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HCSS GEO-ECONOMICS

Standards for Critical Raw Materials

Strategic standard setting in China, the EU and the Netherlands

Irina Patrahau, Hugo van Manen, Tycho de Feijter, Michel Rademaker

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Standards for Critical Raw Materials

Strategic standard setting in China, the EU and the Netherlands

Standard setting is becoming increasingly relevant in securing critical raw materials and technologies needed for climate and digital ambitions. Technical standards are of major strategic importance because they offer a venue for fostering "lock in" and/or dependence. What can the Netherlands and the EU do to protect their interests and mitigate risks caused by Chinese standardization activities?

The Strategic Role of Standards

While traditionally seen as a purely technical tool for ensuring interoperability between products, standardization has developed into an increasingly politicized policy tool.

States and/or actors which enjoy (quasi) monopolies within the product area are seeking to formulate standards to benefit from first mover advantages, from their access to a knowledge base as well as from their products' reach – something which enables them to shape standards in their own image.

China's ambitions

China's standardization ambitions, in the form of longterm strategies such as 'Standards 2035', lead to two distinct problems for the Netherlands and European Union:

China's quasi-monopoly in the extraction of CRM's and the development of related technologies lead to domestically introduced standards becoming de facto established internationally.

Beijing's approach to standard-setting means that the corporations & state agencies representing China in international organizations are incentivized by realizing China's strategic objectives.

European and Chinese influence

Chinese influence within major international standard setting organizations is significant, though not (yet) dominant. EU countries have a strong representation in such organisations and are present in many value-based initiatives, where China is virtually absent.

Recommendations for the Netherlands & EU

- Institutionalize standardization as a strategic instrument through creation of a Dutch national standardization strategy
- Enhance NEN-partnership to ensure alignment of goals and ambitions
- Strengthen representation in international organizations to combat Chinese influence
- Encourage public-private partnerships to actively propose domestic and international standards
- Collaborate with CEN-CENELEC for the inclusion of standardization in European industrial alliances
- The EU should leverage its regulatory power by promoting strict domestic standards
- Emphasize importance of EU's 'Rolling Plans' and 'Future and Emerging Technologies' programs

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Management Samenvatting

De Europese Unie (EU) en China hebben vergelijkbare maar concurrerende economische, technologische en duurzaamheidsdoelstellingen en beide spreken over toenemende mondiale spanningen over de aanvoer van kritieke grondstoffen (Critical Raw Materials, CRM). De prioriteit van de EU en Nederland voor de komende decennia is om het economische concurrentievermogen op een duurzame manier te behouden en te versterken en tegelijkertijd klimaatneutraliteit te bereiken in 2050.[1][2] China heeft ook zeer ambitieuze doelen opgesteld in de aanloop naar 2049.[3] De langetermijnstrategie van het land is het bevorderen van concurrentievoordelen met betrekking tot nieuwe technologieën die naar verwachting uitmonden in aanzienlijke economische en politieke invloed.[4] In tegenstelling tot de EU, die zeer sterk afhankelijk is van import van CRM's, kunnen Chinese ambities grotendeels worden bereikt door hun controle over hen ter beschikking staande relevante natuurlijke hulpbronnen en grote delen van strategische waardeketens.[5] Het verschil in mogelijkheden tussen de EU en China zal de komende decennia zeer waarschijnlijk leiden tot een verdere nadelige positie van de EU in de concurrentie om toegang tot CRM's.

Een van de strategische instrumenten die relevant worden bij deze geopolitieke concurrentie is het stellen van normen. Hoewel standaardisatie van oudsher wordt gezien als een puur technisch instrument om de interoperabiliteit tussen producten en diensten te waarborgen, heeft het zich ontwikkeld tot een steeds meer gepolitiseerd beleidsinstrument. Staten en/ of actoren die (quasi)monopolies genieten binnen het productgebied, proberen normen te formuleren om te profiteren van de voordelen als *first mover*, van hun toegang tot de kennisbasis en het bereik van hun producten – een positie die hen in staat stelt normen vorm te geven naar hun eigen beeld. Dit

1 European Commission, "European Industrial Strategy," Tekst, European Commission, 2020, https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en; Ministerie van Economische Zaken, "Encouraging Innovation - Enterprise and Innovation" (Ministerie van Algemene Zaken, 2020), https://www.government.nl/topics/enterprise-and-innovation/encouraging-innovation .

2 Ministerie van Infrastructuur en Waterstaat, "Nederland Circulair in 2050," 2016; European Commission, "A European Green Deal," Text, Priotities 2019-2024 - European Commission, 2020, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

3 PWC, "China's New Leadership Rolls out New Blueprint for Future Development," 2017, 3, https://www.pwccn.com/en/research-and-insights/publications/china-s-19th-party-congress/business-review-of-china-s-19th-party-congress-cn.pdf.

5 European Commission, "Critical Raw Materials," Tekst, Internal Market, Industry, Entrepreneurship and SMEs - European Commission, 2020, https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en; Polina Klossek, Jakob Kullik, and Karl Gerald van den Boogaart, "A Systemic Approach to the Problems of the Rare Earth Market," *Resources Policy* 50 (December 1, 2016): 134, https://doi.org/10.1016/j.resourpol.2016.09.005; Aiping Han, Jianping Ge, and Yalin Lei, "Vertical vs. Horizontal Integration: Game Analysis for the Rare Earth Industrial Integration in China," *Resources Policy* 50 (December 2016): 158, https://doi.org/10/f9hx4d.

geldt met name voor technische normen, die de fysieke kenmerken van producten voorschrijven en die productielijnen en toeleveringsketens nodig hebben om te produceren en te distribueren. De 'houdbaarheid' van technische normen maakt ze van strategisch belang omdat ze mogelijkheden bieden voor het bevorderen van *lock-in* en/ of afhankelijkheid.

Door middel van gecoördineerde langetermijnstrategieën, zoals Standards 2035 en Main Points 2020, heeft China het ontwikkelen en vaststellen van normen als een nationale prioriteit aangemerkt. In dit rapport worden twee soorten problemen op het gebied van normstelling benoemd waar Nederland de komende jaren voor moet oppassen. Ten eerste positioneert China's quasi-monopolie in zowel de winning van kritieke grondstoffen als de ontwikkeling van aanverwante technologieën het land goed voor het introduceren van normen (zowel in eigen land als regionaal). Deze normen kunnen zich waarschijnlijk de facto internationaal manifesteren, simpelweg omdat China met weinig tot geen concurrentie te maken heeft. Ten tweede heeft Peking een stevige poging ondernomen om China om te vormen tot een normbepaler met als doel om de economie van het land tegen 2049 te transformeren. Dit kwam (althans op korte termijn) tot uiting in de toegenomen aandacht voor normstelling binnen de ISO.[6] De top-down benadering van Peking bij het beheren van China's normaliseringsinitiatieven betekent dat de bedrijven en overheidsinstanties die het vertegenwoordigt binnen de internationale normalisatie-organisaties worden gestimuleerd om de strategische doelstellingen van China te realiseren, terwijl ze ook toegang hebben tot onevenredig meer informatie dan veel van hun collega's.

In dit rapport wordt geconstateerd dat de Chinese invloed binnen grote internationale normalisatie-instellingen significant is, maar (nog) niet dominant. Over het algemeen zijn de EU-landen als geheel sterk vertegenwoordigd in organisaties en commissies zoals de ISO, IEC en ITU. De commissies en werkgroepen die zich bezighouden met technische standaarden voor de opkomende klimaattransitie en digitale technologieën zijn voor de EU en Nederland het belangrijkste om te proberen invloed op uit te oefenen. Bovendien zijn EU-landen al aanwezig bij veel op normen en waarden gebaseerde initiatieven zoals verantwoorde mijnbouw, terwijl China daar vrijwel afwezig is.

Overheidsinstellingen en beleidsmakers in Nederland zouden de traditionele opvatting van standaardisatie als een puur technisch proces moeten verlaten en standaardisatie als strategisch instrument gaan behandelen. Deze positie zou geïnstitutionaliseerd kunnen worden door de totstandkoming van een Nederlandse nationale normalisatiestrategie. Het is van belang dat Nederland een gecoördineerde

6 Björn Fägersten and Tim Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe" (Swedish Institute of International Affairs, 2019), 3, https://www.ui.se/globalassets/ui.se-eng/publications/ui-publications/2019/ui-brief-no.-2-2019.pdf.

langetermijnaanpak ontwikkelt over internationale normering om zijn internationale regelgevings- en innovatiekracht te behouden. Versterkte intra-gouvernementele samenwerking - waarbij de ministeries van Buitenlandse Zaken, EZK en Defensie betrokken zijn - zou de ontwikkeling van een samenhangende strategie mogelijk kunnen maken. Overheidsinspanningen kunnen worden aangevuld met nauwere samenwerking met NEN, om te zorgen voor verdere afstemming van doelen en ambities, op nationaal en internationaal niveau. Bestaande activiteiten op het gebied van informatie-uitwisseling zouden verder versterkt kunnen worden, omdat ze gunstig zijn voor beide partijen.

Nederland kan door een verder gecoördineerde Europese aanpak effectiever worden bij het mitigeren van risico's die worden veroorzaakt door Chinese internationale normalisatieactiviteiten. Bij het, waar nodig, beperken van de internationale invloed van Chinese binnenlandse normen is het doel niet alleen de Nederlandse belangen te beschermen, maar ook die van Europese bondgenoten. Samenwerking op EU-niveau kan in dit geval dus ook de meeste resultaten opleveren. Een aandachtsgebied is het Chinese Belt and Road Initiative (BRI) en de manier waarop de Chinese binnenlandse normen worden toegepast door Europese en niet-Europese landen die bij dit project betrokken zijn. Nederland zou ernaar moeten streven de strategische rol van standaarden in Europa te bevorderen, zodat Chinese standaarden die niet voldoen aan de EU-waarden en normen niet worden overgenomen in EU-landen. De EU zou haar regelgevende macht kunnen gebruiken door strikte normen te bevorderen, in overeenstemming met Europese technologieën, belangen en waarden. De centrale positie van CEN-CENELEC met betrekking tot normalisatie-inspanningen in de EU moet door Nederland worden ondersteund om de opname van de beoogde waarden en normen in industriële en technologische projecten te verzekeren.

Executive Summary

Similar yet competing economic, technological and sustainable goals set by the European Union (EU) and China speak to increasing global tensions over the supply of critical raw materials. The EU and the Netherlands' priority for the following decades is to maintain and strengthen economic competitiveness in a sustainable way, while also achieving climate neutrality by 2050.[7][8] China has also established highly ambitious goals leading up to 2049.[9] The country's long-term strategy of pursuing competitive advantages over new technologies is expected to culminate in significant economic and political influence.[10] Unlike the EU, which relies heavily on imports to secure CRMs, Chinese ambitions can be largely fulfilled by their control over relevant natural resources as well as entire sectors of strategic value chains.[11] The discrepancy in capabilities between the EU and China will lead to a disadvantageous position for the EU in the competition for access to CRMs in the following decades.

One of the strategic instruments that is becoming relevant in this geopolitical competition is standard setting. While traditionally seen as a purely technical tool for ensuring interoperability between products, standardization has developed into an increasingly politicized policy tool. States and/or actors which enjoy (quasi) monopolies within the product area are seeking to formulate standards to benefit from first mover advantages, from their access to a knowledge base as well as from their products' reach – something which enables them to shape standards in their own image. This is especially true for technical standards, which dictate the physical attributes of products requiring production lines and supply chains to manufacture

7 European Commission, "European Industrial Strategy," Text, European Commission, 2020, https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en; Ministerie van Economische Zaken, "Encouraging Innovation - Enterprise and Innovation" (Ministerie van Algemene Zaken, 2020), https://www.government.nl/topics/enterprise-and-innovation/encouraging-innovation .

8 Ministerie van Infrastructuur en Waterstaat, "Nederland Circulair in 2050," 2016; European Commission, "A European Green Deal," Text, Priotities 2019-2024 - European Commission, 2020, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

9 PWC, "China's New Leadership Rolls out New Blueprint for Future Development," 2017, 3, https://www.pwccn.com/en/research-and-insights/publications/china-s-19th-party-congress/business-review-of-china-s-19th-party-congress-cn.pdf.

10 PWC, 3.

11 European Commission, "Critical Raw Materials," Text, Internal Market, Industry, Entrepreneurship and SMEs - European Commission, 2020, https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en; Polina Klossek, Jakob Kullik, and Karl Gerald van den Boogaart, "A Systemic Approach to the Problems of the Rare Earth Market," *Resources Policy* 50 (December 1, 2016): 134, https://doi.org/10.1016/j.resourpol.2016.09.005; Aiping Han, Jianping Ge, and Yalin Lei, "Vertical vs. Horizontal Integration: Game Analysis for the Rare Earth Industrial Integration in China," *Resources Policy* 50 (December 2016): 158, https://doi.org/10/f9hx4d.

and distribute. Technical standards' "stickiness" makes them strategically important because they offer a venue for fostering "lock in" and/or dependence.

Through coordinated and long-term strategies such as Standards 2035 and Main Points 2020, China has identified standard setting as a national priority. This report identifies two types of problems related to standard setting that the Netherlands should be wary of in the following years. First, China's quasi-monopoly in both the extraction of critical raw materials and the development of related technologies positions it well to introduce standards (whether domestically or regionally) that are likely to de facto establish themselves internationally simply because China faces little to no long-term competition within the space. Second, Beijing has made a consecrated push to transform China into a standard setter within the context of its goal to transform the country's economy by 2049, something which (at least in the short term) has manifested in increased attention for standard setting within the ISO.[12] Beijing's top-down approach to managing China's standard-setting initiatives means that the corporations and state agencies which represent it within the international standardization organizations are incentivized by realizing China's strategic objectives, while also having access to disproportionately more information than many of their peers.

This report finds that Chinese influence within major international standard setting organizations is significant, though not (yet) dominant. In general, the EU countries have, as a whole, a strong representation in committees and organizations such as the ISO, IEC and ITU. Those committees and working groups that deal with technical standards for emerging climate transition and digital technologies are the most important for the EU and the Netherlands to try to influence. Moreover, EU states are present in many value-based initiatives such as responsible mining, while China is virtually absent.

Governmental institutions and policy makers in the Netherlands should depart from the traditional understanding of standardization as a purely technical process, toward a revised recognition of standardization as a strategic instrument. This revised understanding should be institutionalized through the creation of a Dutch national standardization strategy. It is imperative that the Netherlands develops a long-term coordinated approach toward international standard setting in order to preserve its international regulatory and innovative power. Strengthened intra-governmental cooperation – involving the Ministry of Foreign Affairs, Ministry of Economic Affairs and Climate Policy, and Ministry of Defense – will facilitate the development of a coherent strategy. Governmental efforts should be complemented by close

12 Björn Fägersten and Tim Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe" (Swedish Institute of International Affairs, 2019), 3, https://www.ui.se/globalassets/ui.se-eng/publications/ui-publications/2019/ui-brief-no.-2-2019.pdf.

cooperation with NEN, to ensure further alignment of goals and ambitions, on the domestic and international levels. Existing information exchange activities should be further enhanced, given that they are beneficial for both parties.

In mitigating risks caused by Chinese international standardization activities, the Netherlands can become more effective through a coordinated European approach. When it comes to combatting the international influence of Chinese domestic standards, the goal is to protect not only Dutch interests, but also those of European allies. Thus, EU-level cooperation can in this case also yield the most effective results. One area of focus is China's BRI and the way its domestic standards are being adopted by European and non-European countries involved in the project. The Netherlands should strive for an understanding of the strategic role of standards throughout Europe, so that Chinese standards do not become widely adopted within the EU. Instead, the EU should leverage its regulatory power by promoting strict domestic standards, in line with European technologies, interests and values. CEN-CENELEC's central position to standardization efforts in the EU should be emphasized by the Netherlands to ensure its inclusion in industrial and technological projects.

1. Introduction

For some time now, geopolitical considerations focused on the question of whether the People's Republic of China (PRC) will overtake the United States to become the new hegemon. Similar yet competing economic, technological and sustainable goals set by the European Union (EU) and China speak to this competition's increasing urgency for Europe, as well as to increasing global tensions. The EU and the Netherlands' priority for the following decades is to maintain and strengthen economic competitiveness in a sustainable way.[13] The 2019-2024 EU industrial policy is focused on achieving digital sovereignty and climate goals set in the European Green Deal.[14] Moreover, both the EU and the Netherlands aim to achieve climate neutrality by 2050.[15] China has also established highly ambitious goals leading up to 2049.[16] The country's long-term strategy of pursuing competitive advantages over new technologies is expected to culminate in significant economic and political influence.[17] Like virtually all members of the international community, China has also committed to sustainable climate goals.[18]

Raw materials are vital for achieving European and Chinese ambitions. The EU has classified materials with high supply risk and high economic importance as *Critical Raw Materials* (CRM) as early as 2011.[19] Unlike the EU, which relies heavily on imports to secure CRMs, Chinese ambitions can be largely fulfilled by their control over relevant natural resources as well as entire sectors of strategic value chains.[20] The discrepancy in capabilities between the EU and China will lead to a disadvantageous position for the EU in the competition for access to CRMs in the following decades.

One of the strategic instruments that is becoming relevant in this geopolitical competition is standard setting. While traditionally seen as a purely technical tool for ensuring interoperability between products, standardization has developed into an increasingly politicized policy tool. This is illustrated by the intensified Chinese efforts to improve its standard setting capacity, a strategy which the country has explicitly earmarked as one which will help it to expand its geopolitical influence. Important national strategies such as *China Standards 2035* and *Main Points of Standardization Work 2020* highlight the need of improving domestic standardization processes as a building block in influencing global standardization processes. These actions, complemented by attempts at establishing de-facto standards as part of the Belt

18 "China," Climate Action Tracker, 2020, https://climateactiontracker.org/countries/china/.

and Road Initiative, are pivotal to the country's goals of achieving economic and technological superiority by 2049.

This study sets out to assert whether Chinese standard setting initiatives pose a threat to the Netherlands' and EU's national security, or whether they can – by and large – be understood as being harmless. The first step in addressing this topic is identifying the CRMs which are set to increase in relevance to the Netherlands and to the EU in light of their climate and digital ambitions. Moreover, this report analyzes ways in which standards might be established internationally, maps out types of standards, and considers scenarios in which Chinese standards in the CRM space might damage EU or Dutch national security. Armed with this framework, it subsequently looks into the concrete steps that Beijing has taken towards increasing its ability to introduce threatening standards. And it suggests some activities to be undertaken to mitigate unwanted effects.

The report finds that technical standards are highly relevant from a strategic point of view because they aid in the creation of long-term dependencies. In the fields of climate transition and digital technologies, the EU and the Netherlands should ensure that international technical standards are developed in accordance with European values and practices. This can be achieved through close cooperation of governments, standardization agencies and market players on both the EU and national levels.

2. Methodology

Standard setting is an important part of China's industrial policy. This exploratory research's aim is to create an overview of the risks and mitigation options for the Netherlands regarding China's broadly oriented efforts to set standards on critical raw materials. This oversight is aimed at contributing to enhanced awareness on the topic and aid in the formulation of policymaking agendas.

The report poses the following research questions:

1. Which standards with regard to critical raw materials are or will be of strategic importance in the short term for the Netherlands?
2. On which standards is or will the Netherlands be dependent in the near future for both economic development as well as security?
3. What are the risks for national security, among others economic security, and commercial interests of these standards?
4. What are the options for the Netherlands to mitigate possible risks?
5. For which standards could the Netherlands play a relevant and or leading role to mitigate these risks?

The first part of the report aims to identify which CRMs are on-course to be of greatest importance to the EU and the Netherlands in the following decades. The supply risk and economic importance of these materials for the EU are encompassed in critical raw materials lists. This report selects the specific CRMs that are relevant for the Netherlands' climate and digital ambitions, and that might cause concerns due to high import-dependence. The selection is done through an analysis of European and Dutch climate and digital ambitions for 2050 on one hand, and Chinese goals on the other hand. Moreover, by analyzing both English and Chinese sources, China's intentions and national strategies surrounding the standardization of CRMs are outlined. The main documents discussed are *China Standards 2035* and *Main Points of Standardization Work 2020.* The Belt and Road Initiative is also considered in light of China's standardization ambitions. This analysis reveals that Beijing views standardization as an important strategic instrument that it aims to use in order to achieve its future goals.

The following section questions how international standardization processes work and why they might be relevant to the Netherlands from a geopolitical perspective. In order to do so, standardization is defined and its importance as a strategic political instrument is discussed. Against this backdrop, the section explores the circumstances in which Chinese influence on standards might be threatening to the Netherlands' national security dimensions – an exercise which serves the purpose of a.) allowing for the identification of organization types that warrant further exploration, and b.) formulating criteria for the analysis of Chinese standards (under what circumstances might a standard be detrimental to EU and Dutch security?).

Chinese efforts in standardization are subsequently mapped in order to determine the country's relative influence and capacity to set standards, compared to the EU and the Netherlands. This is done in two ways. First, the most important international standard setting organizations are analyzed in terms of their functioning and of national representations. The organizations are selected according to their relevance in CRM standard setting. This provides insights into the ability of not only China but also the Netherlands to influence standardization in strategic sectors. It also reveals which organizations are the most relevant for the EU and the Netherlands to try to influence. Chinese domestic efforts at standardization are also explored. Due to China's quasi-monopolistic position in much of the CRM and relevant technology sectors, domestic standards could be implemented as de-facto international standards. This could undermine EU international influence and domestic security. While it is impossible to analyze specific Chinese standards due to a lack of open access for non-Chinese IP addresses, the report provides an overview of Chinese laws, institutions and industrial sectors that would be involved in the development of standards with relevance to the EU. In doing so, the section establishes a strong basis for future analysis of standards that could become threatening to the EU in light of different security dimensions.

After Chinese standardization processes are discussed, the next section looks at Dutch and European efforts in setting standards. Aggregating the main findings of the report, the concluding section offers advice for mitigating potential risks arising from Chinese standardization efforts. The advice focuses on one hand on relevant organizations for the Netherlands/EU to try to influence in order to get first-mover advantages, and on the other hand on how to mitigate risks that might arise from Chinese standardization actions.

3. Ambitions and the need for critical materials

3.1 EU and NL ambitions

The 2019-2024 European Industrial Strategy is built on three pillars – the Green Transition, the Digital Transition and global competitiveness.[21] The latter will be achieved by leveraging the Single Market in order to enhance the EU's international standard-setting power.[22] As such, both the climate and digital sectors are of strategic importance for the Netherlands and the EU in the following decades.[23] The fulfillment of ambitious climate neutrality goals as well as 'technological sovereignty' depends on a steady supply of CRMs. Determining potential bottlenecks in material supply requires a broader analysis of the strategic sectors that the CRMs are used in. Thus, within this report the two relevant sectors – climate and digital technologies – are considered. The former can be divided into two categories. On one hand, the electrification of transport is important. On the other hand, energy transition plays a relevant role and includes wind energy, solar power and energy transmission grid. The digital sector is considered as a whole, including technologies such as semiconductors, hard disk drives and integrated circuits.

