?
- Do you see a third alternative for more sustainable aluminium beside a voluntary CSR initiative and a binding governmental approach?
- How can governmental bodies on a national, European and international level contribute to the success of a sustainability certificate for aluminium/the ASI standard?
- Do you have any further comments on the topic of sustainability in the aluminium value chain?
- Would you like to receive the results of this research study via email?
    ◯ yes ◯ no

I would like to thank you again for sharing your thoughts and for contributing to the success of this research study.

---

[6] The question varies whether or not the expert is aware of the ASI standard design process

Appendix 5: Invitation Letter for Key Informant Interviews[7]

Für Mensch & Umwelt
E. m. R.
1)

Umwelt Bundesamt

Umweltbundesamt | Postfach 1406 | 06813 Dessau-Roßlau

Invitation letter for an expert interview on sustainability within the aluminium value chain

Dessau-Roßlau,
12 Februar 2015
Bearbeiter/in:
Jens Heidingsfelder
Telefon:
+49(0)340 21 03-2594
Fax:
+49(0)340 21 04-2594
E-Mail:
jens.heidingsfelder@uba.de
Geschäftszeichen:
III 2.2

Dear Sir or Madam,

Hereby we would like to invite you to participate in an expert telephone interview in the context of the research study SAMI, a Master Thesis project at the German Federal Environment Agency.

The research project SAMI (*Sustainable Aluminium Mining*) analyses the contribution of voluntary certification schemes in the aluminium value chain on more sustainable practices within the production and conversion of aluminium. The study aims to holistically discuss the opportunities and the usefulness of a sustainability certification for aluminium from the different standpoints of stakeholders from e.g. the Corporate Social Responsibility departments, resource purchase sector and the field of resource policy.

Key points of the research project are the role of certification schemes as an aspect of the Corporate Social Responsibility strategy of companies in the aluminium sector as well as their relevance for more sustainable resource usage and awareness in the industry, policy and society. In particular, the Aluminium Stewardship Initiative (ASI) to certify aluminium and the possible opportunities and challenges for its implementation are under research in this study. The SAMI project entails inter alia the following guiding questions:

- What factors shape the acceptability and applicability for implementing a sustainability certification scheme for the value chain of aluminium such as the Aluminium Stewardship Initiative (ASI) standard?
- What are the strengths and weaknesses of a voluntary sustainability certification scheme, such as the ASI standard?

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Dienstgebäude Langen
Paul-Ehrlich-Str. 29
63225 Langen

Gedruckt auf Recyclingpapier aus 100% Altpapier mit dem Blauen Engel.

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[7] The original letter was sent out in German to the experts via email and was signed by Dr. Bettina Rechenberg, head of the department III 2. at the UBA.

- How do different stakeholders differ in their perception of the possible contribution of a sustainability certification scheme for aluminium, particularly the ASI standard, to a more sustainable provision of aluminium?

We kindly ask you to reply until the 19.02.2015 via email or phone whether or not you would like to participate in our expert interview.

The telephone interview will be conducted by Mr. Heidingsfelder from the 23.02.2015 till the 13.03.2015 and last between 15 and 30 minutes. Mr. Heidingsfelder is pleased to schedule a time and date with you depending on your availability. The telephone interview can be anonymized upon request.

We invite you to tell us further experts that you consider relevant for our research study.

Upon request we would like to share and further discuss our study findings with you.

We appreciate your contribution to our research project and are looking forward to hearing back from you.

On behalf,

Dr. Bettina Rechenberg

Leitung Abteilung III 2-Nachhaltige Produktion, Ressourcenschonung und Stoffkreisläufe

III 2	III 2.2	Heidingsfelder

2) AS III.2 QS, Ausdruck und Vorlage Schlusszeichnung
3) WV Heidingsfelder Versand per E-mail
4) z. d. A.

2

Appendix 6: Diversity Matrix of Participating Key Informant Interview Partners

No.	Job description	Field of occupation	Stakeholder group	Organization
1	Research associate	Sustainable procurement, resource value chains, certification	Civil Society	Südwind e.V.
2	Coordinator of the steering group of resources	Resource policy	Civil Society	PowerShift e.V.
3	General secretary	Sustainable development	Civil Society	German council for sustainable development
4	Consultant	International development, environment and resource policy and standards	Research and Academia	Heidi Feldt Consulting
5	Senior researcher	Recycling technologies, resource management	Research and Academia	Fraunhofer UMSICHT
6	Research associate	Aluminium industry	Research and Academia	UBA
7	Research director	Sustainability rating and certification	Research and Academia	oekom research AG
8	Professor	Sustainable supply chain management, CSR	Research and Academia	University of Ulm
9	Research associate	Resource policy, international development	Research and Academia	Federal Institute for Geosciences and Natural Resources
10	Professor	Supply chains, CSR, Management	Research and Academia	University of Kassel
11	Senior researcher	Sustainable resource management	Research and Academia	Fraunhofer ISI
12	Research associate	Sustainable consumption, resource policy	Research and Academia	Öko Institut e.V.

13	Research associate	Resources and recycling economy	Research and Academia	Resource Think Tank
14	Procurement	Supply chain, resource management	Industry	German automotive company
15	Head of Department Environment policy	Sustainability in the automotive sector	Industry	Umbrella organization for the automotive sector
16	Head of product ecology	Sustainability in the aluminium industry	Industry	Hydro Aluminium
17	Speaker	NA	Industry	Bundesverband der Deutschen Industrie e.V.
18 & 19	Sustainability manager	Sustainability of non-ferrous metals	Industry	Wirtschaftsvereinigung Metalle
20 & 21	Sustainability manager	Sustainability in the aluminium industry	Industry	Umbrella organization for metals
22	Sustainability manager	Sustainability in the packaging industry	Industry	Ball corporation
23	Sustainability manager	Sustainability in the automotive sector	Industry	German automotive company
24	Consultant	Resource policy	Industry	Resource Think Tank

Appendix 7: List of Coding Stripes

Appendix 8: Example for Coded Interview Text Segment (anonymised)