The climate sector is relevant in light of the ambitions laid out in the Green Deal. The 2030 Climate Target Plan requires member states to decrease their greenhouse gas emissions to at least 40% below 1990 levels.[24] This translates to a share of 32% in renewables as part of the EU energy mix and an energy efficiency target of 32.5% by 2030.[25] Based on global and European goals, the *Klimaatakkoord* in the Netherlands serves as the basis for climate policies. The Netherlands committed to a reduction of GHG emissions of 49% by 2030 compared to 1990 levels, which, at the moment of signing this Accord, was higher than the EU target.[26] In June 2021, a revised version of the EU 2030 Climate Plan is expected, which could include a new target of 55-60% emission

24 European Commission, "2030 Climate & Energy Framework," Text, Climate Action - European Commission, November 23, 2016, https://ec.europa.eu/clima/policies/strategies/2030_en.

25 European Commission, "EU Climate Target Plan 2030: Key Contributors and Policy Tools," Text (European Union, September 17, 2020), 2, https://ec.europa.eu/commission/presscorner/detail/en/fs_20_1610.

26 Ministerie van Economische Zaken en Klimaat, "Klimaatakkoord," publicatie (Den Haag: Ministerie van Economische Zaken en Klimaat, June 28, 2019), 5, https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/national-climate-agreement-the-netherlands.

reduction across the EU.[27] If that is the case, the Netherlands and other member states may need to adjust their national goals. The second dimension of the Green Deal, which is in line with the *Klimaatakkoord,* refers to climate neutrality goals for 2050. This would require a 95% decrease in greenhouse emissions.[28] Based on these goals, IRENA predicts a share of renewable energy in final energy use of 70% throughout the EU.[29]

Within the second relevant sector, digital technologies, the concept of technological sovereignty is relevant, implying European autonomy and leadership in the digital sector. European Commission President von der Leyen outlined technological sovereignty as a goal of the current Commission's term in office. This ambition was developed as a reaction to global high-tech companies increasingly threatening the cybersecurity of the EU.[30] The main areas of focus are data protection and artificial intelligence.[31] The EU aims at fostering innovation and competitiveness in the digital sector, while holding companies accountable for ethical issues and security threats.[32] Digital performance is a priority for the Netherlands as well, given that high-tech systems are considered a top sector of the Dutch economy.[33]

The 'Green transition' and 'Digital transition' are two of the main elements of the EU Industrial strategy which aims to maintain the EU's competitiveness globally.[34] The third element is increasingly setting international standards by leveraging the influence of the Single Market.[35] As such, (international) standard setting can play an important part in these broader strategies. Enhancing international cooperation and standardization processes is one of the recurrent recommendations in the 2020 *CRMs for Strategic Technologies and Sectors in the EU - foresight report.*[36] Moreover, standardization is critical in high-tech and ICT sectors, especially in the case of standard-essential patents, as mentioned in section 4.2. Privacy and data protection are sectors in which the EU is already considered a 'global standard-setter'.[37] In terms of cybersecurity, the European Cybersecurity Certification Group is developing an EU-wide certification framework to ensure transparency and mitigate potential threats in the digital sector.[38]

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27 European Commission, "2030 Climate Target Plan," Text, Climate Action - European Commission, September 11, 2020, https://ec.europa.eu/clima/policies/eu-climate-action/2030_ctp_en.
28 European Environment Agency, "The European Environment — State and Outlook 2020," Publication (Luxembourg: Publications Office of the European Union, December 4, 2019), 158, https://www.eea.europa.eu/publications/soer-2020.
29 IRENA, "Global Energy Transformation: A Roadmap to 2050 (2018 Edition)" (Abu Dhabi, 2018), 30.
30 Tambiama Madiega, "Digital Sovereignty for Europe," EPRS Ideas Paper (European Parliament, 2020), 1.businesses and Member States of the European Union (EU
31 Madiega, 1.businesses and Member States of the European Union (EU
32 Madiega, 1.businesses and Member States of the European Union (EU
33 Ministerie van Economische Zaken, "Encouraging Innovation - Enterprise and Innovation," (Ministerie van Algemene Zaken, December 21, 2011), https://www.government.nl/topics/enterprise-and-innovation/encouraging-innovation.
34 European Commission, "European Industrial Strategy."
35 European Commission.
36 European Commission, "CRMs for Strategic Technologies and Sectors in the EU - a Foresight Study" (Luxembourg: Publications Office of the European Union, 2020), https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf.
37 Madiega, "Digital Sovereignty for Europe," 3.businesses and Member States of the European Union (EU
38 EU Commission, "Stakeholder Cybersecurity Certification Group," Text, Shaping Europe's digital future - European Commission, June 24, 2020, https://ec.europa.eu/digital-single-market/en/stakeholder-cybersecurity-certification-group.

3.2 Chinese ambitions

Geopolitical ambitions

China aims to transform itself into a "manufacturing superpower" by 2025 – something which is clearly encoded in the Chinese Communist Party's (CCP's) 13th five-year plan (FYP), Made In China 2025 (MIC2025). Introduced in 2015, the MIC2025 outlines the CCP's goal of reducing the Chinese economy's dependence on foreign goods, services, and innovations. Virtually all high-tech industries are touched upon, from automotive and aviation to machinery, robotics, high-tech maritime & railway equipment, energy-saving vehicles, and medical and information technologies.

China wants both to learn from and to influence standard-setting organizations (see section on Standardization Ambitions). It does so by placing Chinese nationals, often with affiliations to the CCP, in key-positions of these organizations and by expanding its participation in Technical Committees. In China, these efforts are supported by domestic standardization organizations, which are large, well-funded, and fall under the central government.

From the CCP's perspective, the goals outlined in the MIC2025 are tailored to catering to domestic audiences on the one hand, and to contributing to the realization of a range of geostrategic international interests on the other. On the domestic front, the MIC2025 can be understood – first and foremost – as catering to the placating of China's growing middle class. China has experienced unprecedented economic development over the course of the past decades – a feat which can be attributed, in no small part, to the country's adoption of policies which enabled its development into the "cheap labor" manufacturing hub from which the majority of the products we consume in our day-to-day lives are sourced. As China's economy has developed, it has lifted hundreds of millions of people out of poverty and (unsurprisingly) given rise to a sizable middle class. The Centre for Strategic and International Studies (CSIS) estimates that the Chinese middle class grew from 29 million (approximately 2% of its total population) to 531 million (approximately 39% of its population) between 1999 and 2013.[39]

While undoubtedly positive, this growth has placed significant pressure on China's economic system. Middle class consumers are significantly more connected and educated (and, by extension, contextually aware) than their low-income counterparts. This factor reduces the former's willingness to accept an economic model which incentivizes the exploitation of Chinese human and natural resources by foreign corporations. Perhaps more importantly, middle class consumers – and Chinese consumers in particular –

39 "How Well-off Is China's Middle Class?," ChinaPower Project (blog), April 26, 2017, http://chinapower.csis.org/china-middle-class/.

have a pendant for demanding high-tech, luxury goods. Passenger vehicle sales have experienced growth in China for 26 straight years, with 28.9 million cars being sold in 2017.[40] Taken together, these factors make China's "cheap labor" model a political and strategic liability to the CCP. Should the Chinese economy fail to transition away from its current model, the party will have a hard time selling its population the repressive policies which have, until now, been legitimized by improvements in the country's international status and by the system's ability to produce economic welfare. It will also have a hard time maintaining its strategic autonomy. A China which relies on 3rd countries to develop and deliver cutting-edge technologies and luxury consumer goods is one which is susceptible to international pressures and/or influences.

Of equal relevance are the internationally oriented (geostrategic) considerations surrounding MIC2025. Not only does the 13th FYP strive to reduce China's reliance on 3rd countries; it also makes a consecrated effort to increase 3rd countries' reliance on China. Transforming China into an innovation hub capable of developing and exporting breakthrough innovations serves not only to increase the country's international influence and legitimacy, but also to erode the primacy – and international power – of the United States. Within this context, the MIC2025 can readily be viewed as an opening salvo in that it provides an early indication of what to expect from the CCP policy as the country works to achieve President Xi's 'Zhongguo Meng' or 'Chinese Dream', by 2049.[41]

At the time of writing, the (international) economic policies associated with the pursuit of the Chinese Dream have been characterized by two high level trends – both of which raise well-founded concerns over China's dependability (and benevolence) as a major trading partner going forward. First and foremost, the country has shown a willingness to leverage its significant economic clout to introduce policies and practices which infringe on China's WTO commitments and/or clash directly with Western values. Examples of these non-market practices include the state's willingness to finance excess production capacity to facilitate international dumping, laws which force technology transfers from foreign companies,[42] and the Chinese state's role in brokering agreements and facilitating interaction between Chinese-based companies and their Western counterparts. Second, the CCP has systematically engaged in a no-questions-asked approach to securing critical resources through FDI. Clear examples can be observed throughout Africa, where Chinese investors increased their control over mining operations from 10 in 2011 to at least 24 in 2018.[43] Though there is evidence to suggest that the rate at which

40 By contrast, US consumers purchased 17.5 million cars in 2017. See https://www.scmp.com/business/companies/article/2138162/electric-minis-be-built-china-great-wall-gears-1m-new-energy

41 Probal Dasgupta, "Xi Jinping: View: Xi May Have Lost the Plot on China's Dream of Great Rejuvenation - The Economic Times," June 29, 2020, https://economictimes.indiatimes.com/news/international/world-news/view-xi-may-have-lost-the-plot-on-chinas-dream-of-great-rejuvenation/articleshow/76679355.cms?from=mdr.

42 Robert E. Lighthizer, "How to Set World Trade Straight," *Wall Street Journal*, August 20, 2020, sec. Opinion, https://www.wsj.com/articles/how-to-set-world-trade-straight-11597966341.

43 Bee Chun Boo, "China Aims for Win-Win Partnership with African Mining Sector," Baker McKenzie, January 24, 2020, https://www.bakermckenzie.com/en/insight/publications/2020/01/china-partnership-with-african-mining-sector.

Beijing has increased its control over African mines has decreased slightly post-2018,[44] the CCP has arguably had easy purchase of these industries as a result of its willingness to finance corruption and contribute to the consolidation of dictators – factors which have disincentivized Western investments in the past.[45]

The actuality of this trend is compounded by the fact that the Chinese Dream places a heavy emphasis on renewables. Whereas the current-day concern over China's role in a global energy transition revolves around its emissions – British Petroleum (BP) estimated that the country accounted for 28% of global CO_2 emissions in 2018, more than the US and EU combined – the concern going forward is likely to center around the challenges associated with sourcing raw materials from a country whose energy consumption has increased from 400mn tonnes oil equivalent (TOE) in 1978 to 3.27bn TOE in 2018.[46] China has committed to ensuring that renewables account for 20% of the country's energy production by 2030,[47] and to achieving carbon neutrality by 2060.[48] The latter goal is based on a speech Xi Jinping held at a UN Conference which received much media attention.[49] Yet so far no official policy documents establishing or detailing this goal have been published.

Studies conducted by (among others) the World Wildlife Fund (WWF) speak to the feasibility of Beijing's embracing of 80% renewables share by 2050.[50] The country has already emerged as a world leader in renewable energy. Beijing pledged US$286bn to renewable energy development and US$376bn to energy conservation projects between 2011 and 2015,[51] and has continued to invest an average of US$100bn per year in domestic renewable energy projects every year since.[52] The CCP's 12th Five Year Plan (FYP) made a consecrated effort to address the "Four Uns" (unstable, unbalanced, uncoordinated, and unsustainable) that former Premier Wen Jiabao had articulated as describing the country's economy in the early 2010s. As a result, renewables accounted for 36.6% of China's total installed electric power capacity and for 26.4% of its total power generation in 2017.[53] Chinese companies' contribution to the global trade in renewables has catapulted. The country's solar cell manufacturers account for about 60% of global solar cell production, and – in 2018 – it had captured half of the global market for wind turbines.[54] Its lithium-

44 Magnus Ericsson, Olof Lof, and Anton Lof, "Chinese Control over African and Global Mining—Past, Present and Future," *Mineral Economics* 33 (2020): 153–81, https://doi.org/10/ghkmjp.
45 "More than Minerals," *The Economist*, March 23, 2013, https://www.economist.com/middle-east-and-africa/2013/03/23/more-than-minerals.
46 BP 2019 (see the geopolitics of energy transition, p. 76).
47 X. Jin Yang et al., "China's Renewable Energy Goals by 2050," *Environmental Development* 20 (November 1, 2016): 84, https://doi.org/10/ghkmjk.
48 Steven Lee Myers, "China's Pledge to Be Carbon Neutral by 2060: What It Means," *The New York Times*, September 23, 2020, sec. World, https://www.nytimes.com/2020/09/23/world/asia/china-climate-change.html.
49 Lili Pike, "Xi Jinping Wants China to Be Carbon Neutral by 2060. These Researchers Have a Plan for That.," Vox, October 15, 2020, https://www.vox.com/2020/10/15/21516537/climate-change-china-xi-jinping-coal-carbon-neutral.
50 Yang et al., "China's Renewable Energy Goals by 2050," 84.
51 Nicholas, S., He, J., 2014. How China became a climate leader.
52 The geopolitics of energy transitions, 80.
53 Wenjuan Dong and Ye QI, "Utility of Renewable Energy in China's Low-Carbon Transition," *Brookings* (blog), May 18, 2018, https://www.brookings.edu/2018/05/18/utility-of-renewable-energy-in-chinas-low-carbon-transition/.
54 Manfred Hafner and Simone Tagliapietra, eds., *The Geopolitics of the Global Energy Transition*, Lecture Notes in Energy (Springer International Publishing, 2020), 84, https://doi.org/10.1007/978-3-030-39066-2.

ion battery production capacity is also growing rapidly, with Chinese companies being expected to hold 121 gigawatt-hours (GWh) of battery production capacity by 2020.[55]

Ambitious goals for 2050 translate into high material demand in the following decades. China controls large parts of strategic product value chains, particularly those involving CRMs. However, there are certain materials that China does not control and that they will need in the following decades. An overview of such materials is included in Table 1.

Name	Chinese	Main producers	Main uses
Bauxite*	铝土矿	Australia, China, Guinea	Aluminum, precision casting.[56]
Borate** (borate minerals)	硼酸盐矿物	U.S.	Glass,[57] agriculture, flame retardants, nuclear reactors (afterglow suppression.)
Cobalt***	钴	DRC (Congo).	Batteries (phone, electric cars), magnets, turbines.
Hafnium	铪	Australia, South Africa, Brazil.	Nuclear submarines, nuclear reactors, electronics, rocket engines.[58]
Lithium****	锂	Australia, Chile, China (distant third).	Batteries, air purification, optics (mobile phones). Military (rocket fuel, hydrogen bombs)
Niobium	铌	Brazil, Canada	Steel, superalloys (jet engines).[59]
PGM's (Platinum Group Metals)	铂族	South Africa, Russia, Canada.	Medical, electronics, jewelry, chemical (catalysis), catalytic converters (automotive), atomic energy. Military (missiles). Space (fuel cells).[60]
Tantalum	钽	Australia, Brazil, Canada	Electronics, alloys, military (bombs, missiles, guns, mil-grade capacitors).[61]

*Notes. *Bauxite: the EC does not name China as a major source of bauxite imports. However, China is currently the second-bauxite producer in the world (Australia, China, Guinea). Most of its production stays in China and its reserves are small compared to other producers. Bauxite is mainly used to produce aluminum. China is also the largest importer, producer, and exporter of aluminum. ** Borate: Serbia is believed to hold large reserves of borate minerals. American Rio Tinto and Australian Jadar Resources are developing mines in the country.[62] China has a strong position in Serbia and is already involved in copper mining and exploration (gold, silver).[63] ***Cobalt: China is an important refiner of Cobalt.[64] **** Lithium: China is the world's largest refiner of lithium.[65]*

Table 1 - Critical raw materials that China needs

55 Hafner and Tagliapietra, *The Geopolitics of the Global Energy Transition*.
56 Dongying JC Metal Co. Ltd, "What Is Precision Casting?," Investment Casting Foundry & Machining, 2020, https://www.investmentcastingpci.com/what-is-precision-casting/.
57 Chris Cann, "Borates Suddenly Interesting," Mining Journal, July 27, 2018, https://www.mining-journal.com/commodities/news/1343372/borates-suddenly-interesting.
58 "Hafnium," Minor Metals Trade Association, accessed November 23, 2020, https://mmta.co.uk/metals/hf/.
59 "Superalloys - an Overview," ScienceDirect, 2012, https://www.sciencedirect.com/topics/chemistry/superalloys.
60 Jared Sagoff, "Scientists Maximize the Effectiveness of Platinum in Fuel Cells," Phys, December 13, 2018, https://phys.org/news/2018-12-scientists-maximize-effectiveness-platinum-fuel.html.
61 Suri Weng, "How Is Tantalum Used in the Military Industry?," *Magic Metal Tantalum* (blog), August 16, 2019, http://www.strongtantalum.com/how-is-tantalum-used-in-the-military-industry/.
62 "Rio Tinto to Invest ~$200M to Progress the Jadar Lithium Project to Feasibility Study Stage; Jaderite," Green Car Congress, July 31, 2020, https://www.greencarcongress.com/2020/07/20200731-jadar.html; Joshua Peach, "Jadar Resources (ASX:JDR) Hits Borate and Lithium in Serbia," The Market Herald, May 21, 2020, https://themarketherald.com.au/jadar-resources-asxjdr-hits-borate-and-lithium-in-serbia-2020-05-21.
63 Snezana Bjelotomic, "Chinese Company Zijin Discovers Gold, Copper and Silver Ore Deposits in Serbia Worth $30 Billion," Serbian Monitor, December 23, 2019, https://www.serbianmonitor.com/en/chinese-company-zijin-discovers-gold-copper-and-silver-ore-deposits-in-serbia-worth-30-billion/.
64 Natalia Lebedeva, Franco Dl PERSIO, and Lois BRETT, "Lithium Ion Battery Value Chain and Related Opportunities for Europe," Text, December 19, 2016, https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/lithium-ion-battery-value-chain-and-related-opportunities-europe.
65 Xin Sun et al., "Supply Risks of Lithium-Ion Battery Materials: An Entire Supply Chain Estimation," Materials Today Energy 14 (December 1, 2019): 100347, https://doi.org/10/ghgss7.

Standardization ambitions

Though it remains unclear *today* how Beijing might leverage standards in order to strengthen its position and to aid in the implementation of the MIC2025, there is little doubt that it intends to do so. The country unveiled a research project in 2018 – the first phase of China Standards 2035 – which explicitly aims to empower the country to participate in the creation of international standards, to influence how new technologies will work, and to gain influence in international standard setting organizations, among others. Given the country's quasi-monopolistic command over many of the world's critical material supplies and the degree to which the demand for them is expected to rise, these standards are likely to impact the Netherlands. The global demand for materials necessary in the construction of wind-turbines and solar panels is projected to outpace global supply by as much as 21% by 2050.[66]

The robust collaboration between the Chinese government and domestic industrial players allows the country to develop long term strategic visions. This is not only the case for general development strategies such as Made in China 2025 or the Chinese dream, but also for standardization plans. China Standards 2035 and Main Points of National Standardization Works are two national programs that focus on the role of standardization as a strategic instrument. The two documents complement each other by working toward the same goals – improving China's local standardization system and, in doing so, increasing influence within international standardization organizations. The two documents are compared and contrasted below.

China Standards 2035 is commonly understood as a strategy or action plan, although there is no official definition of the document.[67] In stark contrast to the attention that the Made in China 2025 strategy has garnered in Western media, China 2035 received comparatively little attention. The international edition of Global Times has only two articles about the matter and China Daily has only one.[68] China Standards 2035 complements the 2025 and 2049 ambitions of establishing global Chinese dominance in the following decades. The 2035 strategy is focused on standardization mechanisms, more specifically aiming at strengthening domestic standards and influencing international standards in order to advance the Chinese economy.[69] Currently it is in its research phase: *China Standard 2035 - National Standardization Development*

66 Samuel Carrara et al., *Raw Materials Demand for Wind and Solar PV Technologies in the Transition towards a Decarbonised Energy System*, JRC119941 (Luxembourg: Publications Office of the European Union, 2020), https://ec.europa.eu/jrc/en/publication/raw-materials-demand-wind-and-solar-pv-technologies-transition-towards-decarbonised-energy-system.

67 State Administration for Market Regulation, "'中国标准2035'项目结题会暨'国家标准化发展战略研究'项目启动会在京召开," 2020, http://www.samr.gov.cn/xw/zj/202001/t20200115_310519.html.

68 "Search - The Global Times," The Global Times, 2020, https://search.globaltimes.cn/QuickSearchCtrl; "News Search - China Daily," ChinaDaily, 2020, https://newssearch.chinadaily.com.cn/en/search?query=china+standards+2035.

69 Arjun Kharpal, "Power Is 'up for Grabs': Behind China's Plan to Shape the Future of next-Generation Tech," CNBC, April 27, 2020, https://www.cnbc.com/2020/04/27/china-standards-2035-explained.html.

Strategy Research. This phase is scheduled for completion in 2022.[70] After 2022 another phase will ensue, but details are unclear as to how it will unravel.[71]

The Main Points of National Standardization Work in 2020 outlines the way in which standardization ambitions can be included in China's 14th Five Year Plan (FYP), in the form of a National Standardization Strategy Outline.[72] This National Standardization Strategy will be based on the results of the research phase of China Standards 2035, which is currently taking place. In other words, Main Points 2020 is a supporting plan arguing in favor of standardization to be included in the FYP, as a complement to China Standards 2035. China's National Development and Reform Commission (NDRC) is in charge of publishing the plan, supported by dozens of organizations including the Chinese Academy of Social Sciences (CASS). Currently, there is no official translation of the Main Points 2020. The information in this section is based on the translation and interpretation of the Chinese document.

Overall, both the Standards 2035 and Main Points strategies lay out ambitions of improving and strengthening domestic standard setting mechanisms. The Main Points document strongly argues for the 14th FYP to '*vigorously promote*' the reform and improvement of the domestic standardization system, as well as acknowledge the *'fundamental and strategic role of standardization in the modernization of the national governance system and governance capabilities'.* There are 117 recommendations and goals in the Main Points, the sectors touched upon varying from toys and housekeeping to military equipment and steel production. The recommendations are divided into five chapters, mentioned in Box 1. For an overview of relevant excerpts from the recommendations, see Appendix 7: Excerpts from Main Points 2020.

Box 1 - Recommendations of the Main Points 2020

1. Strengthen the top-level design [ability to develop at the top] and enhance the strategic positioning of standardization work.
2. Deepen the reform of standardization and enhance the vitality of standardization development.
3. Strengthen the construction of the standard system and enhance the ability to lead high-quality development.
4. Participate in the governance of international standards and improve the level of internationalization of standards.
5. Strengthen scientific management and improve standardization governance efficiency.

70 Feng Lin, "《中国制造2025》走后，又来了《中国标准2035》," 美国之音, 2020, https://www.voachinese.com/a/china-standards-2035-20200428/5395187.html.
71 State Administration for Market Regulation, "'中国标准2035'项目结题会暨'国家标准化发展战略研究'项目启动会在京召开."
72 国家标准化战略纲要.

In both Standards 2035 and Main Points 2020, domestic standards are seen as a steppingstone for international standard setting. In other words, the better China's own standards are, the more influence it can yield. Comparing the goals of the two strategies, seen in boxes 1 and 2, it becomes clear that they are closely connected. This type of coherence and complementarity gives China significant advantages in pursuing long-term strategies.

Box 2 - Goals of the Standards 2035 Strategy[73]

1. Improve standards in China.
2. Promote the integration of domestic and foreign standards.
3. Participate in the formulation of international standards.
    - Gain influence in international standard setting institutions, mainly ISO.
    - Align global technology standards developed by bodies such as the International Telecommunication Union (ITU) with proprietary technologies used by Chinese suppliers.
4. Put forward more proposals for international standards.
5. Influence the way new technologies will work

Beijing also believes that better local standards and a better local standard-setting system will boost the economy and therefore enhance its international influence.[74] This has much to do with the current lack of centralization, especially at the provincial level, which may cause companies to comply with various provincial standards in addition to a national standard.

The Chinese government is aware of the fact that its own standards are not good enough and that its standard-setting system lacks a clear centralized chain of command. Since Xi Jinping came to power in China, a clear trend has been observed toward a more centralized chain of command and a more top-down decision-making process, with Beijing trying to be the center.[75] However, powerful entities with overlapping mandates – including local government entities, large state-owned companies, and an endless plethora of semi-governmental institutions such as research institutions and universities – are not willing to renounce their influence. Delegations of the Chinese Academy of Engineering, tasked with leading the research for China Standards 2035, have been visiting numerous provincial capitals, holding conferences with local

73 Hai Yun, "中国参与国际标准化工作的重要性和举措 | The importance and measures of China's participation in international standardization work," ChinaQKing, February 11, 2019, http://zsll.chinaqking.cn/yc/2019/1581041.html; Paul Triolo and Robert Greene, "Will China Control the Global Internet via Its Digital Silk Road?," SupChina, May 8, 2020, https://supchina.com/2020/05/08/will-china-control-the-global-internet-via-its-digital-silk-road/.

74 China Government Network, "《中国标准2035》将发布 | 'China Standards 2035' Will Be Released," Sina Finance, January 11, 2018, http://finance.sina.com.cn/roll/2018-01-11/doc-ifyqptqv7516166.shtml.

75 Timothy Heath, "The Consolidation of Political Power in China Under Xi Jinping: Implications for the PLA and Domestic Security Forces," Testimony (The RAND Corporation, 2019), https://doi.org/10.7249/CT503; David Gitter, "Xi Jinping's Latest Power Move, in Context," The Diplomat, February 27, 2018, https://thediplomat.com/2018/02/xi-jinpings-latest-power-move-in-context/.

government, institutes, and companies.[76] Officially, these talks are called 'consultations', but it rather appears that Beijing wants to involve as many entities as possible to broaden support. Another reason why complete centralization has proven difficult is the tension between these entities' commercial and public interests. For an overview of institutions involved participating in the Standards 2035 National Development Strategy Research, see appendix 6.3. Organizations involved in China Standards 2035.

Apart from international standards, the Main Points also emphasizes multilateral, bilateral and regional cooperation. There are explicit mentions of BRICS, the EU, the African Union, ASEAN, the Belt and Road Initiative, and Asia in general. Additionally, Saudi Arabia stands out as one of the main individually named countries.

Similarities can be observed when it comes to the sectors of focus of the two strategies. China Standards 2035 applies to a wide variety of sectors, the majority of which include new and strategic technologies. Artificial Intelligence, telecommunication networks (including 5G), internet of things and cloud computing, as well as big data take precedence over other technologies in the strategy.[77] Moreover, secondary attention is given to solar photovoltaic technology and data circulation.[78] Other focus fields include Chinese traditional medicine, military-civilian integration and modern agriculture. These sectors, illustrated in Table 2, seem to represent the strategic areas in which China will try to influence standardization. The country that first develops the necessary technology and knowledge in order to propose standardization is likely to have the most significant global competitive and strategic advantage in future decades.

Importance to Standards 2035	Sector
Main focus	Artificial Intelligence (AI)
	Telecommunications Networks
	Internet of Things (IoT) / Cloud Computing
	Big Data
Secondary focus	Solar Photovoltaic Technology
	Data Circulation
Other	Military-Civilian Integration
	Modern Agriculture

Table 2 - Sectors of focus for China Standards 2035

76 Runhua Chang, "'中国标准2035'项目组赴广东省开展调研 | 'China Standard 2035' Project Team Went to Guangdong Province to Conduct Research," Chinese Academy of Engineering, December 19, 2018, http://www.cae.cn/cae/html/main/col1/2018-12/19/20181219141118655490222_1.html; Runhua Chang, "'中国标准2035'项目组赴青海省开展调研 | 'China Standard 2035' project team went to Qinghai Province to conduct research," Chinese Academy of Engineering, January 30, 2019, http://www.cae.cn/cae/html/main/col84/2019-01/30/20190130182814492366190_1.html.

77 Feng Lin, "《中国制造2025》走后，又来了《中国标准2035》," VOA Chinese, April 28, 2020, https://www.voachinese.com/a/china-standards-2035-20200428/5395187.html; Kharpal, "Power Is 'up for Grabs'"; The State Council of the People's Republic of China, "Main Points of National Standardization Work in 2020," 2020, http://www.gov.cn/zhengce/zhengceku/2020-03/24/content_5494968.htm.

78 Feng, "《中国制造2025》走后，又来了《中国标准2035》," April 28, 2020. Only available in Chinese.

In Main Points 2020, a clear classification in terms of sector relevance lacks. The document is too wide in scope to clearly say something about which standards are the most important. Yet several strategic sectors are discussed. These include high-tech products as well as blockchain, internet of things, new cloud computing, big data, AI, new smart cities and geographic information. Comparing these with table 2, it becomes clear that the main priorities of the China Standards 2035 and Main Points coincide. Moreover, while critical raw materials are not mentioned explicitly in Main Points, there is a desire to standardize carbon fiber (carbon), rare earths and graphene – critical materials over which China has significant dominance.

3.3 Overall picture

The European Commission defines critical raw materials as having high economic value and supply risk.[79] In the context of the 2050 climate goals, the Commission views critical raw materials as essential resources for the construction of technologies such as wind turbines, magnets and solar panels. A similar definition is adopted by the U.S. Department of Energy, which views criticality as both relevant for renewable technologies and heightened supply risk.[80]

Supply risk is a measure of a product's vulnerability to disruptions.[81] On one hand, disruptions can be environmental, such as natural disasters on the short term and ore depletion on the long term.[82] On the other hand, political and economic developments can also lead to supply risks through the imposition of trade restrictions.[83] The availability of substitution possibilities,[84] strategic importance, price sensitivity and future demand to supply ratio[85] are additional aspects often taken into account when assessing criticality. Depending on the particularities of each country's technological requirements, different raw materials are deemed critical.[86] The latest critical materials

79 European Commission, "COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards Greater Security and Sustainability" (Brussels, March 9, 2020), 2, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474.

80 U.S. Department of Energy, "Critical Materials Strategy," 2010, 6, https://www.energy.gov/sites/prod/files/edg/news/documents/criticalmaterialsstrategy.pdf.

81 Nabeel A. Mancheri et al., "Effect of Chinese Policies on Rare Earth Supply Chain Resilience," Resources, Conservation and Recycling 142 (March 1, 2019): 101, https://doi.org/10.1016/j.resconrec.2018.11.017.

82 Benjamin Sprecher et al., "Framework for Resilience in Material Supply Chains, With a Case Study from the 2010 Rare Earth Crisis," Environmental Science & Technology 49, no. 11 (June 2, 2015): 6746, https://doi.org/10.1021/acs.est.5b00206.

83 Sprecher et al., 6746.

84 Artem Golev et al., "Rare Earths Supply Chains: Current Status, Constraints and Opportunities," Resources Policy 41 (September 1, 2014): 53, https://doi.org/10.1016/j.resourpol.2014.03.004.

85 Christoph Helbig et al., "How to Evaluate Raw Material Vulnerability - An Overview," Resources Policy 48 (June 2016): 7, https://doi.org/10.1016/j.resourpol.2016.02.003.

86 Gabrielle Gaustad et al., "Circular Economy Strategies for Mitigating Critical Material Supply Issues," Resources, Conservation and Recycling, Sustainable Resource Management and the Circular Economy, 135 (August 1, 2018): 24, https://doi.org/10.1016/j.resconrec.2017.08.002.

list of the EU from 2020 – one of the Union's strategies of ensuring security of supply – recognizes 30 critical materials.[87]

Table 3 provides an overview of the critical materials which, given China's active efforts at growing and modernizing its market and considering the EU-projected demand from within strategic sectors, emerge as disproportionately relevant to the coming energy transition and digital ambitions. These materials will also serve as the basis of this report's further analysis, with the impact of potential Chinese standard setting activities being viewed through the lens of the implications that said standard setting activities might have on EU and Dutch access to them, among others.

CRM		Technology	HS Codes for CRMs[88]
Light Rare Earth Elements	Cerium	Electric vehicles	2805
	Lanthanum	Electric vehicles	
	Neodymium	Wind turbines, Electric vehicles, Digital technologies	
	Praseodymium	Wind turbines, Electric vehicles	
	Samarium	Electric vehicles	
Heavy Rare Earth Elements	Dysprosium	Wind turbines, Electric vehicles, Digital technologies	
	Terbium	Wind turbines, Electric vehicles	
Cobalt		Carbon capture and storage, Electric vehicles, Digital technologies	2605
Gallium		Solar PV, Electric vehicles, Digital technologies	8112
Germanium		Solar PV, Electric vehicles, Digital technologies	8112
Graphite		Digital technologies	2504
Indium		Solar PV, Electric vehicles, Digital technologies	8112
Lithium		Electric vehicles, Digital technologies	283691
Silicon		Solar PV, Digital technologies	280461
Titanium		Geo-thermal energy	2614
Tungsten		Digital technologies	2611
Vanadium		Carbon capture and storage	2615

***Note**. For a more detailed list of materials and their uses, see Appendix 3*: Chinese Critical Raw Materials control*. For the descriptions of HS codes for CRMs as well as HS codes for relevant technologies, see Appendix 4: Overview HS Codes for CRMs and Technologies .*

Table 3 - Critical raw materials considered in this report and their uses

87 European Commission, "COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards Greater Security and Sustainability," 3.

88 HS Codes are extracted from the UN Comtrade database. This database is compatible with the Netherlands' CBS coding system.

4. Standards

4.1 What are standards?

Standards prescribe the behavior or characteristics of people or inanimate objects, often in technical terms. CEN CENELAC – an EU-affiliated standard-setting organization – distinguishes between four major types of standards;[89] namely: fundamental standards, test methods and analysis standards, specification standards, and organization standards. These are outlined in further detail below:

- **Fundamental standards** concern terminology, conventions, signs, and symbols. These standards do little in the way of standardizing technologies or methodologies but facilitate interoperability of communication. A fundamental standard might encourage corporations working within the transport sector to adhere to a system in which the color red is associated with danger and the color green is associated with green or might strive to ensure that all producers of corrosive acids use the same iconography in their packaging.
- **Test methods and analysis standards** strive to create uniformity in measurement types, ensuring (within the EU context) that EU-funded projects yield results which are easily comparable.
- **Specification standards** define characteristics of a product (product standards) or service (service standards). They also define performance thresholds such as fitness for use, interface and interoperability, health and safety, environmental protection, etc. USB-C, a port found on many consumer electronics, is an example of a specification standard which has enjoyed widespread adoption in recent years. In the case of USB-C, the standard dictates the port size and composition, allowing manufacturers to produce cables and peripherals which can utilize it to interface with 3rd devices.
- **Organization standards** describe the functions and relationships of a company, as well as elements such as quality management and assurance, maintenance, value analysis, logistics, project or system management, production management, etc. Organization standards regulate intra and inter-organizational behaviors and practices, meaning that they play a role in (among others) the protection of workers' rights.

89 "Types of Standards," CEN-CENELEC, 2020, https://www.cencenelec.eu/research/innovation/standardstypes/Pages/default.aspx.

Standards differ from government regulations in several ways. Perhaps most importantly, they tend to be targeted at regulating facets of modern life which are not typically regulated by governments. This has a lot to do with the fact that, unlike government regulations – the primary raison d'être of which tends to be the safeguarding of consumer or societal wellbeing – most standards exist primarily to produce value to parties which comply with them.[90] Though they generally achieve this by creating predictability, reducing barriers to interoperability, and by leveling the playing field between actors they affect, not all standards necessarily serve the interests of a wide group of stakeholders. For example, Apple's Lightning Connector – a direct competitor to USB-C – represents something of a "soft" technical standard which primarily serves to allow Apple to tightly control which manufacturers can and cannot produce devices that interface with its iPhones and to collect revenues through licensing fees.[91] In this case, Apple's large market share has allowed it to opt out of adopting the USB-C standard and to develop and maintain one of its own, a move which is arguably unfriendly to both consumers and to the environment.[92]

Apple's Lightning case study (which clearly benefits Apple) notwithstanding, standards have the potential of benefiting a wider group of private sector actors which adopt them in several ways. First and foremost, a standard may provide a business with a solution to a technical problem which is superior to the solution it is currently using.[93] Making use of superior technologies can often be associated with cost savings in the long term, meaning that actors which develop such technical standards are likely to enjoy widespread adoption. Second, adhering to existing standards – particularly when they are widely adopted – offers significant benefits as far as market access is concerned. This is partially because standards reduce information asymmetries between producers and consumers, and partially because adhering to standards creates network externalities capable of producing economic incentives. In the case of standards' ability to reduce information asymmetry, this has to do with the fact that – once a standard is widely adopted and recognized by consumers – consumers come to learn what to expect, what interfacing with a standard entails, and may even be irritated by a producer's choice *not* to adhere to it.

The Qi wireless charging standard, developed by the Wireless Charging Consortium, provides a clear example of this dynamic. The standard describes a form of power transfer in which coils in a charging peripheral transmit power to coils in a battery-

90 Tim Büthe and Walter Mattli, "International Standards and Standard Setting Bodies," in The Oxford Handbook of Business and Government (Oxford: Oxford University Press, 2010), 444.
91 Theo Priestley, "Apple Ditching The Headphone Jack Is Less About Music, More About Royalties," Forbes, 2016, https://www.forbes.com/sites/theopriestley/2016/01/11/apple-ditching-the-headphone-jack-is-less-about-music-more-about-royalties/.
92 Cameron Faulkner, "Apple Is Gearing up to Fight the EU over the Lightning Connector," The Verge, January 17, 2020, https://www.theverge.com/2020/1/17/21070848/eu-apple-european-commission-common-charger-lightning-cable-port.
93 Büthe and Mattli, "International Standards and Standard Setting Bodies," 441.

powered device, among other things. Because the Qi standard incorporates specific transmitter specifications, devices which do not adhere to the Qi standard are unable to interface with Qi-certified devices. Qi is almost ubiquitous in 2020 – something which, from a consumer perspective, increases confidence that buying a phone which advertises wireless charging capabilities will work with a previously purchased wireless charger, or vice-versa.[94] Because Qi has become synonymous with wireless charging, consumers do not need to worry about whether the wireless charging coils in their phones are compatible with those in their chargers. In this case, the presence of the standard has reduced information asymmetry, making purchasing decisions easier for consumers.

The Qi standard also clearly showcases standards' utility as a facilitator for market access. The existence of the technical standard means not only that all consumers are "locked in" to buying Qi-enabled devices; it also incentivizes other producers to develop and introduce devices which make use of the standard. As more devices supporting the standard are introduced, consumer demand for peripherals (chargers) increases, creating an ecosystem of Qi-enabled devices. As consumers obtain and come to rely on these devices, an expectation is constructed among consumers that their devices *work* with them. The standard's existence, in other words, allows for a degree of interoperability and fosters a degree of market demand that allows producers to chart out product cycles under the assumption that it will continue to exist. Because of its wide adoption rate, it also levels the playing field between producers. The ubiquity of the standard disincentivizes R&D investments into competing solutions, allowing manufacturers to invest their resources *either* into a technologically superior solution *or* into the development of additional Qi-based product offerings.[95]

The previously described dynamics are not unique to mobile phone charging. The alternating current standard won out over the direct current standard in the early years of the electrical age – even despite the efforts of individuals such as Thomas Edison – because it was a superior technology that greatly reduced losses in the transmission of electrical power over long distances. Many companies make significant attempts to certify themselves as adhering to labor practices which go above and beyond what is required by national law. This is not because they face fines for not doing so, but because not doing so is likely to result in a failure on their parts to attract employees or to receive insurance coverage. Consumers can reasonably buy any lightbulb at a supermarket and expect it to fit into a socket in their homes because standards describing technical aspects of the aforementioned sockets (and the objects that plug into them) have been widely adopted. Though some standards are transposed into law and though some are explicitly designed to facilitate compliance with

94 Thuy Ong, "Qi Reigns as the Standard for Wireless Charging after Powermat Joins WPC," The Verge, January 8, 2018, https://www.theverge.com/2018/1/8/16862244/powermat-wireless-power-consortium-qi-charging.
95 Büthe and Mattli, "International Standards and Standard Setting Bodies," 442.

government legislation, the enforcement mechanisms that incentivize compliance with standards tend to be soft. Private sector actors comply not because they wish to avoid government backlash, but because *not* doing so shrinks their customer base, results in unwanted social or political pressures, or incurs direct costs in the form of, for example, increased insurance premiums.

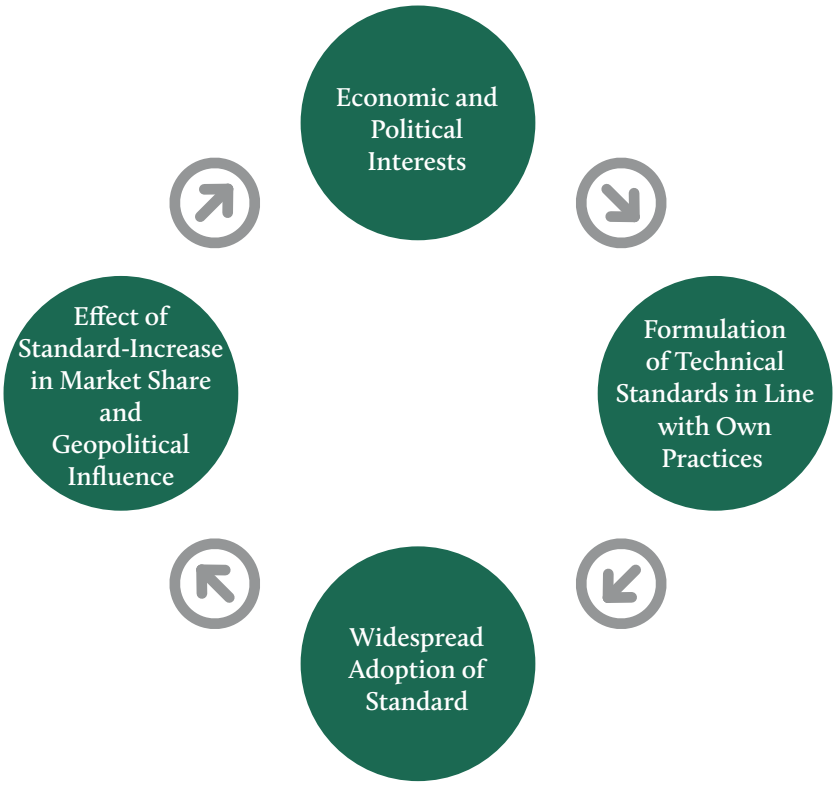

Figure 1 - The strategic role of a technical standard

Technical standards, despite appearing neutral in value at first sight, are informed by economic and often political interests. When competition unfolds between two companies that originate and operate in the same market, it is likely that the primary goal behind their standardization initiatives is economic. Two Dutch companies could be competing for market share, but the political aspect plays a lesser role given that they originate in the same political system. These dynamics change, however, when the two companies originate in different political and economic ideologies, who in turn, are also in a geopolitical competition for international influence. In a hypothetical situation between a private corporation from the Netherlands and a Chinese state-owned company, the two compete not only for market share, but also indirectly for political influence (Figure 1). If the Chinese company were to set standards for the composition of lithium-ion batteries, for instance, that standard might on the one hand be aimed at increasing its revenues, and at undermining the international influence of its Dutch counterpart on the other. This could happen by, for example, making their products both incompatible with other related Dutch products and less expensive – in

that way, the Dutch product loses its economic profitability and consumers will tend to choose the Chinese technologies. This latter act would be derived from the Chinese interest to become a technological leader by 2049, as explained in section 3.2.

The illustrative examples in this section make it clear that technical standards cannot be considered in isolation from the interests and values of companies and countries who lobby for standardization. For this reason, the following sections of this report are primarily focused on the strategic role of technical standards.

It is important to mention that companies can also try to exert influence by designing standards with the main purpose of formalizing norms and values.[96] Examples of the latter case are responsible mining initiatives that aim at preventing environmental damage or human rights violations, such as the EU's Conflict Minerals Regulation or the OECD Due Diligence Guidance for Responsible Supply Chains.[97] The EU's role as an international regulatory power is often highlighted by the bloc's many initiatives in promoting responsible mining standards and certification schemes. For this reason, some purely normative standardization initiatives for mining are analyzed in section 5.1.6. Still, although the effectiveness of both technical and normative standards are dependent on wide applicability, the former tend to become more widely spread due to their indirect bearing of norms. Therefore, technical standards take precedence in importance for the following decades.

4.2 How are standards formed and established, and where does China's advantage lie?

Standards may emerge as a result of a myriad of differing processes – something which is reflected in (among others) the examples of real-world standards cited in this section. USB-C and Qi were introduced by the USB Implementor's Forum and Wireless Charging Consortium, meaning that they are both examples of standards which were developed by consortia. By contrast, Apple's Lightning connector – though it shares many specifications and underlying technologies with USB-C – was developed and introduced by Apple individually, and succeeded largely due to that company's well-established foothold within the global smartphone market. Standard setting initiatives exist at both the national and international levels, and may be spearheaded by public or private sector actors, or by a combination thereof. Generally speaking,

96 Shi Chen, Qinqin Zhang, and Yong-Pin Zhou, "Impact of Supply Chain Transparency on Sustainability under NGO Scrutiny," *Special Issue on Innovations and Sustainability* 28, no. 12 (2018): 3003, https://doi.org/10.1111/poms.12973.

97 "Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 Laying down Supply Chain Due Diligence Obligations for Union Importers of Tin, Tantalum and Tungsten, Their Ores, and Gold Originating from Conflict-Affected and High-Risk Areas," Pub. L. No. 32017R0821, 130 OJ L (2017), http://data.europa.eu/eli/reg/2017/821/oj/eng.

we can distinguish between the four following high-level models for developing and introducing standards:

- **Public (governmental) non-market**.[98] Public non-market standard setting can take the form of a.) ad-hoc agreements, b.) trans-governmental collaboration among specialized regulatory agencies, or c.) international organizations (IOs). This form of standardization emerges as a result of collaboration between mid-level public officials and/ or bureaucrats charged with similar tasks in different countries. These standards are not formulated or adopted through traditional (political) channels and hierarchies or through international diplomacy. Examples of public non-market standard setting bodies include the Basel Committee on Banking Supervision, the Consultative Committee for Space Data Systems, the International Organization of Securities Commissions (IOSCO), the International Telecommunications Union (ITU), the Universal Postal Union (UNU), the International Labor Organization (ILO), the International Monetary Fund (IMF), and the International Maritime Organization (IMO). These organizations universally develop standards which, although not binding, strongly incentivize governments to implement changes and introduce pieces of legislation that ensure compliance. These standards typically solve or mitigate the impact of coordination problems.
- **Public market**.[99] Regional, national, and subnational regulators may choose to introduce standards which – though they comply with existing (inter)national legislation – fall short of the ideals enshrined in existing international standards. The key difference between public market and public non-market standard setting is that public market standard setting is, more often than not, enforced by local law. Studies have found that several factors, including the regulatory capacity of standard-setting entities and the economic weight of the markets they standardize, increase the chance that standards introduced at the local level will go on to be established as de-facto global standards. EU competition policy provides a clear example of this dynamic. EU standards for the permissibility of mergers among multinational firms effectively govern mergers among US-based firms because compliance with EU standards is a precondition for EU market access. This dynamic clearly showcases how a country such as China might be able to establish de-facto global standards through the introduction of domestically binding standards and/ or regulations.
- **Private non-market**.[100] Private non-market bodies are responsible for the introduction of the bulk of global private sector rules. These standards are formulated by a diverse set of (usually private sector) stakeholders, by or through an international non-governmental organization. The International Organization

98 Büthe and Mattli, "International Standards and Standard Setting Bodies," 449–53.
99 Büthe and Mattli, 453–55.
100 Büthe and Mattli, 455–60.

for Standardization (ISO) and the International Electrotechnical Commission (IEC) account for roughly 80% of all international product standards, meaning that they are the two most prominent organizations within this space. These organizations are involved in the formulation of standards which regulate everything from freight container dimensions to air quality measurement methods and beyond. The vast majority of standards is fiercely contested during their conception, given that some firms face less institutional and domestic roadblocks to introducing standards than others. Specifically, research based on business surveys shows that the degree to which a private-sector actor is likely to be able to influence the introduction of a standard correlates closely with the degree to which a company is able to coordinate internally. In turn, a company's ability to coordinate internally has been linked to the rigidity of its internal hierarchies. Given the highly organized nature of Beijing's forays into introducing international standards within organizations such as the ISO, it stands to be argued that it may be able to actualize its goals.

- **Private market**.[101] The private market model of standard setting refers to a process in which individual private-sector actors introduce standards (whether technological or otherwise) with the goal of capitalizing on their wider adoption. Apple's Lightning connector (previously detailed) constitutes a clear example of a firm achieving de facto standardization by leveraging its existing market dominance. In similar veins, firms may seek to establish copyrighted business models as essential components of industry-wide service provision, or to make a specific (patented) technology a starting point for further product development within a market segment. There are certain technologies that function based on many standardized products that are protected through patents.[102] As such, *standard-essential patents* are those that make the effective world-wide use of a technology possible.[103] The most prominent examples are communication and high-tech sectors, such as 4G and Wi-Fi networks, that rely on hundreds of patented inventions for their functioning.[104] By securing such strategic patents, firms can reap significant financial benefits through royalty fees.[105] Moreover, being in control of licensing a large number of companies becomes an important geopolitical advantage.[106] This form of standardization can be achieved by (as showcased in the Apple example) the leveraging of preexisting market dominance, the licensing of intellectual property, pricing goods or technology below cost, or through the use of other business strategies.

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101 Büthe and Mattli, 460–63.
102 EU Commission, "Patents and Standards," Text, Internal Market, Industry, Entrepreneurship and SMEs - European Commission, July 5, 2016, https://ec.europa.eu/growth/industry/policy/intellectual-property/patents/standards_en.
103 The US-China Business Council, "China in International Standards Setting: USCBC Recommendations for Constructive Participation," February 2020, 6.
104 EU Commission, "Patents and Standards."
105 The US-China Business Council, "China in International Standards Setting: USCBC Recommendations for Constructive Participation," 6.
106 The US-China Business Council, 6.

Type of standard	Level of authority	Main purpose	Relevant actors	Example of standards
Public non-market	Non-binding	Solve or mitigate coordination issues	Public standard setting bodies (e.g. ITU, ILO, IMF)	Optical-transport networks specifications
Public market	Binding	Ensure minimum necessary requirements for activity	Regional, national, subnational regulators (e.g. EU, local government)	EU competition policy
Private non-market	Non-binding	Solve or mitigate coordination issues	International non-governmental organizations (e.g. ISO, IEC)	Freight container dimensions, air quality measurement
Private market	Non-binding	Increase market power	Private sector	Apple's lightning connector

Table 4 - Overview of standard setting processes

Regardless of the model through which a standard is introduced, its salience is defined by its adoption rate. A standard which fails the adoption test is unlikely to enjoy the benefits of having an ecosystem of soft "enforcement mechanisms" developed around it, and is therefore unlikely to produce value for consumers and manufacturers alike.

China's domestic standard setting is highly complex. It involves many different hierarchical institutions that in turn develop hierarchical standards (see appendix 6.1. for an overview of Chinese standards). In practice, this means that lower-class standards must be designed to comply with higher-class standards. National standards – which can take either mandatory or voluntary forms – make up the top rung of China's standard hierarchy. These are followed by sector (industry) standards, local standards, association standards, and, finally, enterprise standards. The high degree of vertical integration – particularly when combined with China's bureaucratic enforcement of the standards hierarchy – means that Beijing enjoys a relatively high degree of strategic autonomy as far as introducing domestic standards with the purpose of establishing them globally is concerned. The country's standard-setting initiatives also have several other characteristics which potentially afford them an outsized capacity to formulate standards which go on to be widely adopted. This may be of concern to policymakers thinking about these initiatives' potential impact on Dutch national security.[107]

The country wields the most outsized potential influence within the private market and private non-market standard setting models. This is, in no small part, because China's non-market driven approach to developing and extracting critical resources

107 Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe," 3.

means it can prioritize the pursuit of its strategic objectives over profitability.[108] This positions it well to introduce standards through a private market model because it has allowed the country to achieve a quasi-monopoly over the global supply of critical resources.[109] Any standard China introduces (whether domestically or regionally) is likely to go on to de facto establish itself internationally simply because China faces little to no long-term competition within critical raw materials' supply chains. States which object to the standards it introduces to regulate its domestic market will need either to introduce competing standards or to ban imports through regulation. For most states, neither of these options is feasible. Competing standards are unlikely to enjoy widespread adoption if China – the world's leading producer of critical resources – chooses not to adhere to them. Introducing legislation limiting imports from China will have a negative economic impact in the absence of access to a viable alternative source of critical materials. Should push come to shove, the international community is more likely to opt into accepting the existence of and adopting Chinese standards than it is to compromise on its ability to pivot towards renewables (Box 3).

China also looks set to play an increasingly central role in private non-market standard setting through the ISO. Beijing has made a consecrated push to transform China into a standard setter within the context of its goal to transform the country's economy by 2050, something which (at least in the short term) has manifested in increased attention for standard setting within the ISO.[110] Chinese organizations which participate in standard setting within the organization differ from competing members in several ways. First and foremost, their participation is incentivized by significantly different factors than that of their competitors. The country's quasi-monopoly over global rare earth elements (REE) supply, particularly when combined with the government's willingness to support and expand Chinese corporations' efforts to access resources abroad (see for example Africa), means that they – unlike many of their competitors – are not incentivized by their wish to protect their market share. Beijing's top-down approach to managing China's standard-setting initiatives means that the corporations and state agencies which represent it within the ISO are incentivized by realizing China's strategic objectives. These factors also combine to ensure that Chinese standard setters have access to disproportionately more information than many of their peers, something which has previously been shown to further an actor's standard-setting capacity within the ISO significantly.

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108 Polina Klossek, Jakob Kullik, and Karl Gerald van den Boogaart, "A Systemic Approach to the Problems of the Rare Earth Market," Resources Policy 50 (December 1, 2016): 134, https://doi.org/10.1016/j.resourpol.2016.09.005; Aiping Han, Jianping Ge, and Yalin Lei, "Vertical vs. Horizontal Integration: Game Analysis for the Rare Earth Industrial Integration in China," Resources Policy 50 (December 2016): 158, https://doi.org/10.1016/j.resourpol.2016.09.006.

109 European Commission, "COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards Greater Security and Sustainability," 4; Marc Humphries, "China's Mineral Industry and U.S. Access to Strategic and Critical Minerals: Issues for Congress" (Congressional Research Service, March 20, 2015), 9.

110 Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe," 3.

Box 3 - BRI

The BRI project is a clear illustration of how Chinese domestic standards can become widely adopted and thus relevant for other international players such as the EU. Through the BRI, Chinese domestic norms and rules are championed globally. In this way the Chinese government rather than market players determine which standards are acceptable and established. Due to China's stronghold over strategic reserves of CRMs and technological value chains, the standards they promote are likely to become de facto accepted in many countries without significant economic or geo-political influence. A 2020 report from the European Chamber of Commerce in China states: *"Smaller, less developed countries that do not have the capacity for setting their own standards will certainly be put under considerable pressure to simply adopt Chinese standards".*[111] Such a prospect is problematic to the EU, whose ability to promote European values and norms erodes.

The BRI is a strategic instrument used to promote standardization processes on either bilateral or multilateral bases. By creating interdependent relations with BRI countries, China has a rather straightforward and inexpensive channel of influence. As such, standardization could be more rapid and less costly than the procedures normally associated with bi/ multilateral dialogues. According to state media in 2019, China signed "85 standardization cooperation agreements with 49 countries and regions".[112]

Within BRI projects, a distinction can be made between 'hard connectivity' on one hand – including infrastructure and transport – and 'soft connectivity' on the other – including data flows and digital infrastructure. The standard-setting ambitions refer to the latter, with the aim of optimizing the flow of information and trade between China and partner BRI countries. Standardization of trade rules is also mentioned, regarding quality inspections and border procedures, for example.

The National Standardization Administration of China launched in 2017 an *Action Plan on Belt and Road Standard Connectivity (2018-2020),* illustrating the importance of standardization as a strategic tool in the BRI.[113] In the plan, it is stated that "*standardization plays a fundamental and strategic role in advancing the construction of the Belt and Road".*[114] An overview of all action points in the Plan can be found below.

1. Align strategic planning and consolidate the international consensus on standard connectivity.
2. Deepen infrastructure standardization cooperation to support the construction of facility connectivity networks.
3. Promote international capacity and equipment manufacturing standardization cooperation to promote a better and faster real economy.

111 European Union Chamber of Commerce in China, "The Road Less Travelled: European Involvement in China's Belt and Road Initiative," 2020, 22, https://www.europeanchamber.com.cn/en/publications-belt-and-road-initiative.

112 China Daily, "The BRI Progress, Contributions and Prospects," 2019, //global.chinadaily.com.cn/a/201904/23/WS5cbe5761a3104842260b7a41.html.

113 "《标准联通共建'一带一路'行动计划（2018—2020年）》发布 | 'Standard Unicom Joint Construction of the "Belt and Road" Action Plan (2018-2020)' released," ce.cn, December 24, 2017, http://www.ce.cn/xwzx/gnsz/gdxw/201712/24/t20171224_27401100.shtml.

114 The quote is translated from the Chinese document Action Plan on Belt and Road Standard Connectivity (2018-2020).

Box 3 - BRI

4. Expand foreign trade standardization cooperation to promote the development of foreign trade.
5. Strengthen energy-saving and environmental protection standardization cooperation to serve the construction of a green "Belt and Road".
6. Promote standardization cooperation in the humanities field to promote exchanges and mutual learning between civilizations.
7. Strengthen health services cooperation in the field of standardization to enhance people-to-people bonds.
8. Carry out standardization cooperation in the financial field to serve the construction of a stable and fair international financial system.
9. Strengthen standardization cooperation in the maritime field to help unblock the 21st Century Maritime Silk Road.

Apart from this central document regarding standards, China has developed other BRI programs relevant to standardization as well. In the field of environmental protection, China developed a separate BRI-standards program in support of the UN 2030 Sustainable Development Agenda.[115] Additionally, the Digital Silk Road plan is a complementary program to the Action Plan – the former focuses on promoting connectivity to facilitate trade, while the latter seems to be focused solely on connectivity itself.[116]

A few examples illustrate the types of standardization activities that occurred in relation to the BRI. China aims at establishing a form of international tribunal that would serve as a dispute settlement mechanism regarding BRI-related trade and investment conflicts. This new tribunal would replace other existing bilateral and multilateral dispute settlement procedures. Another example is represented by construction standards. Most BRI construction in other countries is carried out by Chinese companies with Chinese staff and Chinese equipment. During construction, these companies follow Chinese construction standards instead of the standards of their host-country.[117] Moreover, China aims at basing digital infrastructure, including software and hardware, on Chinese standards.[118]

115 Xu Haoliang, "Harmonized Standards Can Make Belt and Road a Driver to Attain SDGs," ChinaDaily, April 27, 2019, https://www.chinadaily.com.cn/a/201904/27/WS5cc3b24aa3104842260b8b32.html.

116 Clayton Cheney, "China's Digital Silk Road: Strategic Technological Competition and Exporting Political Illiberalism," *Council on Foreign Relations* (blog), September 26, 2019, https://www.cfr.org/blog/chinas-digital-silk-road-strategic-technological-competition-and-exporting-political; Zhou Lanxu, "Vice-Minister Stresses Alignment of BRI Standards - Chinadaily.Com.Cn," ChinaDaily, April 25, 2019, http://www.chinadaily.com.cn/a/201904/25/WS5cc178c2a3104842260b8611.html.

117 Stephen Pudner and Xeris Gregory, "How Will China's Belt and Road Initiative Change the World?," American Bar Association, 2019, https://www.americanbar.org/groups/construction_industry/publications/under_construction/2019/winter2019/china-belt-road-initiative/.

118 Reuters, "European Firms Get 'crumbs' from China's Belt and Road: Business Group," *Reuters*, January 16, 2020, https://www.reuters.com/article/us-china-europe-silkroad-idUSKBN1ZF08O.

4.3 Under what circumstances would Chinese standard setting infringe on EU security?

What, in practice, do Beijing's efforts at establishing standards within the critical materials space mean for Dutch and European security? The National Coordinator for Security and Counterterrorism's (NCTV's) National Security Strategy (NSS) provides a useful framework for conducting further analysis. The NSS splits the concept of national security into six domains; namely: territorial, physical, economic, and ecological security, social and political stability, and the international rule of law.[119]

1. **Territorial security**. The unimpeded of the Netherlands and its EU and NATO allies as independent states in a broad sense, or territorial security in a narrow sense.
2. **Physical security**. The ability of people to go about their lives in an unimpeded manner within the Netherlands and their own physical environments.
3. **Economic security**. The unimpeded functioning of the Dutch economy in an effective and efficient manner.
4. **Ecological security**. The unimpeded continued existence of the natural living environment in and around the Netherlands.
5. **Social and political stability**. The continued and unimpeded existence of a social climate in which individuals are free to go about their lives and groups are able to coexist within and in accordance with the Netherlands' democratic and lawful state and its shared values.
6. **International rule of law**. The functioning of the international system of rules, standards and agreements established for the purposes of international peace and security.

Chinese standard setting efforts can be widely understood as infringing on the EU's **territorial**, **economic**, and **ecological** security, as well as on the **international rule of law**. To understand how Beijing's efforts might negatively impact these pillars of (Dutch) national security, it helps to consider what real-world developments their establishment might eventually come to be associated with. Chinese standard setting efforts could erode the EU's relevance as a "regulatory superpower," something which would reduce the trading bloc's international influence – thus undermining its ability to safeguard the **international rule of law**. Equally conceivable (and not mutually exclusive with the previous point), Chinese efforts at formulating (technical) standards

119 National Coordinator for Security and Counterterrorism, "National Security Strategy 2019" (The Hague: Ministry of Justice and Security, 2019), https://english.nctv.nl/binaries/nctv-en/documents/publications/2019/09/19/national-security-strategy/National+Security+Strategy_2019.pdf.

and establishing them internationally might result in intra-EU fragmentation. In turn, this would exacerbate existing fragmentation and undermine EU unity, thus infringing on its ability to safeguard the **international rule of law** and negatively impacting its **territorial**, **economic**, and **ecological** security in the process. Beijing's efforts might also foster an outsized dependence on China (**territorial** and **economic** security), undermining the framework surrounding the protection of human rights and granting China greater autonomy when it comes to flaunting Western norms (**international rule of law**).

The ways in which Chinese standard-setting might contribute to these developments are diffuse and oftentimes indirect. In the case of their contribution to the erosion of the EU's relevance as a regulatory superpower, this has everything to do with Beijing's efforts at developing China's capacity as a technical (specification) standard setter. Because technical standards define many of the basic characteristics that guarantee interoperability, they constitute the "recipe" for most modern technologies. The EU's relevance as a regulatory superpower derives – in no small part – from its outsized influence within the ISO and the IEC. EU MSs command far more positions within the ISO and the IEC than do any other major economic powers, something which allows the trading bloc to punch well above its weight as far as defining the nature of international technical standards is concerned.[120] Maintaining some form of control over technical standard setting within the critical resources space – what characteristics should the end-products which incorporate these materials have? How should these materials be incorporated into said end-products? What technologies and software should those end-products be interoperable with? – is likely to be of key importance to defining the nature of the technologies that will contribute to the coming energy transition. Given the fact that the EU has afforded climate change, in addition to issues such as antitrust regulation, labor protections, and online privacy, an increasingly central role within its international influence portfolio, Beijing's strides into the technical standard-setting space is likely to erode the EU's international influence.

Beijing's efforts at technical standard setting are also central to the discussion surrounding EU fragmentation. This is because China takes an unorthodox, aggressive approach to formulating and *establishing* its technical standards. As alluded to in previous sections, China's standard-setting apparatus benefits from a high degree of public-private cooperation. In practice, this means that Beijing can make strategic decisions as far as formulating and establishing its standards are concerned. Chinese companies participating in organizations such as the ISO or the IEC are, in contrast to many of their Western counterparts, not independent parties whose participation is motivated by profit. Instead, they are state-backed actors whose decisions are at least

120 Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe," 3.

partially shaped by Chinese strategic thinking, with the establishment (read: adoption) of the standards they introduce being incentivized through diplomatic and economic channels. This can clearly be observed in the circumstances surrounding Chinese efforts to establish Chinese companies as leading suppliers within the 5G space. A 2019 Wall Street Journal investigation found that Huawei – a Chinese company at the center of the unfolding 5G controversy – received as much as $75bn in state support in the run-up to 2020,[121] something which likely contributed to the company's ability to offer 5G hardware at significantly lower costs than rivals such as Ericsson and Nokia Oyj.[122] Chinese efforts within the 5G space have, by and large, succeeded. Despite US efforts at organizing a widespread boycott, many states outside of the geopolitical West have given Huawei (and China by extension) a green light, Russia, Turkey, Saudi Arabia, the United Arab Emirates, Thailand, Malaysia, and Indonesia included. Chinese financial incentives have also proved themselves central to fueling disagreement over adoption within Europe. As early as 2019, Deutsche Telekom AG, a German cellphone operator, claimed that rolling out 5G without Huawei would delay its network by at least two years and increase the costs of its construction by billions.[123] European MSs remain split on whether and how to utilize Huawei's technologies in the introduction of their 5G networks, with Spain and Hungary both having expressed their intent to use Huawei equipment in their 5G "cores" and Romania, Poland, the Czech Republic, Latvia, and Estonia having pledged not to do business with companies which are subject to state interference.[124]

Discussions such as the one surrounding European MSs adoption of 5G are likely to recur as a result of Chinese standardization efforts in the future. Given its commitment to establishing China as a global standard setter, Beijing is sure to continue leveraging a high degree of public-private cooperation to incentivize the widespread international adoption of its technical standards. Because of the geopolitics underpinning standards adoption, (non)adoption of Chinese standards is likely to continue to split along ideological lines and is likely to serve as vassal for EU fragmentation and for the exercising of Chinese influence going forward. In ten years, European MSs may well disagree over the technical specifications of windmill turbines, or over the acceptable composition of the magnets used therein. Some countries might choose to erect wind turbines which adhere to Chinese standards, while others might refuse to implement anything that doesn't comply with German or American ones. These countries' wind turbines are unlikely to be compatible with one-another, meaning that countries

121 State support came in the form of tax breaks, financing, and cheap resources. See Chuin-Wei Yap, "State Support Helped Fuel Huawei's Global Rise," Wall Street Journal, December 25, 2019, sec. Tech, https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736.

122 "Huawei Is a Paralyzing Dilemma for the West," Bloomberg.Com, November 23, 2019, https://www.bloomberg.com/opinion/articles/2019-11-23/huawei-s-5g-networks-are-a-paralyzing-dilemma-for-the-west.

123 "Huawei Is a Paralyzing Dilemma for the West."

124 Patrick Wintour, "Europe Divided on Huawei as US Pressure to Drop Company Grows," The Guardian, July 13, 2020, sec. Technology, https://www.theguardian.com/technology/2020/jul/13/europe-divided-on-huawei-as-us-pressure-to-drop-company-grows.

which have opted for Chinese wind turbines will be reliant on China for replacements and repairs – something which Beijing, in turn, might leverage to influence, for instance, how said countries vote within the European Council (EC).

The dependence Beijing may foster as a result of standards-reinforced EU fragmentation combines with the high degree to which its standards are likely to be adopted outside of the Western geopolitical sphere to undermine several aspects of the international order. Widespread standards adoption will earn China considerable influence within the EU, which is likely to reduce the bloc's ability to condemn its illiberal behavior. The success of Chinese standards will come at the cost of EU-backed standards, meaning that the EU stands to lose both economic benefits and international influence from their introduction. China is also likely to introduce procedural standards which – when compared to their EU equivalents and/ or to EU norms and values – fall short on issues pertaining to the protection of human rights. Coupled with Beijing's quasi-monopolistic control over the global supply of critical raw materials, the introduction of these standards is likely to contribute to the erosion of the normative framework surrounding the protection of human rights.

5. Analysis of Chinese standard setting initiatives

The previous chapter outlined several things which warrant further exploration within this part of the report. First and foremost, because a significant portion of the EU's international influence derives from its outsized weight within international standard setting organizations, the degree to which Chinese efforts are likely to impact the EU depends – at least partially – on its actions within organizations such as the ISO, which practice a private non-market approach to standard setting. Second, China's standard setting capacity within the CRM space has characteristics which mean that – whether they are introduced at the national or international levels – its standards are likely to go on to establish themselves internationally. As a result, the *nature* of the standards it introduces – do they incentivize fragmentation? Are they designed to render EU countries dependent on Chinese manufacturers? Do they allow for infringements on human rights? etc. – is of great relevance. This section explores and reflects on trends in Chinese influence within major international standard setting bodies on the one hand, and provides an overview of their *domestic standardization processes* and their potential international influence on the other.

5.1 Analyzing Chinese influence within international standard setting bodies

5.1.1 International Organization for Standardization (ISO)

General Information

Founded	1947
Headquarters	Geneva, Switzerland
President / Country	Eddy Njoroge / Kenya
CEO / Country	Sergio Mujica / Chile
Chinese name	国际标准组织（ISO）

Table 5 - ISO General Information

ISO is the largest and most important international standard setting organization, referring to itself as "a network of national standard bodies".[125] The ISO, together

125 "ISO - Members," ISO, accessed November 2, 2020, https://www.iso.org/members.html.

with the International Electrotechnical Commission (IEC) and the International Telecommunication Union (ITU), are the main international standard-setting bodies.[126] Countries are represented within the ISO by their main national standard-setting organizations, which participate in developing standards and vote on their behalf. At the moment, the ISO distinguishes between 253 sectors of standards.[127]

Standards are developed in Technical Committees (TC), each of which is responsible for standard setting within a specific field.[128] There is no limit to the number of standards that a TC can develop, the only limiting factor being its ability to generate agreement among its members. Once a TC has agreed upon a standard, it sends the proposal to the ISO's Technical Management Board (TMB).[129] After review, the TMB further sends the proposal to the ISO Council. The final stage is the General Assembly vote.[130]

Each TC can be identified by reference and by title. The most productive ISO TC is reference ISO/TC 22, title Road Vehicles, which has published 936 standards and has another 258 under development. The least productive active TCs (some are 'on standby' or inactive) is reference ISO/TC 109, title Oil and gas burners, with two published standards and nothing under development. The most important TC is ISO/IEC JTC1, title Information Technologies. This is a joint TC, run by ISO and IEC, analyzed below in 5.1.3. This joint TC has published 3256 standards. It has another 586 under development.

Each TC has a Secretariat, a Committee Manager, a chairman, a secretariat, participating members, and observing members. The secretariat role is usually fulfilled by a country's representative standard setting organization. This country also appoints the manager and the chairman. Moreover, participating members actively take part in the development of standards and have a right to vote in the TC. An observing member follows the work of a TC and receives all relevant documents, but does not have voting rights. The country with observing members can still participate in the final stage of standard development – the General Assembly vote – although their influence in TCs is limited.[131] Finally, two representatives from the ISO's bureaucracy participate in each TC: an ISO Technical Program Manager (TPM) and an ISO Editorial Program Manager (EPM).

Besides a country's official representatives, ISO also collaborates with 'Organizations in Cooperation with ISO'. These organizations include international bodies, branch organizations, associations, councils, federations, and confederations.[132] Their role, when it comes to ISO standard setting, appears to be mostly advisory.

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126 "About the IEC," IEC, accessed November 3, 2020, https://www.iec.ch/about/?ref=menu.
127 "ISO - Technical Committees," ISO, accessed November 2, 2020, https://www.iso.org/technical-committees.html.
128 "ISO - Technical Committees."
129 "ISO - Who Develops Standards," ISO, accessed November 2, 2020, https://www.iso.org/who-develops-standards.html.
130 "ISO - Structure and Governance," ISO, accessed November 2, 2020, https://www.iso.org/structure.html.
131 Mari Morikawa and Jason Morrison, "A Survey of Participation in ISO's International Standards Development Processes" (Pacific Institute, 2004).
132 "ISO - Organizations in Cooperation with ISO," ISO, accessed November 2, 2020, https://www.iso.org/organizations-in-cooperation-with-iso.html.

National Representation

China is represented by the Standardization Administration of China (SAC).[133] The Netherlands is represented by the Royal Netherlands Standardization Institute (NEN).[134]

The SAC is a state-controlled and state-funded entity under AQSIQ, which is presided over by the Chinese State Council. This position means that the Chinese representation at ISO has endless funding, people, and research at its disposal. Such an abundance of resources is convenient given China's ambition to both influence ISO and learn good practices that can be applied in order to strengthen the domestic standardization institutions.

Contrastingly, NEN is a smaller private non-profit foundation which enjoys little formal and/ or structural cooperation with the Dutch policymaking system – although it has, in recent years, experienced an increased degree of cooperation with the Dutch Ministry of Economic Affairs (MinEZK). The main funding source of NEN is the selling of certification services as well as running a *Standards Shop.*[135] There is no apparent government support, or a research staff like in the case of SAC.

Box 4 - Structure of ISO Technical Committee on Ships and Marine Technology[136]

The ISO/TC8 was founded in 1947, making it one of ISO's oldest TCs.

Scope: *Standardization of design, construction, training, structural elements, outfitting parts, equipment, methods and technology, and marine environmental matters, used in shipbuilding, comprising sea-going ships, vessels for inland navigation, offshore structures, ship-to-shore interface, the operation of ships, marine structures subject to IMO requirements, and the observation and exploration of the sea.*

ISO/TC8 has: 365 published ISO standards. 101 ISO standards under development. 26 participating members. 23 observing members. The TC has 10 active subcommittees (SC). For example: ISO/TC8/SC1 Maritime safety. Each subcommittee can have several working groups (WG). For example: ISO/TC 8/SC 1/WG 1 Lifesaving appliances and arrangements.

The Secretariat of ISO/TC8 is the Standardization Administration of China (SAC). The Committee Manager is Ms. Wang Jing (China) and the Chairperson is Mr. Li Yangqing (China). The 26 participating members include: China, Iran, Italy, Greece, the Netherlands, the U.K. and the U.S. The 23 observing members include: Cuba, Hong Kong, DPRK, Pakistan, and Serbia.

Concluding: ISO/TC8 is a Chinese affair. It holds the secretariat, the manager, the chairperson, and it has important allies (or debtors) with both the participating members and with the observing members.

133 "SAC - China," ISO, accessed November 2, 2020, https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/member/00/16/1635.html.
134 "NEN - Netherlands," ISO, accessed November 2, 2020, https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/member/00/20/2027.html.
135 "NEN Webshop," accessed November 2, 2020, https://www.nen.nl/en/norm-kopen.
136 "ISO/TC 8 - Ships and Marine Technology," ISO, accessed November 3, 2020, https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/committee/04/57/45776.html.

Type of representation/ Country	China	United States	The Netherlands	EU countries incl. The Netherlands
TC Secretariats	64	104	13	295
TC Participating members	700	580	453	6000
TC Observing members	38	9	162	5247

Table 6 - National representation in ISO Technical Committees[137]

As indicated in Table 6, despite the vast financial and human resources behind Chinese representation at ISO, the EU is better represented in TCs – not only as participating or observing members, but also in secretariats. Moreover, China is not well represented in ISO's structure and bureaucracy. There are no Chinese members among the Principal Officers, none among the Council, and none among the Council's bodies.[138] Although at the moment Chinese representation in ISO seems poor relative to the EU's, the difference in resources between state-supported Chinese and private European delegations might become relevant in the near future. The abundant resources give China significant advantages in trying to influence strategic sectors of ISO, which is one of their national goals. They are already strongly involved in the committee on marine technology (Box 4), a strategic sector toward which China seems to be directing a lot of attention.

5.1.2 International Electrotechnical Commission (IEC)

General Information

Founded	1906
Headquarters	Geneva, Switzerland
President / Country / Term	Shu Yinbiao / China / 2020-2025
General Secretary / Country	Philippe Metzger / Switzerland
Chinese name	国际电工委员会（IEC）

Table 7 - IEC General Information[139]

IEC is a standard-setting organization for electrical, electronic, and related technologies. A few relevant technology sectors in relation to Chinese interests are smart cities, cyber security, energy efficiency, and renewable energies. Standards are discussed and developed by companies, industries, and governments. IEC cooperates with ISO and ITU, the three being referred to as "global sister organizations".[140]

137 "SAC - China"; "ANSI - United States," ISO, accessed November 2, 2020, https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/member/00/21/2188.html; "NEN - Netherlands."
138 "ISO - Principal Officers," ISO, accessed November 2, 2020, https://www.iso.org/principal-officers.html; "ISO - Structure and Governance."
139 "IEC Central Office (IEC-CO)," IEC, accessed November 3, 2020, https://www.iec.ch/about/locations/iec-co/welcome.htm.
140 "About the IEC."

The standard-setting process is like the ISO's: standards are developed by Technical Committees (TC), headed by a Secretariat and a Chair, and overseen by the Standardization Management Board (SMB). TCs can create subcommittees (SC) for detailed technical work.[141] The SMB is supported by Technical Advisory Committees for technical matters and by Strategic Groups for market-strategy matters.[142] TCs have P-Members (Participating members) and O-Members (Observer members), with similar tasks and responsibilities as at ISO.

National Representation

China is represented by the Standardization Administration of China (SAC) and The Netherlands is represented by NEN. In 2020 Shu Yinbiao, representative of China, became president of the IEC. Besides the president, China also has two (out of eight) ambassadors. An 'ambassador' represents the IEC internationally, finding more support for IEC and new areas of business.[143] Not only the IEC Chair, but also the two ambassadors have direct connections to the Chinese state and to Huawei, indicating close alignment with domestic Chinese political goals. For more information about Shu Yinbiao and Chinese Ambassadors, *see appendices* 5.1. IEC Chair Shu Yinbiao *and* 5.2. The Ambassadors of IEC.

Type of representation/ Country	China	United States	The Netherlands	EU countries incl. The Netherlands
Participating members in TCs/SCs	186	170	129	1714
Observing members in TCs/SCs	1	0	36	1574
Secretariats of TCs (109 in total) and SCs (101 in total)	11	26	1	92

Table 8 - National Representation in Technical Committees and Sub-committees at IEC[144]

China has a position in the Council Board, in various Management Advisory Committees, and in several entities under the Standardization Management Board (SMB).[145] China's positions are more or less comparable to most other countries' positions.

141 "IEC Technical Committees and Subcommittees," IEC, accessed November 3, 2020, https://www.iec.ch/dyn/www/f?p=103:62:0::::FSP_LANG_ID:25.
142 "Standards Development," IEC, accessed November 3, 2020, https://www.iec.ch/standardsdev/how/?ref=menu.
143 "IEC Ambassadors," IEC, accessed November 3, 2020, https://www.iec.ch/about/profile/ambassadors.htm.
144 "National Committees," IEC, accessed November 3, 2020, https://www.iec.ch/about/profile/members.htm.
145 "Council Board Structure," IEC, accessed November 3, 2020, https://www.iec.ch/dyn/www/f?p=103:48:14718174577878::::FSP_ORG_ID,FSP_LANG_ID:3254,25; "Management Advisory Committees (MAC)," IEC, accessed November 3, 2020, https://www.iec.ch/dyn/www/f?p=103:67:35098453042128::::FSP_LANG_ID:25; "Standardization Management Board Structure," IEC, accessed November 3, 2020, https://www.iec.ch/dyn/www/f?p=103:48:0::::FSP_ORG_ID,FSP_LANG_ID:3228,25#3.

The IEC represents a main interest of the Chinese government's standardization efforts, in a similar way to the ISO. China has important positions within the IEC due to the chairmanship and ambassadorship of Chinese nationals. However, in terms of technical committees – as seen in Table 8 – the EU overshadows China in representation in all positions. Like in the case of ISO, China will be trying to gain influence in both managerial and technical positions. Such an approach is aided not only by the strategic direction provided by the Chinese government but also by abundant resources at the disposal of standardization representatives.

5.1.3 ISO/IEC Joint Technical Committee 1 (IOS/IEC JTC 1)

General Information

Founded	1987
Headquarters	Geneva, Switzerland
Parent	ISO & IEC
Chairperson / Country	Phil Wennblom / United States
Chinese name	-

Table 9 - ISO/IEC JTC 1 General Information[146]

ISO/IEC JTC 1 is a technical committee of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The committee has its own membership and organization. It is officially headquartered in Geneva but the Secretariat is run by the American National Standards Institute (ANSI) in Washington.[147]

ISO/IEC JTC 1 develops information technology (IT) standards.[148] Given that it is a technical committee, its standard-setting entities are called *subcommittees* (SC). The ISO/IEC JTC 1 has 22 such SCs, 15 advisory groups, and 3 working groups. Working groups are created under the auspices of SCs in order to aid in the development of standards in a specific field of expertise.[149] Advisory groups engage in coordination and planning on behalf of the TC – ISO/IEC JTC 1 in this case.[150] This TC also works with 120 partner organizations for advice and support.[151] Finally, it has a program that allows 9 other international organizations to submit drafts for standards directly to ISO/IEC JTC 1, without going through the SC process.

146 "JTC1 - Contact," JTC 1, accessed November 2, 2020, https://jtc1info.org/contact/.
147 "JTC1 - Contact."
148 "Information Technology Standards - About Us," JTC 1, accessed November 2, 2020, https://jtc1info.org/.
149 "JTC1 - More about Us," JTC 1, accessed November 3, 2020, https://jtc1info.org/.
150 "JTC1 - More about Us."
151 "Partners," JTC 1, accessed November 2, 2020, https://jtc1info.org/about/partners/.

National Representation

The SC structure is like ISO's TC structure. Each SC has a Secretariat (national standard setting organization of a member country), a Committee Manager, and a Chair. As seen in Table 7, the U.S. is the leading country with seven SC secretariats, followed by Japan with five. Although China does not control any secretariats, it does have participating members – with voting rights – in several SCs, including ISO/IEC JTC 1/SC7 Software and Systems Engineering and ISO/IEC JTC 1/SC24 Computer graphics, image processing and environmental data representation.[152]

China is slightly better represented in the Advisory Groups (AGs). It holds the Convenorship[153] of JTC 1/AG 4 Quantum Computing, JTC 1/AG 4 Digital Twin, and JTC 1/AG 16 Brain-computer interface.[154]

Type of representation/ Country	China	United States	The Netherlands	EU countries incl. The Netherlands
SC Secretariat	0	7	0	3
AG Convenorship	3	3	0	2

Table 10 - National Representation in ISO/IEC JTC1

JTC 1 is an important strategic institution due to its focus on standardizing information technologies. Although the Netherlands in particular does not hold any leadership positions within JTC 1, the EU as a whole and the US are better represented than China in SC Secretariats, where standards are being developed. It is important to note, however, that China has leadership positions in strategic AGs. While AGs do not focus on developing standards, they do give strategic direction to SCs. As such, it might become problematic for the EU if China has an upper hand in oversight and planning. Therefore, the JTC 1 membership, especially for Advisory Groups, is an area that the Netherlands and the EU should focus on in order to safeguard their influence over international rule of law.

152 "ISO/IEC JTC 1/SC 7 - Software and Systems Engineering," ISO, accessed November 3, 2020, https://www.iso.org/committee/45086.html?view=participation; "ISO/IEC JTC 1/SC 24 - Computer Graphics, Image Processing and Environmental Data Representation," ISO, accessed November 3, 2020, https://www.iso.org/committee/45252.html?view=participation.
153 At ISO/IEC JTC 1, the head of an Advisory Group is called 'Convener'.
154 "Committees," JTC 1, accessed November 3, 2020, https://newjtc1info.dvl.iec.ch/about/committees/.

5.1.4 International Telecommunication Union (ITU)

General Information

Founded	1865
Headquarters	Geneva, Switzerland
Secretary General / Country / Term	Zhao Houlin / China / 2019-2022
Chinese name	国际电信联盟（ITU）

Table 11 - ITU General Information[155]

ITU is different from ISO and IEC in several regards. Most importantly, it is a United Nations Specialized Agency. Second, entities other than countries can be members. ITU offers membership to companies, universities, and international and regional organizations.[156] Finally, ITU is not only a standard organization – it is a wider regulatory body that was founded in 1865 to regulate international radio and telecommunications. At the moment, the organization works in three different sectors, described in Table 12.[157]

ITU Sector	Function
ITU-R (Radio Communication)	Manages the radiocommunication services, as well as the international management of the radio-frequency spectrum and satellite orbits.
ITU-T (Standardization)	Sets standards for any kind of Information and Communications Technology (ICT)
ITU-D (Development)	Supports the development of sustainable and affordable global access to ICT.

Table 12 - ITU Sectors and their functions

ITU has played a vital role in the development of technology standards for broadband cellular networks (3G, 4G).[158] It is now involved in the development of the new 5G standard.[159] However, since 5G is not only related to radio and telecommunication networks, but to connecting everything (IoT), ITU's role in standard-setting for 5G remains smaller than for earlier networks.[160] As of today, there still is no complete worldwide unified standard for 5G networks.

The actual standard-setting process at ITU-T is done by Study Groups (SG), where members discuss and develop technical standards. At ITU, these standards are referred

155 "About ITU," ITU, accessed November 3, 2020, https://www.itu.int/en/about/Pages/default.aspx; "Office of the Secretary-General," ITU, accessed November 3, 2020, https://www.itu.int/en/osg/Pages/default.aspx.
156 "About ITU."
157 "About ITU."
158 ITU, "ITU-R FAQ on International Mobile Telecommunications (IMT)," 2020, 1–2.
159 ITU, "5G - Fifth Generation of Mobile Technologies," 2019, https://www.itu.int/en/mediacentre/backgrounders/Pages/5G-fifth-generation-of-mobile-technologies.aspx.
160 ITU.

to as *Recommendations.*[161] SGs are led by a management team which, in turn, is led by a chairman. SGs are supported and advised by a plethora of other ITU-T Groups,[162] the most important of which are the Telecommunication Standardization Advisory Group (TSAG); Focus Groups, which give advice on a single topic and include organizations outside ITU's membership; and Regional Groups, which represent the regional (world) interests.[163]

The ITU Secretary General, Zhao Houlin, is a Chinese national who simultaneously occupies a senior advisor function at Datang, a state-owned company with close connections with the People's Liberation Army of China and with clearance to classified high-tech projects of the PLA (see appendix 5.3. ITU Chair for more information on Zhao Houlin).[164] Like all Chinese representatives in international standardization organizations, the ITU Secretary General is closely associated with the Chinese state and its national interests. The fact that the leading figure of the ITU has security clearance to new telecommunications technologies of the Chinese military could place China in an advantageous position when trying to influence the development of international standards.

National Representation

Type of representation in ITU-T/Country	China	United States	The Netherlands	EU countries incl. The Netherlands
Public Institutions	1	4	4	71
Companies	50+	70+	14	128
Academia	24	9	1	22

Table 13 - National Representation in ITU-T[165]

National representation in ITU-T is primarily assumed by relevant ministries: MIIT in China, the Division for International Communications and Information Policy in the US (part of the Department of State), and the Ministry of Economic Affairs in the Netherlands. Table 13 illustrates the large number of European representatives in the ITU standardization sector compared to Chinese ones. The presence of the Netherlands is noticeable, as its participation is quite significant in relative terms to its size.

ITU-T currently has 11 SG's, dealing with subjects such as *Broadband cable and TV*, *Future networks (& cloud)*, and *Internet of Things (IoT) and smart cities & communities*

161 "About ITU."
162 "ITU-T Groups," ITU, accessed November 3, 2020, https://www.itu.int/en/ITU-T/groups/Pages/default.aspx.
163 "ITU-T Groups."
164 Bryan Krekel, Patton Adams, and George Bakos, "Occupying the Information High Ground: Chinese Capabilities for Computer Network Operations and Cyber Espionage" (Northrop Grumman Corp, March 7, 2012), 81, https://www.uscc.gov/sites/default/files/Research/USCC_Report_Chinese_Capabilities_for_Computer_Network_Operations_and_Cyber_%20Espionage.pdf.
165 "China," ITU, accessed November 3, 2020, https://www.itu.int/en/myitu/Membership/ITU-Members/Member-States/Entities; "United States," ITU, accessed November 3, 2020, https://www.itu.int/en/myitu/Membership/ITU-Members/Member-States/Entities; "Netherlands," ITU, accessed November 3, 2020, https://www.itu.int/en/myitu/Membership/ITU-Members/Member-States/Entities.

(*SC&C*).[166] China has one or more members in each management team of SGs. These members are either from MIIT, from companies (mostly Huawei), or from universities. China is best presented in SG2-Operational Aspects with 4 out of a 16-member management team.[167] China has the chairmanship of two SGs: SG5- Environment and circular economy and SG16-Multimedia.[168]

Even though China is not particularly well represented in the actual standardization groups, it does occupy strategic managerial positions. SG2- Operational Aspects is an important one for the EU, as China could be assuming regulatory power. As discussed in section 4.3, a decline in EU global regulatory power is harmful for the international influence of the EU. Moreover, China is heading departments where the EU wants to excel such as environment and circular economy. This can further undermine the EU's ambitions of becoming a global leader in environmental protection.

5.1.5 3rd Generation Partnership Project (3GPP)

General Information

Founded	1998
Headquarters	Sophia Antipolis, France (shared address with European Telecommunications Standards Institute (ETSI)
Chairman / Country	Luis Jorge Romero / Spain (also Director-General of ETSI)
Chinese name	第三代合作伙伴计划

Table 14 - 3GPP General Information[169]

3GPP develops standards for mobile telecommunications. It has been involved in 2G, 3G, 4G, and is now mainly focused on the development of the new 5G standard. 3GPP has two kinds of membership: Organizational Partners and Market Representation Partners.[170] There are seven Organizational Partners, primarily state-level national telecommunication standard bodies. Moreover, the 20 Market Representation Partners are industry associations, both national and international. On the level of Organizational Partners, China is represented by the China Communications Standards Association (CCSA). The Netherlands is represented by The European Telecommunications Standards Institute (ETSI). On the level of Market Representation Partners, China is represented by the China Society of Automotive Engineers (CSAE).[171]

166 "ITU-T Study Groups (Study Period 2017-2020)," ITU, accessed November 3, 2020, https://www.itu.int/en/ITU-T/studygroups/2017-2020/Pages/default.aspx.
167 "SG2 - Management Team," ITU, 2, accessed November 3, 2020, http://www.itu.int/net4/ITU-T/lists/mgmt.aspx?Group=2&Period=16.
168 "SG5 - Management Team," ITU, accessed November 3, 2020, http://www.itu.int/net4/ITU-T/lists/mgmt.aspx?Group=5; "SG16 - Management Team," ITU, accessed November 3, 2020, http://www.itu.int/net4/ITU-T/lists/mgmt.aspx?Group=16.
169 "Contact," 3GPP, accessed November 3, 2020, https://www.3gpp.org/contact; Sabine Dahmen-Lhuissier, "ETSI - HQ Sophia Antipolis," ETSI, 3, accessed November 3, 2020, https://www.etsi.org/about/find-us; "3GPP Officials," 3GPP, accessed November 3, 2020, https://www.3gpp.org/DynaReport/TSG-WG--PCG--officials.htm.
170 "Partners," 3GPP, accessed November 3, 2020, https://www.3gpp.org/about-3gpp/partners.
171 "Partners."

The main decision-making body at 3GPP is the Project Coordination Group, which formally adopts standards set by Technical Specification Groups (TSGs).[172] The Project Coordination Group is headed by Luis Jorge Romero, who also heads ETSI. There is no Chinese representation in the Project Coordination Group.

The actual standard-developing work is done by Technical Specification Groups (TSGs). There are three TSGs divided by sector: TSG Radio Access Network (RAN), TSG Core Network and Terminals (CT), and TSG Service & System Aspects (SA).[173] Each TSG is further divided into Working Groups (WGs).[174]

National Representation

Members of these working groups are representatives from telecom companies. Chinese companies include: CATT (holding company), China Mobile, China Telecom, Huawei, ZTE. It is also notable that quite a few American companies in these groups are represented by either Chinese nationals or by overseas Chinese.

TSG/ National Representation		China	United States	The Netherlands	EU countries incl. The Netherlands
TSG RAN with **5** WGs	**TSG**	1 Vice-Chairman	0	0	2 Chairmen,1 Vice-chairman
	WG	2 Chairmen, 3 Vice Chairmen	2 Chairmen 1 Vice Chairman	0	2 Vice-chairmen
TSG CT with **4** WGs	**TSG**	1 Vice-Chairman	1 Vice Chairman	0	1 Chairman, 1 Vice-chairman.
	WG	2 Chairmen 3 Vice Chairmen	1 Vice Chairman	0	3 Chairmen, 3 Vice-chairmen.
TSG SA with **6** WGs	**TSG**	1 Chairman	1 Vice-chairman	0	0
	WG	5 Vice Chairmen	2 Chairmen 3 Vice Chairmen	1 Chairman	3 Chairmen, 2 Vice-chairmen.

Table 15 - National representation in 3GPP Technical Specification Groups (TSG)[175]

As indicated in Table 16, national representation in TSGs of 3GPP is quite balanced between China and the EU, with China holding a slight advantage. However, the organization is headed by the leader of ETSI, giving the EU an upper hand. 3GPP is an important organization for standardization in 5G technologies and it appears that both China and the EU are heavily involved.

172 "Project Coordination Group (PCG)," 3GPP, accessed November 3, 2020, https://www.3gpp.org/about-3gpp/project-coordination-group-pcg.
173 "About 3GPP Home," 3GPP, accessed November 3, 2020, https://www.3gpp.org/about-3gpp/about-3gpp.
174 "Specifications Groups Home," 3GPP, accessed November 3, 2020, https://www.3gpp.org/specifications-groups/specifications-groups.
175 "Specifications Groups Home."

5.1.6 Standard-setting organizations for mining

ISO and Mining

ISO has an important role in standard-setting for the mining industry. The structure of the organization has been discussed above, in *section 5.1.1*. At ISO, the sector for mining is '73 Mining and Minerals'.[176] Within this sector, there are six sub-sectors (ICS). Within each sub-sector, standards are made by several Technical Committees (TCs), depending on their specialization. Table 16 illustrates relevant positions of China and the EU in the ISO subsector in charge of standardizing mining activities.

Subsector and TCs/SCs/ National Representation		China	EU countries incl. The Netherlands
73.020 Mining and quarrying	ISO/TC 263 Coalbed methane	The Secretariat, Chairpersonship, and Management are held by China (SAC)	N/A
	ISO/TC 82 Mining	N/A	The Secretariat, Chairpersonship, and Management are held by Germany.
	ISO/TC 82/SC 7 Mine closure and reclamation management	N/A	Chairpersonship held by France.
	ISO/TC 298 Rare earth	The Secretariat, Chairpersonship, and Management are held by China (SAC)	N/A
73.040 Coals		N/A	N/A
73.060 Metalliferous minerals and their concentrate	ISO/TC 132 Ferroalloys	The Secretariat, Chairpersonship, and Management are held by China (SAC)	N/A
	ISO/TC 79/SC 12 Aluminum ores	The Secretariat, Chairpersonship and Management are held by China (SAC)	N/A
73.080 Non-metalliferous minerals		N/A	N/A
73.100 Mining equipment	ISO/TC 105 Steel wire ropes	The Secretariat and Management are held by China (SAC)	N/A
	ISO/TC 41/SC 3 Conveyor belts	The Secretariat and Management are held by China (SAC)	N/A
73.120 Equipment for processing of minerals		N/A	N/A

Table 16 - National Representation in the ISO sector 73 Mining and Minerals[177]

176 "73 - Mining and Minerals," ISO, accessed November 3, 2020, https://www.iso.org/ics/73/x/.
177 "ISO - Technical Committees."

ISO/TC 298 Rare earths is a relatively new TC, created in 2015. It is a TC in which China enjoys a significant amount of influence. Though it has not set any standards yet, it has 12 under development.[178] The TC has 8 participating members and 26 observing members (including the Netherlands' NEN). This committee aims to standardize most sectors of rare earth supply chains, from mining and separation to conversion into compounds that are useful for manufacturers.[179] All of these standards should, however, align with sustainable practices.[180]

The Chinese standardization organization (SAC) occupies important positions in many mining sectors at ISO. Comparatively, the EU is influential in only two committees. These committees are relevant to CRMs and the EU's presence is meaningful. It is, however, not sufficient to safeguard the EU's normative influence and economic security. China's stranglehold over mining activities has several potential implications, as discussed in section 4.3. Given China's quasi-monopoly in the exploitation of important CRMs, they can establish domestic standards as de facto requirements. On one hand, this means that the EU's normative power to set labor and environmentally friendly standards elsewhere is diminished under Chinese authority. On the other hand, the internationalization of Chinese standards affects the EU economically, as they can no longer use standardization as a way of diversifying supply. In other words, if every country will commit to weak standards, standardization fails to be a differentiating factor of supply. As such, China's existing quasi-monopoly will be strengthened, and the EU's economic dependence will increase.

International Council on Mining and Metals (ICMM)

ICMM is an industry association founded in 2001 by several mining companies with the goal of improving the public image of the mining industry.[181] Recently, the organization has moved into (soft) standard setting. The ICMM's main product is the Mining Principles, a set of social and environmental requirements developed by its members.[182]

ICMM's values include responsible mining for society, for workers and for the environment.[183] The association is based in London and the vast majority of its staff is British. ICMM employs many former reporters and researchers who previously worked for NGOs and non-profit organizations. ICMM is active in many countries,

178 "ISO/TC 298 - Rare Earth," ISO, accessed November 10, 2020, https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/committee/59/02/5902483.html.
179 "ISO/TC 298 - Rare Earth."
180 "ISO/TC 298 - Rare Earth."
181 "Our History," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/about-us/annual-reviews/our-history.
182 "Mining Principles," ICMM, accessed November 3, 2020, https://www.icmm.com/mining-principles.
183 "Our History."

running large projects around mines and mining, mostly concerned with the local community's relation to mining companies.[184]

ICMM has two types of members: Company and Association members.[185] There are 27 Company members, including some of the largest mining companies in the world, but not a single Chinese one. It is however possible that Chinese companies own, co-own, or have ties with Company members.[186] The Association members are mostly national mining industry associations and specialized international mining industry associations, such as the International Copper Association and the International Antimony Association.[187] Again, no Chinese members are involved.

Their main standardization project is the Global Industry Standard on Tailings Management.[188] This standard refers to cleaning up left over materials once a mining project has ended, in order to protect local communities. There is no Chinese involvement.

Global Mining Guidelines Group (GMG)

GMG is an industry association based in Canada.[189] The association develops *Guidelines* for the development and implementation of new mining technologies, with the eventual goal of making mining cleaner, safer, and cheaper. GMG's staff consists of members' representatives, most of them with backgrounds in tech & innovation.

GMG has published Guidelines for, among others, AI in mining, autonomous systems in mining, electric mining equipment, and underground communications.[190] Guidelines are developed by Working Groups.[191] GMG does not list membership for these groups, but they too seem to consist of members' representatives.

GMG has Corporate Members and Partner Organizations.[192] Corporate members are divided by Leadership Members, Collaborator Members, and General Members. Members include mining companies, construction equipment companies, and technology companies. Like in ICMM, there are no Chinese members in the GMG either. This lack of Chinese involvement in normative institutions stands out as the

184 "Case Studies," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/news-and-resources/case-studies.
185 "Members," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/members.
186 "Company Members," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/members/member-companies.
187 "Association Members," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/members/member-associations.
188 "Global Industry Standard on Tailings Management," ICMM, accessed November 3, 2020, https://www.icmm.com/en-gb/environment/tailings/global-industry-standard-on-tailings-management.
189 "Global Mining Guidelines Group | Contact Us," GMG, accessed November 3, 2020, https://gmggroup.org/contact-us/.
190 "Global Mining Guidelines Group | Guidelines," GMG, accessed November 3, 2020, https://gmggroup.org/guidelines/.
191 "Global Mining Guidelines Group | Working Groups," GMG, accessed November 3, 2020, https://gmggroup.org/working-groups/.
192 "Global Mining Guidelines Group | Corporate Members," GMG, accessed November 3, 2020, https://gmggroup.org/about-gmg/corporate-members/.

main observation of this section, contrasting the large number of representatives that the Chinese government sends to ISO and other large organizations.

Other

Besides these large organizations, there are several smaller entities promoting social responsibility and environmental friendliness in mining. These clubs compete with each other for funding and influence. A few examples are IRMA, Resolve, the Alliance for Responsible Mining, and Planet Gold. Their real-world influence is likely limited. Chinese representation is not immediately evident within any of these entities.

5.1.7 Conclusions

In light of Chinese national strategies aimed at influencing international standardization organizations, this section analyzed relevant institutions in terms of their functioning and compared EU and Dutch representation with China's. Several conclusions can be drawn from this analysis. The main difference between delegations is that China's representatives are supported by the government, whereas Dutch and European ones tend to be private entities. The SACs efforts are thus likely integrated into and/ or informed by an overarching (geo)political strategy. The State Council is the chief administrative body of the PRC, meaning that it is involved in and executes on virtually all of Beijing's policy objectives. The State Council's role in facilitating forced technology transfer, fostering the development of dual-use technologies within China's private sector through (among others) state funding, and overseeing Chinese standard setting initiatives within ISO provides a clear example of Chinese government centralization.

While ISO and IEC are two of the main organizations mentioned in China Standards 2035 and Main Points 2020, Chinese representation within those organizations is at least matched or outweighed by the EU. Generally, the EU is well represented in all institutions analyzed in this chapter – ISO, IEC, ISO/IEC JTC 1, ITU and 3GPP. In some, such as ISO and ITU, the Netherlands is doing particularly well. In ISO, IEC and ITU the difference between China and the EU is staggering, with the EU being significantly better represented. The competition for influence is more noticeable in ISO/IEC JTC 1 and 3GPP, where the national delegations are similar in size. Another observation is that although EU representatives are plentiful in technical committees and working groups, it is important to mention that China is often better represented in managerial teams who determine strategic direction and oversight of many committees.

In terms of mining organizations, China has significant advantage in mining sectors at ISO. They have leadership positions in more committees than the EU, which has only two. The rare-earth committee is led by China and is currently developing several standards.

China's high number of representatives in the ISO mining sector stands in stark contrast to the lack of involvement in organizations promoting responsible mining such as ICMM, GMG or IRMA. Such normative initiatives are dominated by European and other Western countries. It appears that China is focused on establishing international technical standards that align with its domestic practices, while the EU is also exploring the development of normative standards.

5.2 Analyzing China's domestic standard setting

Given China's ability to set de facto international standards due to its quasi-monopoly on critical materials and technologies, Chinese domestic standards are highly relevant to the security of the EU. This section assesses which Chinese standards initiatives could become threatening to the EU's international influence and national security. Unfortunately, it is not possible to see the s*tandard itself* from outside of China without paying for it or for the translation. The website automatically blocks requests from non-Chinese IP addresses. Inside China, the entire text of the standard can be freely downloaded and viewed. Due to lack of access to specific standards, this chapter looks instead at the laws governing Chinese minerals sector and at the standardization institutions that could be trying to turn domestic laws into standards. As such, a strong basis for analysis is provided. These entities are the starting point for an analysis of whether certain Chinese standards are or will become threatening for the national security dimensions discussed in section 4.3. In China each standards-setting entity uses a 'publisher,' as seen in Table 18. The development history on publisher websites show exactly which entities, and even which persons, were involved in developing the standard. This is how relevant standardization institutions for CRMs and associated technologies are identified.

5.2.1 Chinese laws and regulations for minerals

Several relevant laws provide a better understanding of the Chinese mineral sector. The Mineral Resources Law is China's main mining law.[193] It was adopted in 1986 and last amended in 1996. The law has been outpaced by recent developments, and in some cases overruled by new regulations issued by various ministries.

Such recent developments include the annual China Mineral Resources report, a detailed blueprint for exploration, exploitation and utilization of China's mineral resources, as well as for cooperation with other countries.[194] The first edition appeared in 2011 and since then it has been written by the Ministry of Natural Resources

193 "Mineral Resources Law of the People's Republic of China," China.org.cn, accessed November 9, 2020, http://www.china.org.cn/environment/2007-08/20/content_1034342.htm.
194 Ministry of Natural Resources, "China Mineral Resources" (Beijing, 2019).

(MNR), published by the Geological Publishing House Beijing, and approved by the State Council.[195] Although the 2020 edition has not yet been published, some ambitions stand out from the 2019 version. First, international cooperation in the field of minerals is mentioned. There is an ambition to expand bilateral and multilateral cooperation in the field of geology and mineral resources through BRI. Moreover, mining exchanges and cooperation through China Mining and China - ASEAN Mining Cooperation Forum are sought. There is also mention of environmental ambitions, for instance by encouraging the construction of green mines. Another noticeable goal is increasing the mineral industry's effectiveness through improved geological surveying and a pilot project for unified mineral rights registration of mineral resources and reserves. Lastly, a pilot test area is mentioned for natural gas hydrate exploration and trial production in the northern South China Sea.

Another important legislative act is the National Mineral Resources Plan (2016 - 2020), which is part of the broader 13th Five Year Plan. As such, this is a 5-year plan on mineral resources, approved by the State Council and implemented by the Ministry of Natural Resources. In early 2020, China announced the planning for drafting of the next five-year plan on mineral resources for inclusion in the upcoming 14th Five Year Plan. [196]Some of the main points include:

1. Improved planning on all levels, partly by strengthening provincial-level planning.
2. Strengthen resource security by enhancing international mining cooperation.
3. Optimize the layout and structure of resource exploration, development and protection, by:
    a) Building an energy resource base to ensure a stable supply of resources.
    b) Delimiting strategic mineral resource protection areas, national planned mining areas, key exploration areas, and key mining areas.
4. Promote efficient use of resources.
5. Speed up the green development of mining industry.

What is notable about all of these plans is a clear friction between the desire to centralize by Beijing, and a desire to do the exact opposite – to decentralize, by giving more responsibilities to, for example, the provinces. The centralization efforts focus on "unified planning". Decentralization efforts focus on improving efficiency and planning at local level. Both centralization and decentralization are meant to speed

195 Ministry of Natural Resources.
196 Ministry of Natural Resources, "自然资源部关于全面开展矿产资源规划（2021-2025年）编制工作的通知 | Notice of the Ministry of Natural Resources on the Comprehensive Development of the Preparation of the Mineral Resources Plan (2021-2025)-Special Plan," Fjsc.gov.cn, March 11, 2020, http://www.fjsc.gov.cn/cms/html/scxrmzf/2020-03-11/338069756.html.

up exploration and exploitation. This friction is similar to the one seen in standard-developing procedures, see 3.2. Standardization ambitions, where China wants to centralize this process while simultaneously creating new local institutions.

5.2.2 Chinese entities involved in the administration of the mining industry

Having broadly looked at Chinese laws awnd regulations for the mineral sector in the previous section, the analysis moves toward the entities involved in the administration of the Chinese mining sector. These are the institutions who not only develop laws and regulations, but also dictate standardization processes.

Name	Chinese name	Parent	Web	Logo
Ministry of Natural Resources (MNR)	中华人民共和国自然资源部	State Council	web	
Ministry of Ecology and Environment (MEE)	中华人民共和国生态环境部	State Council	web	
Information Center of the Ministry of Ecology and Environment [EIC]	生态环境部信息中心	MEE	web	
Ministry of Industry and Information Technology (MIIT)	中华人民共和国工业和信息化部	State Council	web	
Provincial departments of Natural Resources	省厅-自然资源部	Province/ MNR		
China Geological Survey (CGS)	中国地质调查局	MNR	web	

Table 17 - Chinese governmental organizations involved with the mining industries[197]

Table 17 provides an overview of the most important organizations involved in the mining sector. First, the MNR was formed in 2018, combining the functions of the former Ministry of Land & Resources, the State Oceanic Administration (SOA) and the State Bureau of Surveying and Mapping. One of MNR's functions is regulating the mining sector, supported by its local-government subsidiaries.

Further, the MEE was formed in 2018. It is tasked with: "*Protecting China's air, water, and land from pollution and contamination. In charge of ecological monitoring and environmental protection affairs. Mainly responsible for formulating and organizing the*

197 Guohua Wu and Yingnan Li, "China: Mining Laws and Regulations 2021," Text (Global Legal Group, 2020), United Kingdom, https://iclg.com/practice-areas/mining-laws-and-regulations/china; Guohua Wu, Yingnan Li, and Jincheng Tongda, "Mining in China: Overview," *Practical Law* (blog), 2018, http://uk.practicallaw.thomsonreuters.com/w-011-1348?__lrTS=20200726183037552&transitionType=Default&contextData=(sc.Default)&firstPage=true.

implementation of eco-environmental policies, plans and standards. It is furthermore responsible for the monitoring and law enforcement of the eco-environment, supervising and managing pollution prevention, nuclear and radiation safety, and organizing the development of central environmental protection inspections."

CGS, together with its affiliated organizations, is China main geological survey organization.[198] It is tasked with: *"Carrying out the acquisition and updating of basic geological data to support the nation's economic and social development"*. The CGS operates a large number of exploration vessels and platforms.[199] Whenever a conflict arises about a Chinese 'research ship' exploring other country's waters in the SCS, it is usually the CGS operating it. Additionally, CGS is involved in BRI, tasked with jointly surveying mineral resources in BRI countries and with scouting mineral-investment opportunities for Chinese companies.[200] Interestingly, their BRI-related tasks also include the: *"Geological prospecting and resource environment evaluation in the border areas of China".*[201]

5.2.3 Chinese CRM standard setting entities[202]

As mentioned previously, the concept of critical raw materials has been developed by the EU. While China does not have a specific term that refers to such materials, they are nonetheless widely used in Chinese industries. As such, even though there are many complementary institutions that develop standards for critical materials, they need to be identified separately from each other, depending on the sector in which the 'critical' materials are used.

The standards for the mining industry are divided by National Standards (GB) and by industry/local standards. A two-letter code is used for the identification of each industry in documents. For example, HG stands for Huagong[203], Chemical Industry. The industry/local standards concerned with the mining industry are:

1. Geological and Mineral Industry (DZ).
2. Chemical Industry (HG).
3. Commodity Inspection (SN) [import & export].
4. Oil & Gas (SY).

198 Ma Si, "Didi, BAIC Ink Self-Driving Pact," ChinaDaily, 2020, https://www.chinadaily.com.cn/a/202006/23/WS5ef15b72a310834817254c6b.html.
199 Wang Keju, "Transport Projects to Get More Funding," ChinaDaily, May 20, 2020, https://global.chinadaily.com.cn/a/202005/20/WS5ec48119a310a8b241156e7b.html.
200 China Geological Survey, "Program of Geological Survey and Information Service for "One Belt and One -China Geological Survey," accessed November 9, 2020, http://en.cgs.gov.cn/at/MajorPrograms/pgsls/201603/t20160309_266178.html.
201 China Geological Survey.
202 "标准分类 | Standard Classification," CSRES, accessed November 23, 2020, http://www.csres.com/sort/index.jsp.
203 化工.

5. Environmental Protection (HJ).
6. Electricity & Power (DL).
7. Petrochemical (SH).
8. Light Industry (QB).

Table 18 illustrates the sectors in which national standards applicable to CRMs are developed. It is noticeable that each standard is approved, developed and published by a state-owned entity. This implies a high degree of centralization of the standardization process and therefore a great deal of control of the Chinese state on domestic standards. For an overview of Chinese organizations involved in standard setting and their functions, see appendix 6.2. Chinese Organizations for Standard Setting.

Category	Code	Approved by	Developed by	Published by	Web
Safe Production	AQ	National Work Safety Administration	National Work Safety Administration	Coal Industry Press	CCIPH
Surveying	CH	National Bureau of Surveying and Mapping	National Bureau of Surveying and Mapping	China Surveying and Mapping Press	ChinaSMP
Geology and Minerals	DZ	Ministry of Natural Resources	Ministry of Natural Resources[204]	China Standard Press	SPC
Nuclear Industry	EJ	National Defense Science and Industry Committee	China National Nuclear Corporation	Nuclear Industry Standardization Institute	(part of) AtomInfo[205]
National Military Standard	GJB	Commission of Science, Technology and Industry for National Defense			
Aviation	HB	National Defense Science and Industry Committee	China Aviation Industry Corporation	China Aviation Technology Research Institute	CAPE
Chemical industry	HG	National Development and Reform Commission	China Petroleum and Chemical Industry Association	Chemical Industry Press	CIP
Oceans	HY	State Oceanic Administration	State Oceanic Administration	China Standard Press	SPC
Coal	MT	National Development and Reform Commission	China Coal Industry Association	Coal Industry Press	CCIPH
Petrochemical	SH	National Development and Reform Commission	China Petroleum and Chemical Industry Association	China Petrochemical Press	CPP
Electronics	SJ	Ministry of Information Industry	Ministry of Information Industry	People Post Press	PTpress

204 The Ministry of Natural Resources is the successor of the Ministry of Land and Resources.
205 "核工业标准化研究所 | Nuclear Industry Standardization Institute," Atominfo, accessed November 23, 2020, http://www.atominfo.com.cn/aboutUs/business_info.aspx?url=35.

Category	Code	Approved by	Developed by	Published by	Web
Petroleum gas	SY	National Development and Reform Commission	China Petroleum and Chemical Industry Association	Petroleum Industry Press	PetroPub
Offshore oil and gas	SY	National Development and Reform Commission	China National Offshore Oil Corporation	Petroleum Industry Press	PetroPub
Railways	TB	Ministry of Railways	Ministry of Railways	China Railway Publishing House	TDpress
Railway traffic	TJ	Ministry of Railways Standards Institute	Ministry of Railways Standards Institute	China Standard Press	SPC
Ordnance	WJ	National Defense Science and Industry Committee	China Ordnance Industry Corporation	China Ordnance Industrial Standardization Institute	BZC (Norinco)
Rare Earths	XB	Rare Earth Office of National Development and Reform Commission	Rare Earth Office of National Development and Reform Commission	China Standard Press	SPC
Ferrous metallurgy	YB	National Development and Reform Commission	China Iron and Steel Association	Metallurgical Industry Press	CNMIP
Communica-tion	YD	Ministry of Industry and Information Technology	Ministry of Industry and Information Technology	People Post Press	PTpress
Non-ferrous metallurgy	YS	National Development and Reform Commission	China Nonferrous Metals Industry Association	China Standard Press	SPC
Medicine	YY	State Food and Drug Administration	State Food and Drug Administration	China Standard Press	SPC
Chinese Medicine	ZY	State Administration of Traditional Chinese Medicine	State Administration of Traditional Chinese Medicine	China Press of Traditional Chinese Medicine	CPTCM

Table 18 – Chinese standard setting industries related to CRMs

5.2.4 Standards for Rare Earths

Rare Earths form the largest group within CRMs. China is very conscious about its valuable rare earth resources and has developed a long list of national and sector/industrial standards. The number of standards for rare earths, as of 2020, stands at 156, including national and industry/sector standards.[206] For an illustration of Chinese standards for rare earths, see Appendix 8.1. Example Standard for REEs.

Most national standards for rare earths are national voluntary standards (GB/T), with a small number of national mandatory standards (GB). The number of industry/

206 China National Standards, "China Rare Earth Standards," GB Standards, accessed November 9, 2020, https://www.gbstandards.org/index/Standards_Search.asp?word=Rare%20earth.

sector standards for rare earths is low compared to the national GB/T standards. The industry standards concerned with rare earths are:

1. China Chemical Industry Standards (HG).
2. China Electronics Standards (SJ, SJ/T).
3. China Import Export Inspection Standards (SN, SN/T).
4. China Metrological Standards (JJF).
5. China Light Industry Standards (QB).

For an overview of the national entities involved in rare earth standardization processes, see appendix 6.4. Rare Earth Standards Setting Organizations in China.

6. EU and Dutch standard setting initiatives

6.1 EU efforts

While standardization is relevant on the European level, international standardization is also relevant for economic competitiveness. If certain standards that do not align with European and Dutch priorities are agreed upon on the international level, consequences will arise for the strategic autonomy of the EU.

From the analysis of different national representations within international standards organizations in chapter 5, it became clear that Western countries are generally well represented by small, non-governmental entities[207], whereas China is represented by state officials. In other words, while in the EU and the Netherlands standardization is industry-led, in China it is state-led. This can lead to an imbalance between EU countries interests on the one hand and Chinese or other foreign countries on the other hand with regard to influence on quality of standards for e.g. EU values like privacy, environmental conditions, human values and rights as well as rules for competition and transparency, financial and human resources.

The state-industry distinction is relevant not only to standardization processes, but also to CRM industries in general. Ever since the 1990s, the Chinese government has pursued a long-term strategy to develop upstream and downstream sectors of rare earth elements and other critical materials.[208] This was made possible due to profound involvement of the Chinese government in the sectors, for instance through subsidization or through vertical integration.[209] Contrastingly, industrial market players have dominated Western countries.[210] For example, Western high-tech companies are focused on product development and short-term investment decisions, lacking the necessary concerted approach to make significant changes to the market.[211]

207 Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe."
208 Klossek, Kullik, and van den Boogaart, "A Systemic Approach to the Problems of the Rare Earth Market," December 1, 2016, 136.
209 Klossek, Kullik, and van den Boogaart, 136.
210 Klossek, Kullik, and van den Boogaart, 136.
211 Klossek, Kullik, and van den Boogaart, 136.

The current and near future developments in important policy areas and technology developments are in Energy transitions, Electrification, Transport and Cables and Digital Technologies. For that reason, the following standards setting priorities, policies and bodies are of importance:

1. The EU Commission has in 2016 identified the following **priority areas**[212]**: 5G communications, cloud computing, the internet of things (IoT), (big) data technologies and cybersecurity**. These are the essential technology building blocks of the Digital Single Market. Stronger European leadership in **standard setting** in these areas should increase competitiveness and help European innovations better access the global market.
2. The **Communication on ICT Standardization Priorities for the Digital Single Market**[213], COM(2016)176 aims to ensure that all related digital policies and technologies in the future will be able to connect and share data with each other – independently of manufacturer, operating system, or other technical details. It is focused on two main priorities:
   a) It aims to guarantee a fresh approach to standards in the following domains: 5G, IoT, Cybersecurity, Cloud and Big Data.
   b) It tries to ensure that all forces in Europe pull in the same direction, using standardization as a strategic instrument to EU industrial policy.
   c) The Commission has in 2016 identified the following priority areas: 5G communications, cloud computing, the internet of things (IoT), (big) data technologies and cybersecurity. These are the essential technology building blocks of the Digital Single Market. Stronger European leadership in standard setting in these areas should increase competitiveness and help European innovations better access the global market.
3. The **EU Rolling Plan 2020**[214] identifies 165 actions grouped into four thematic areas: key enablers and security, societal challenges, innovation for the single market and sustainable growth. The Rolling Plan is developed by The EU Multi-stakeholder platform. A COVID-19 update of the Rolling Plan was published in 2020 too. **EU website** on involved organizations in EU ICT Standardization setting bodies[215] keeps un updated list. EU level coordination and alignment of standards setting priorities and efforts is an important activity in order to guarantee maximum influence and balanced representation.

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212 European Commission, "Rolling Plan 2020," June 2020, https://joinup.ec.europa.eu/collection/rolling-plan-ict-standardisation/rolling-plan-2020.
213 European Commission, "ICT Standardisation Priorities for the Digital Single Market," Text, April 19, 2016, https://ec.europa.eu/digital-single-market/en/news/communication-ict-standardisation-priorities-digital-single-market.
214 European Commission, "Rolling Plan 2020."
215 European Commission, "Annex II - List of Links to Standards Bodies' Web Sites With Up-to-Date Information on Ongoing Work," June 2020, https://joinup.ec.europa.eu/collection/rolling-plan-ict-standardisation/annex-ii-list-links-standards-bodies-web-sites-date-information-ongoing-work.

4. The EU has a **future and emerging technologies program** to identify and prioritize as well as support the identification and development of future and emerging technologies.[216]

5. The **EU Strategy on Adaptation to Climate Change** (COM(2013) 216 final) invites European Standardization Organizations to contribute to the European efforts aiming to make Europe more climate-resilient. The strategy highlights the key role of standards in strengthening climate resilience. As part of the European Green Deal, the European Commission aims to put forward a new Adaptation Strategy in early 2021.[217]

6. Officially recognized European Standards Organizations (ESO's) by the European Union and by the European Free Trade Association (EFTA) as being responsible for developing and defining voluntary standards at European level are:

    a) European Committee for Standardization (CEN), is an association that brings together the National Standardization Bodies of 34 European countries. CEN is one of three European Standardization Organizations (together with CENELEC and ETSI) that have been officially recognized.[218]

    b) European Telecommunications Standards Institute (ETSI), ETSI is a leading standardization organization for Information and Communication Technology (ICT) standards fulfilling European and global market needs. Their mission is to provide platforms for interested parties to work together to produce standards for ICT systems and services that are used globally.[219]

    c) European Committee for Electrotechnical Standardization (CENELEC), is a non-profit International Association is responsible for standardization in the electrotechnical engineering field. CENELEC prepares voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a Single European Market.[220]

6.2 Dutch efforts

The Netherlands' approach to developing, identifying, establishing, and adopting standards is characterized by its reliance on private sector activities. At the highest possible level, the government fulfills one of two roles within the domestic standard setting process:

- **Standard identifier**. The Dutch government has undertaken various initiatives to identify standards and/ or best practices which it might benefit from applying

216 European Commission, "Future & Emerging Technologies (FET)," Text, Shaping Europe's digital future - European Commission, October 29, 2020, https://ec.europa.eu/digital-single-market/en/future-emerging-technologies-fet.
217 "Climate Change Adaptation," CEN-CENELEC, accessed October 13, 2020, https://www.cencenelec.eu/standards/Topics/Environment/Pages/Climatechangeadaptation.aspx.
218 "Who We Are," CEN, accessed November 23, 2020, https://www.cen.eu/about/Pages/default.aspx.
219 "ETSI - About Us," ETSI, accessed November 23, 2020, https://www.etsi.org/about.
220 "About CENELEC - Who We Are," CENELEC, accessed November 23, 2020, https://www.cenelec.eu/aboutcenelec/whoweare/index.html.

within its various agencies. One prominent example of such an initiative can be observed in *Forum Standaardisatie*, an agency that advises the government on the use of open standards within the ICT and/ or Digital sectors. Once identified, these standards are outlined in the *Overheidsbreed Beleidsoverleg Digitale Overheid (OBDO)* and, in some cases, earmarked as "mandatory" standards. Once a standard is mandatory, government agencies are required to apply – or provide an explanation for their decision *not* to apply – it within the context of any acquisition over EUR 50.000.[221]

- **Development facilitator**. The Dutch government has earmarked several societal challenges as potentially benefitting from an increased and focused degree of standardization. The general thinking underpinning the government's intervention as a development facilitator within these areas is that the application of *existing* standards is unlikely to have an adequate impact, meaning that the development of new standards is necessary. In such situations, the Dutch government may choose to provide funding for networks which facilitate multi-stakeholder discussions geared towards standard formulation. One example of such an initiative can be observed in the *Overleg Standaarden Klimaatadaptatie* (OSKA) – a network, comprised of a combination of private and public-sector actors, whose primary purpose is to develop standards that might contribute to a successful energy transition in the Netherlands.[222]

The Netherlands also engages actively in international standard setting initiatives. As previous outlined, The Netherlands is represented within the ISO by the Royal Netherlands Standardization Institute (NEN)[223] – a private non-profit foundation whose main source of funding is the sale of certification services.[224] NEN receives little government support, although cooperation with the Ministry of Economic Affairs has been recently enhanced. NEN is also involved with (among others) the OBDO and the OSKA, and thus it can be readily regarded as something of a de-facto government contractor.

The Dutch government regards standards as central to managing China as a trading partner. It has not formulated a specific strategy for leveraging standards – whether international or domestic – as tools for safeguarding its access to critical raw materials, though several of the standards introduced within the cadre of the OSKA touch upon circularity.

221 "Onze Diensten En Expertise," Forum Standaardisatie, accessed November 23, 2020, https://www.forumstandaardisatie.nl/over-forum-standaardisatie/diensten-en-expertise.
222 "Overleg Standaarden Klimaatadaptatie van start," Kennisportaal Ruimtelijke Adaptatie, November 27, 2019, https://ruimtelijkeadaptatie.nl/actueel/actueel/nieuws/2019/oska-start/.
223 "NEN - Netherlands."
224 "NEN Webshop."

7. Conclusions and Recommendations

7.1 Conclusions

Characteristics of standards

Standardization is generally understood as a technical process that ensures interoperability of products, components and services. It is generally intended to improve interoperability within markets, something which increases consumer trust in manufacturers and facilitate international trade. States and/ or actors that enjoy (quasi) monopolies within the product area seek to formulate standards to benefit not only from first mover advantages, but from their access to a knowledge base and from their products' reach – something which enables them to shape standards in their own image. This is especially true for technical standards, which dictate the physical attributes of products which require production lines and supply chains for manufacturing and distribution. Technical standards' "stickiness" makes them strategically important because they offer a venue for fostering "lock in" and/ or dependence.

Technical standards can be introduced and established internationally in two ways. First, case studies such as (among others) Apple's Lightning Connector show that – though technical standards are usually introduced through international standards setting organizations such as the ISO – monopolists can force the international adoption of standard they develop unilaterally and/or domestically. Second, they can be formulated and established through international standards setting organizations such as the ISO – a venue in which a multi-stakeholder process means that the chance that a formulated standard will be formulated is somewhat (though not entirely) reduced.

This study finds both that Beijing has ambitions to utilize standard setting as a tool for spreading Chinese influence and that China's standard-setting system is organized in a fashion which – theoretically – should enable it to do so. It also finds that Chinese influence within major international standard setting organizations is significant, though not (yet) dominant.

China behavior specific

Through coordinated and long-term strategies such as Standards 2035 and Main Points 2020, China has identified standard setting as a national priority. The Chinese state is fully engaged in promoting standards for its industries. Its goals are twofold: to improve domestic standardization systems (1) and to influence international standardization organizations (2).

China is increasingly more active in international standardization organizations. Beijing aims to secure managerial positions in order to be able to set agendas and steer the processes within organizations such as the ISO. Whereas European delegates to these organizations generally represent private actors, Chinese representatives are overtly state-affiliated. This means that China's representation within these organizations has access to significantly more robust human and financial resources than its EU counterparts do, something which stacks the deck in China's favor. Representatives of the Chinese state are incentivized to act in accordance with national geopolitical strategies, whereas European industry players seem to be more interested in short-term commercial gains. While China is heavily involved in technical standardization committees on the international level, they are absent from normative-based standardization organizations promoting values such as responsible mining.

China's quasi-monopoly over many CRM and technologies means it is well-positioned to transform domestic standards into de facto international standards. One of the ways Beijing is pursuing this objective is through the BRI, which incentivizes a large number of countries to adopt Chinese standards in exchange for high investments from China and trade agreements. This might imply that international standardization organizations will become increasingly sidelined in the CRM space and that the Netherlands and the EU will need to find alternative venues for challenging Chinese standard setting.

Future areas of relevance for standardization

When analyzing Dutch and European ambitions for the following decades, two strategic sectors stand out; namely: climate transition (1) and digital technologies (2). These sectors are likely to be relevant in the near future in terms of standardization. Specifically, climate goals are associated with an increased demand for wind turbines, solar PV technologies, energy grid infrastructure, carbon capture and storage, and geo-thermal energy. The electrification of transport is also highly relevant to the energy transition. Relevant digital technologies include semiconductors, microchips as well as communication (especially 5G), internet of things, artificial intelligence and cloud computing. Cybersecurity is thus of importance for the following decades.

In which organizations are these areas being developed and is the EU present in those areas?

Standard setting is a precondition for enhancing not only interoperability but also competitiveness. On a geopolitical level, countries and institutions constantly compete to establish standards that align with their domestic rules and values. Standardization represents an important aspect of the EU's influence portfolio, as illustrated by its very strong representation in international standard setting organizations, compared to the rest of the world. Additionally, the Netherlands is well represented in many organizations, relatively to other EU countries. The representatives of EU countries are more often private than public actors. As such, EU governmental representation is low. Due to the presence of independent private entities as representatives of EU countries, there is a lack of strategic alignment and coherence between countries' goals.

In general, the EU countries have, as a whole, a strong representation in committees and organizations such as the ISO, IEC and ITU. Moreover, EU states are present in many value-based initiatives such as responsible mining, while China is virtually absent. However, ISO/IEC JTC 1 and 3GPP are institutions that the EU should be mindful of. In these two organizations, EU representation is similar to that of China. It is therefore important to maintain or strengthen European positions. Another area of focus for the EU is the mining sector at ISO, where China overshadows European participation significantly. While this list might be not comprehensive, it is nonetheless relevant for the EU to consider the above-mentioned organizations and committees.

The Netherlands' influence in international standardization organizations is important in furthering domestic interests but it is unlikely to accomplish important goals in isolation from its like-minded counterparts. On one hand, cooperation can be achieved on the EU level by designing a common strategy. On the other hand, like-minded non-EU countries who are able and willing to collaborate are also important to furthering Dutch goals.

Which categories of standards are relevant for the (near) future?

Overall, a few observations stand out in terms of which categories of standards will be the most important in the future. First, the technical-normative distinction is relevant. Technical standards are highly important from a strategic point of view due to their influence over how emerging technologies will be used. Normative standards are also important, as a direct way of promoting value-based practices. Although the effectiveness of both technical and normative standards is dependent on wide applicability, the former tends to become more widely spread due to their indirect bearing of norms. In other words, technical standards are often informed

by a company/ country's norms and values, but due to their 'technical' nature, the norms they stand for are not directly evident. For instance, if a Chinese state-owned company tries to introduce a certain technical standard in accordance with their own technology, the company's goal may extend further than simply ensuring component interoperability. It may also be aiming to reach an advantageous geopolitical position of spreading and implementing its standards worldwide. Yet without a strategic view of standardization, such geopolitical action through technical standards can go unnoticed. Therefore, this report concludes that technical standards take precedence in importance in the following decades.

Second, the sectors of focus for future standardization are green and digital technologies. Those committees and working groups that deal with technical standards for emerging climate transition and digital technologies are the most important for the EU and the Netherlands to try to influence. In order to succeed in developing international standards that are in accordance with European ambitions and values, it is necessary for the public and private sectors to collaborate. Close cooperation between governments, standardization agencies and industry players can lead to a coherent and holistic strategy that will aid the geopolitical, value driven and competitive power of the Netherlands and of the EU.

7.2 Recommendations

This report identifies two types of problems related to standard setting that the Netherlands should be wary of in the following years. First, China's quasi-monopolistic position in both the extraction of critical raw materials and the development of related technologies positions it well to introduce standards (whether domestically or regionally) that are likely to de facto establish themselves internationally simply because China faces little to no long-term competition within the space of CRM supply chains. Second, Beijing has made a consecrated push to transform China into a standard setter within the context of its goal to transform the country's economy by 2050, something which (at least in the short term) has manifested in increased attention for standard setting within the ISO.[225] Beijing's top-down approach to managing China's standard-setting initiatives means that the corporations and state agencies which represent it within the international standardization organizations are incentivized by realizing China's strategic objectives, while also having access to disproportionately more information than many of their peers.

There are several general policy options that the Netherlands can employ in order to mitigate both types of challenges. These are related to the fact that the Netherlands

225 Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe," 3.

lacks a coordinated strategy that focuses on the strategic role of standardization, thus increasing the country's vulnerability to well-organized strategic efforts from, among others, China. Governmental institutions and policy makers in the Netherlands should depart from the traditional understanding of standardization as a purely technical process to a revised recognition of standardization as a strategic instrument.

This revised understanding could be institutionalized through the creation of a Dutch national standardization strategy. It is imperative that the Netherlands develops a long-term coordinated approach toward international standard setting in order to preserve its international regulatory and innovative power. Strengthened intra-governmental cooperation – involving the Ministry of Foreign Affairs, Ministry of Economic Affairs and Climate Policy, and Ministry of Defense – will facilitate the development of a coherent strategy. Based on this national standardization strategy, standardization can also be explicitly identified as a threat and/or opportunity for the Netherlands' territorial, economic security, and the international rule of law in the next Dutch national security strategy. In this way, not only will the Netherlands be able to mitigate security risks, but will also be able to design its own preemptive moves.

Governmental efforts should be complemented by close cooperation with NEN, to ensure further alignment of goals and ambitions, on the domestic and international levels. The existing partnership should be further enhanced, given that they are beneficial for both parties. On one hand, relevant ministries will be able to derive knowledge regarding the standardization development processes at ISO and other organizations, information that they can further use to develop effective and realistic national plans. On the other hand, NEN will receive support and resources from the public sector, allowing it to increase its influence over those economically and politically important sectors in international standard setting.

The collaboration and coordination with NEN is especially relevant in combatting China's international standardization efforts. In other words, strengthening the Dutch representation in international organizations by increasing human and financial resources as well as by sharing relevant information, allows NEN to not only pursue its own business community economic interests but also to ensure that Chinese influence does not become threatening to the geopolitical influence of the Netherlands.

Furthermore, public-private partnerships in the Netherlands should be encouraged in order to stimulate and support private actors in trying to propose domestic and international standards. Integrating clauses regarding standard setting in subsidization contracts for private actors is a way of emphasizing the importance of standardization. Once a new technology has been developed, standardization should become a priority for the private developers, who could collaborate with NEN in planning their international operations. Again, this will have the effect of strengthening

the performance of Netherlands' representatives in international standardization bodies, further allowing them to compete with Chinese state-owned enterprises and governmental agencies.

In mitigating risks caused by Chinese international standardization activities, the Netherlands can become more effective through a coordinated European approach. When it comes to combatting the international influence of Chinese domestic standards, the goal is to protect not only Dutch interests, but also those of European allies. Thus, EU-level cooperation can in this case also yield the most effective results. One area of focus is China's BRI and the way its domestic standards are being adopted by other countries involved in the project. This does not only apply to non-European countries, but also to members of the EU who have been concluding agreements with Chinese (state owned) companies. As such, the Netherlands should strive for an understanding of the strategic role of standards throughout Europe, so that unwanted Chinese standards do not become widely adopted within the EU.

The EU should leverage its regulatory power by promoting strict domestic standards, in line with European technologies, interests and values. CEN-CENELEC's central position to standardization efforts in the EU should be emphasized by the Netherlands to ensure its inclusion in industrial and technological projects. In the field of CRMs and energy transition, CEN-CENELEC participates in the revision of the *Adaptation to Climate Change* plan, to be published in 2021. This is a window of opportunity for the Netherlands to lobby for the integration of standardization not only in a technical but also strategic way regarding emerging technologies.

Lastly, the importance of the EU's *Rolling Plans* and *Future and Emerging Technologies* program should be emphasized, using it in gaining first-mover advantages in standard setting for new strategic technologies and, at the same time, preventing a situation like that of 5G when European countries adopted Chinese domestic standards. Another way of doing so is to incorporate standardization in the newly formed industrial alliances within the Commission's Industrial Strategy so that private actors become actively involved in standard setting processes.

Appendices

Appendix 1: EU Member States representation in international standardization organizations

1.1. EU Member States in ISO

	TC Secretariats	TC Participating members	TC Observing members
Austria	3	338	216
Belgium	5	417	139
Bulgaria	0	44	300
Croatia	0	7	185
Cyprus	0	18	99
Czech	0	250	444
Denmark	3	270	97
Estonia	0	6	105
Finland	3	318	282
France	78	627	114
Germany	134	699	41
Greece	0	55	158
Hungary	0	105	417
Ireland	0	176	165
Italy	21	573	124
Latvia	0	7	14
Lithuania	0	23	36
Luxembourg	0	65	48
Malta	0	18	33
Netherlands	**13**	**453**	**162**
Poland	2	215	424
Portugal	1	219	231
Romania	0	110	578
Slovakia	0	52	435
Slovenia	0	41	70
Spain	6	435	218
Sweden	26	459	112
Total EU	**295**	**6000**	**5247**

Table 19: EU Member States representation in ISO[226]

226 "ISO - Members."

1.2. EU Member States in IEC

	Participating	Observing	Secretariat
Austria	109	66	2
Belgium	126	60	3
Bulgaria	1	142	0
Croatia	12	68	1
Cyprus	0	0	0
Czech	65	119	0
Denmark	117	61	2
Estonia	3	0	0
Finland	123	58	0
France	166	21	23
Germany	186	0	36
Greece	12	91	0
Hungary	28	124	1
Ireland	53	70	0
Italy	168	19	13
Latvia	0	0	0
Lithuania	4	0	0
Luxembourg	5	7	0
Malta	1	0	0
Netherlands	**129**	**36**	**1**
Poland	50	131	1
Portugal	48	81	0
Romania	32	136	0
Slovakia	4	92	0
Slovenia	21	71	0
Spain	119	66	2
Sweden	132	55	7
Total EU	**1714**	**1574**	**92**

Table 20: EU member states representation in IEC[227]

227 "IEC Members," IEC, accessed November 10, 2020, https://www.iec.ch/dyn/www/f?p=103:5:0.

1.3. EU Member States in ISO/IEC JTC 1

	TC Secretariats	AG Convenorship
Austria		
Belgium		
Bulgaria		
Croatia		
Cyprus		
Czech		
Denmark		
Estonia		
Finland		
France	1	1
Germany	2	
Greece		
Hungary		
Ireland		1
Italy		
Latvia		
Lithuania		
Luxembourg		
Malta		
Netherlands		
Poland		
Portugal		
Romania		
Slovakia		
Slovenia		
Spain		
Sweden		
Total EU	**3**	**2**

Table 21: EU member states representation in ISO/IEC JTC 1[228]

228 "ISO/IEC JTC 1 Structure," IEC, accessed November 10, 2020, https://www.iec.ch/dyn/www/f?p=103:29:30679325008613::::FSP_ORG_ID,FSP_LANG_ID:3387,25.

1.4. EU Member States in ITU

	TC Secretariats	AG Convenorship
Austria		
Belgium		
Bulgaria		
Croatia		
Cyprus		
Czech		
Denmark		
Estonia		
Finland		
France	1	1
Germany	2	
Greece		
Hungary		
Ireland		1
Italy		
Latvia		
Lithuania		
Luxembourg		
Malta		
Netherlands		
Poland		
Portugal		
Romania		
Slovakia		
Slovenia		
Spain		
Sweden		
Total EU	**3**	**2**

Note: Sweden's company number includes Huawei Technologies Sweden AB.

Table 22: EU member states representation in ITU[229]

229 "ITU-T Groups."

1.5. EU Member States in 3GPP

	TSG RAN		TSG CT		TSG SA	
	Chair	Vice	Chair	Vice	Chair	Vice
Austria						
Belgium						
Bulgaria						
Croatia						
Cyprus						
Czech						
Denmark						
Estonia						
Finland	1					
France			1			
Germany				1		
Greece						
Hungary						
Ireland						
Italy						
Latvia						
Lithuania						
Luxembourg						
Malta						
Netherlands						
Poland						
Portugal						
Romania						
Slovakia						
Slovenia						
Spain						
Sweden	1	1		1		
Total EU	**2**	**1**	**1**	**1**	**0**	**0**

Table 23: EU member states representation in TSGs in 3GPP [230]

230 "Specifications Groups," 3GPP, accessed November 10, 2020, https://www.3gpp.org/specifications-groups.

	TSG RAN		TSG CT		TSG SA	
	Chair	Vice	Chair	Vice	Chair	Vice
Austria						
Belgium						
Bulgaria						
Croatia						
Cyprus						
Czech						
Denmark						
Estonia						
Finland	1		1			1
France						1
Germany			1	2		
Greece						
Hungary						
Ireland						
Italy						
Latvia						
Lithuania						
Luxembourg						
Malta						
Netherlands					**1 [KPN]**	
Poland						
Portugal						
Romania						
Slovakia						
Slovenia						
Spain						
Sweden	1		1	1	2	
Total EU	**2**		**3**	**3**	**3**	**2**

Table 24: EU member states representation in TSG WGs in 3GPP [231]

231 "Specifications Groups."

Appendix 2: Chinese Terms

Critical Raw Materials	关键原料 / 关键原材料
Critical	关键
Raw Materials	原料
Rare and precious metals	稀贵金属
China Standards 2035	中国标准2035
China Standards 2035 Strategy	中国标准2035战略
National Standardization Development Strategy Research	国家标准化发展战略研究
Main Points of National Standardization Work in 2020	2020年全国标准化工作要点
14th Five Year Plan	十四五
National Standardization Strategy Outline	国家标准化战略纲要
National Mineral Resources Plan	国家矿产资源计划
China's participation in international standardization	中国参与国际标准化工作的预先和逐步
Standardization +	标准化+
BRI	一带一路 (One Belt One Road) 一带一路倡议 (One Belt One Road Initiative)
Soft Connectivity	软联通
Hard Connectivity	硬联通
Action Plan on Belt and Road Standard Connectivity (2018-2020)	标准联通共建"一带一路"行动计划
Standard Number	标准号
China Standard Classification Number (CCS)	中国标准分类号（CCS）
International Standard Classification Number (ICS)	国际标准分类号（ICS）
International Standardization Organization (ISO)	国际标准组织
International Telecommunication Unit (ITU)	国际电信联盟
3rd Generation Partnership Project (3GPP)	第三代合作伙伴计划
International Electrotechnical Commission (IEC)	国际电工委员会
World Wide Web Consortium (W3C)	万维网联盟

Table 25: Relevant Chinese terms for critical raw materials

Appendix 3: Chinese Critical Raw Materials control

Name	Chinese	% imported from China - EU	% imported from China - Global	Main uses
Antimony[232]	锑	N/A	74	Flame retardants (including military use), batteries, alloys, semiconductors. Military: hardening agent for bullets.
Baryte	重晶石	38	38	Space, military, aerospace, X-ray.
Bismuth	铋	84	82	Medicine, pharmaceuticals, jet engines, magnets, replacement for lead.
Cobalt	钴	*Although primarily mined in the DRC, it is largely refined in China.*[233]		In cathode materials in batteries. In HDDs, semi-conductors and integrated circuits.
Coking coal (*Metallurgical coal*)	炼焦煤（冶金煤）	N/A	55	Steelmaking
Fluorspar (Fluorine)	萤石（氟）	N/A	65	Chemicals, chips, glass, cement.
Gallium	镓[234]	27	80	Semiconductors, alloys, biomedical, neutrino telescopes
Germanium	锗	17	80	Semiconductors, optics (lenses), solar panels, solar cells (space), alloys, quantum computing.
Graphite (Natural Graphite)	石墨	47	69	Batteries.
Indium[235]	铟	N/A	48	LCD's (touch screen, screen, solar panels), electrical components (transistors), coatings.
Lithium	锂	*Although primarily mined in Australia and Chile, it is largely refined in China.*[236]		Used as Li-Co oxide (cathode) and as salt (electrolyte) in Lithium-ion battery.
Magnesium[237]	镁	93	89	Alloys (aircraft, automotive), lightweight products.
Rare Earths	稀土	**95**	**95**	

232 Robert R Seal II, Klaus Schulz, and John H. DeYoung, "Antimony," in *Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply*, Professional Paper (Virginia: U.S. Geological Survey, 2017).
233 Lebedeva, DI PERSIO, and BRETT, "Lithium Ion Battery Value Chain and Related Opportunities for Europe."
234 钅= Radical 167 - 'Jin'. Meaning: gold or metal.
235 "Indium," Royal Society of Chemistry, accessed November 23, 2020, https://www.rsc.org/periodic-table/element/49/indium.
236 Sun et al., "Supply Risks of Lithium-Ion Battery Materials."
237 "Magnesium," Royal Society of Chemistry, accessed November 23, 2020, https://www.rsc.org/periodic-table/element/12/Magnesium.

Name		Chinese	% imported from China - EU	% imported from China - Global	Main uses
Light Rare Earth Elements (LREE)		轻稀土元素	99	86	
LREE	Cerium	1	99	86	Catalysis & coatings (automotive), alloys.
	Lanthanum[238]	镧	99	86	Automotive (storage of hydrogen gas in hydrogen-powered vehicles, batteries for hybrid vehicles), lenses, alloys, X-ray detectors.
	Neodymium	钕	99	86	NIB magnets (for computers, cell phones, medical equipment, toys, motors, wind turbines), Nd:YAG lasers and military laser weapons[239]
	Praseodymium	镨	99	86	Alloy (aircraft engines), magnets (wind turbines).
	Samarium	钐	99	86	Lasers, nuclear reactors, magnets (motors), medicine.
Heavy Rare Earth Elements (HREE)		重稀土元素	**98**	**86**	
HREE	Dysprosium	镝	98	86	Magnets (wind turbines and electrical vehicles), nuclear reactors, lasers.
	Erbium[240]	铒	98	86	Nuclear reactors, lasers, hardening agent, amplifier for fiber optic cables.
	Europium	铕	98	86	Lasers, optoelectronics, quantum memory chip, nuclear reactors, thin super-conducting alloys.
	Gadolinium	钆	98	86	Medical (neutron therapy, MRI), nuclear reactors, nuclear marine propulsion systems, X-ray, superconducting motors and generators (wind turbines).
	Holmium	钬	98	86	Magnets, nuclear reactors, lasers, microwave equipment, data storage[241], quantum computing.
	Lutetium	镏	98	86	Catalysis
	Terbium	铽	98	86	Doping agent (solid-state devices, fuel cells).
	Thulium	铥	98	86	Laser (military, medicine, meteorology), X-ray, superconductors.
	Ytterbium	镱	98	86	X-ray, atomic clocks, doping agent (stainless steel), doping agent (lasers), quantum computing.
	Yttrium	钇	98	86	Medical, superconductors, LFP batteries (cars, submarines, ships).

238 "Lanthanum," Encyclopedia Britannica, accessed November 23, 2020, https://www.britannica.com/science/lanthanum.
239 Paschotta Rüdiger, "YAG Lasers," RP Photonics Encyclopedia, accessed November 23, 2020, https://www.rp-photonics.com/yag_lasers.html.
240 "Erbium," Royal Society of Chemistry, accessed November 23, 2020, https://www.rsc.org/periodic-table/element/68/erbium.
241 "How They Did It: Meet the IBM Nanoscientists Who Stored Data on a Single Atom," IBM Research Blog, March 29, 2017, https://www.ibm.com/blogs/research/2017/03/meet-ibm-nanoscientists/.

Name	Chinese	% imported from China - EU	% imported from China - Global	Main uses
Phosphate rock	磷矿	N/A	48	Fertilizers, animal feed, source of rare earths.
Phosphorus	磷	9	74	Fertilizers, steelmaking, incendiaries.
Strontium[242]	锶	N/A	19	Magnets, medicine, incendiaries (fireworks), displays. Radioactive Strontium-90: RTGs (powering space vehicles, remote weather stations and navigation buoys).
Titanium	钛	N/A	45	Aerospace, missiles, ships & submarines.
Tungsten (Wolfram)	钨丝	N/A	69	Hard materials, alloys, armaments (shells, missiles, explosives).
Vanadium	钒	N/A	N/A	Catalysis, coatings, batteries.
Carbon [243]	碳	-	-	-
Graphene[244]	石墨烯	-	-	-

In red: materials covered in this report. Source: EU 2020 Critical Raw Materials List.[245]

Table 26: Chinese Critical Raw Materials control

242 Traci Pedersen, "Facts About Strontium," livescience.com, May 20, 2013, https://www.livescience.com/34522-strontium.html.

243 Although not considered critical raw materials, the Main Points of National Standardization Work in 2020 specifically mentions carbon fiber and graphene. They are therefore included in this table.

244 Although not considered critical raw materials, the Main Points of National Standardization Work in 2020 specifically mentions carbon fiber and graphene. They are therefore included in this table.

245 European Commission, "COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards Greater Security and Sustainability."

Appendix 4: Overview HS Codes for CRMs and Technologies

The CRMs and technologies are matched with Harmonized System (HS) codes from the UN Comtrade and CBS databases. The Harmonized System is a universal classification of goods and services that can be used to track trade flows across borders. Should any further research into the CRMs that are relevant to the Netherlands be needed, the HS codes below can be used.

4.1. HS Codes for CRMS

Critical material		HS Codes for CRMs[246]
Light Rare Earth Elements	Cerium	**2805** - *Alkali or alkaline-earth metals; rare-earth metals, scandium and yttrium, whether or not intermixed or interalloyed; mercury.*
	Lanthanum	
	Neodymium	
	Praseodymium	
	Samarium	
Heavy Rare Earth Elements	Dysprosium	
	Terbium	
Cobalt		**2605** - *Cobalt ores and concentrates*
Gallium		**8112** - *Beryllium chromium, germanium, vanadium, gallium, hafnium, indium, niobium, rhenium, thallium; and articles of these metals, including waste and scrap*
Germanium		**8112**
Graphite		**2504** – *Graphite; natural*
Indium		**8112**
Lithium		**283691** – *Carbonates; lithium*
Niobium		**2615** - *Niobium, tantalum, vanadium, or zirconium ores and concentrates*
Palladium		**711021**- *Metals; palladium, unwrought or in powder form*
Silicon		**280461** – *Silicon; containing by weight not less than 99.99% silicon*
Tantalum		**2615**
Titanium		**2614** – *Titanium ores and concentrates*
Tungsten		**2611** – *Tungsten ores and concentrates*
Vanadium		**2615**

Table 27: HS codes for CRMs considered in this report[247]

246 HS Codes are extracted from the UN Comtrade database. This database is compatible with the Netherlands' CBS coding system.

247 UN, "UN Comtrade | International Trade Statistics Database," accessed October 28, 2020, https://comtrade.un.org/.

4.2. HS Codes for Technologies

Technology	Relevant HS Code	Description
Solar PV	854140	Electrical apparatus; photosensitive, including photovoltaic cells assembled or not in modules or made up into panels, light-emitting diodes (LED)
Wind Energy	850231	Electric generating sets; wind-powered, (excluding those with spark-ignition or compression-ignition internal combustion piston engines)
Permanent Magnets	8505	Electro-magnets; permanent magnets, intended permanent magnets; electro-magnetic, permanent magnet chucks, clamps, similar; electromagnetic couplings, clutches, brakes; electro-magnetic lifting heads
Batteries	850650	Cells and batteries; primary lithium
	850760	Electric accumulators; lithium-ion, including separators, whether or not rectangular (including square)
Semiconductors	8542	Electronic integrated circuits and microassemblies

Note: These are the existing codes relevant to the technologies included in this report.

Table 28: HS codes for technologies considered in this report[248]

248 UN, "UN Comtrade | International Trade Statistics Database."

Appendix 5: Chinese Positions in Standards Setting Organizations

5.1. IEC Chair Shu Yinbiao[249]

Name / Chinese name	**Shu Yinbiao** 舒印彪	
Born. Place of birth.	1958. Zhuozhou City[250], Hebei Province.	
Education	North China Electric Power University. Wuhan University (PHD).	
Day job	Chairman of State Grid Corporation of China.	
Other positions (current)	• Academician (honorary), Chinese Academy of Engineering (CAS). • Representative of the 19th National Congress. • Member of the Population, Resources and Environment Committee of the 13th CPPCC National Committee. • Chairman and Party Secretary of China Group. • Member of the Leading Group for Poverty Alleviation and Development of the State Council. • Standing director of the Chinese Society of Electrical Engineering • Chairman of the National Electric Power Construction Expert Committee. • Deputy editor of the "Power Grid Technology" magazine.	
Comment	Shu spent his entire career at the State Grid Corporation, one of the largest SOEs in China, and in different party and management positions, making him an influential figure.	

5.2. The Ambassadors of IEC

An 'Ambassador' represents the IEC internationally, enhancing support for IEC and its areas of expertise.[251] China is well-represented in this regard, having two (out of eight) ambassadors. The first ambassador is Mr Hu Jingyi, whose daytime job is Senior Director of Standardization & Industry Development at Huawei. The second ambassador is Mr. Wei Hao, whose daytime job is Director General of China Information Security Certification Center (ISCCC) – a large agency responsible for cyber security product certification and approval.[252] ISCCC sits under the *Office of the*

249 "舒印彪 | Shu Yinbiao," Baidu Encyclopedia, accessed November 20, 2020, https://baike.baidu.com/item/%E8%88%92%E5%8D%B0%E5%BD%AA.
250 涿州市, 河北省.
251 "IEC Ambassadors."
252 Paul Milton, "How Do China's Information Security Laws Affect You?," *China Business Review* (blog), August 26, 2016, https://www.chinabusinessreview.com/how-do-chinas-information-security-laws-affect-you/.

Central Cyber Security and Information Committee of the Communist Party of China[253], commonly known in English as the CPC Central Cyberspace Affairs Commission. It is an organ of the Party headed directly by Xi Jinping. To provide some context, another entity under the Central Cyber Security and Information Committee is the *Office of Central Cyberspace Affairs Commission* – commonly known in English as the Cyberspace Administration of China – which oversees the Great Firewall of China, the infamous internet censoring system. At IEC, Ambassador Wei is responsible for the sector of cyber security.

5.3. ITU Chair Zhao Houlin[254]

Name / Chinese name	**Zhao Houlin** 赵厚麟
Born. Place of birth.	1950. Gaoyou, Jiangsu[255].
Education	Nanjing University of Posts and Telecommunications, University of Essex (MSc).
Day job	-
Other positions (current)	• Doctoral supervisor of Nanjing University of Posts and Telecommunications. • Senior Advisor of China Datang Telecom Technology & Industry Group, a company with ties to the People's Liberation Army.256 • Senior Advisor, China Academy of Telecommunications Technology (under Datang). • Foreign Academician of the Russian Academy of Telecommunications. • Senior Consultant of "People's Post and Telegraph". • Senior Strategic Advisor of China Unicom. • Member of Shanghai Information Expert Committee

Zhao, Datang and the PLA

Zhao Houlin is senior advisor at the Chinese state-owned Datang and a related research bureau. Datang has been involved in standardization, having conceived the TD-SCDMA 3G mobile phone standard. The company has close ties to the People's Liberation Army (PLA), supplying their communication networks (including dual-use emergency communication networks) and operating a joint research facility in Xi'an. [257] Datang is

253 中共中央网络安全和信息化委员会办公室.
254 "Houlin Zhao: ITU Secretary-General," ITU, 2020, https://www.itu.int/en/osg/Pages/default.aspx.
255 高邮, 江苏.
256 James Mulvenon and Rebecca Tyroler-Cooper, "China's Defense Industry on the Path of Reform" (Defense Group Inc., October 2009), 24.
257 Krekel, Adams, and Bakos, "Occupying the Information High Ground: Chinese Capabilities for Computer Network Operations and Cyber Espionage," 68.

certified for '*Class A in secret information system integration*' and were involved in the Shenzhou-6 and Shenzhou-10 space missions, and in the security of the 2018 Beijing Olympics.[258] Close connections with the PLA have not prevented western companies such as Ericsson, Agilent and Qualcomm from collaborating with Datang.[259] The recent U.S. sanctions on Chinese chip maker SMIC has brought Datang forward in the media, given that the latter is one of SMIC's largest shareholders. [260]

258 Krekel, Adams, and Bakos, 81.

259 "Qualcomm and Datang Demonstrate World's First Multi-Chipset Vendor C-V2X Direct Communication Interoperability," Qualcomm, August 22, 2018, https://www.qualcomm.com/news/releases/2018/08/22/qualcomm-and-datang-demonstrate-worlds-first-multi-chipset-vendor-c-v2x.

260 Richard Windsor, "USA vs. China – Semi Chokehold.," *Radio Free Mobile* (blog), September 7, 2020, https://radiofreemobile.com/2020/09/07/usa-vs-china-semi-chokehold/.

Appendix 6: Chinese Standards Setting

6.1. Types of standards

Standard	Chinese name	Prefix code	Developed by	Authorized by
National Mandatory Standard	强制性国家标准	GB	Administrative department in charge of standardization under State Council (SAC).	State Council
National Voluntary Standard	推荐性国家标准	GB/T	Administrative department in charge of standardization under State Council (SAC).	State Council
Sector Standard (Industry Standard)	行业标准	Depends on industry	Relevant administrative departments under the State Council. Ministries/State Administrations/General Administrations.	Administrative department in charge of standardization under the State Council (SAC).
Sector Standard - Local	行业标准	N/A	Relevant administrative departments of local people's governments at or above the county level.	
Local Standard	地方标准	N/A	Administrative departments in charge of standardization of people's governments of provinces, autonomous regions and municipalities directly under the central government.	Administrative department in charge of standardization under the State Council (SAC).
Association Standard	协会标准	N/A	Societies, associations, chambers of commerce, federations, industrial technology alliances and other social organizations, in coordination with relevant market stakeholders.	Their members upon agreement and/or by voluntary adoption by others.
Enterprise Standard	企业标准	Q	Enterprises, alone or together with others.	Legal representative of the enterprise

Table 29: Types of Chinese standards [261]

261 Jack Kamensky, "Standards Setting in China: Challenges and Best Practices" (The US-China Business Council, February 2020), 4–5.

6.2. Chinese Organizations for Standard Setting

Name	Chinese name	Parent	Web	Logo
National Level				
General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)	中华人民共和国国家质量监督检验检疫总局	State Council	web	
National Standardization Administration of China (SAC)	国家标准化管理委员会	AQSIQ	web	
China Association for Standardization (CAS)	中国标准化协会	AQSIC > SAC	web	
China National Institute of Standardization (CNIS)	中国标准化研究院	SAMR / AQSIQ > SAC	web	
Institute of Resource and Environmental Standardization	中国标准化研究院 - 资源与环境分院	CNIS	web	
Certification and Accreditation Administration of China (CNCA)	中国国家认证认可监督管理委员会	AQSIQ	web	
China Quality Certification Center (CQC)	中国质量认证中心	AQSIQ > CNCA	web	
State Administration for Market Regulation (SAMR)	国家市场监督管理总局	State Council	web	
China Quality and Standards Publishing & Media (China Standards Press)	中国质量标准出版传媒有限公司 (中国质检出版社)	-	web	
Subject Level				
Ministry of Information Industry Technology (MIIT)	中华人民共和国工业和信息化部	State Council	web	
China Electronics Standardization Institute (CESI)	中国电子技术标准化研究院	MIIT>SAC	web	
National Technical Committee of Automotive Standardization (NTCAS)	全国汽车标准化技术委员会	MIIT>SAC	web	
China Communication Standards Association (CCSA)	中国通信标准化协会	MIIT	web	
National Institute of Metrology (NIM)	中国计量科学研究院	SAMR	web	

Table 30: Chinese Organizations for Standard Setting[262]

262 "China (PRC)," CLASP, accessed November 20, 2020, https://clasp.ngo/china-overview; "Who Is Who in the Chinese Standardization," SESEC, accessed November 20, 2020, https://www.sesec.eu/who-is-who-in-the-chinese-standardization/.

National Standardization Administration of China (SAC)

Task: *"Exercising the administrative functions and carry out centralized & unified administration for standardization in China for all sectors. Promoting trade and economic growth. Encouraging the development of products, systems and services that are safe, efficient and environmentally friendly".*[263]

- Establishes and administers Chinese national GB standards;
- Sets China's annual national standards agenda;

China Association for Standardization (CAS)[264]

Task: *Academic standardization research, standardization training, scientific publications, organizing academic seminars. Researching policies, laws, and regulations related to standardization. Unit of the China Association for Science and Technology*

China National Institute of Standardization (CNIS)[265]

Task: *Standardization research. Mainly addresses the global, strategic and comprehensive standardization issues in the national economy and social development of China.*

Certification and Accreditation Administration of China (CNCA)

Task: *"Exercising the administrative responsibilities by undertaking unified management, supervision and overall coordination of certification and accreditation activities across the country".*[266]

China Quality Certification Center (CQC)[267]

Task: *implementation of product certification. Responsible for product standards and quality standards in China. Certification, inspection, testing, and standards setting.*

China Electronics Standardization Institute (CESI)[268]

Task: *Standards setting for electronics and IT. Research to standardization issues, electronics and IT. Provides professional support for policy research, industry management and strategic decision-making to the government. Assists in the establishment of a first-class domestic and internationally renowned standardization research and service organizations.*

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263 "Who Is Who in the Chinese Standardization."
264 "Who Is Who in the Chinese Standardization."
265 "Who Is Who in the Chinese Standardization."
266 "China (PRC)."
267 "China (PRC)."
268 "中国电子技术标准化研究院|China Electronics Standardization Institute," Baidu Encyclopedia, accessed November 20, 2020, https://baike.baidu.com/item/%E4%B8%AD%E5%9B%BD%E7% 94%B5%E5%AD%90%E6%8A%80%E6%9C%AF%E6%A0%87%E5%87%86%E5%8C%96%E7%A0%94%E7%A9%B6%E9%99%A2/2326872?fr=aladdin.

State Administration for Market Regulation (SAMR)[269]

Task: *Market supervision and management. Formulate relevant regulations, policies and standards. Unified registration of market entities. Standardize market supervision and administrative enforcement actions. Approves standards set by SAC.*

6.3. Organizations involved in China Standards 2035

In implementing the research phase that the plan is currently in, the central government is closely collaborating with other social actors, including local governments, state-owned enterprises, as well as many semi-governmental institutions such as research centers and universities. The research is headed by the Chinese Academy of Sciences (CAS), with strong support from the Standardization Administration of China (SAC) and the State Administration for Market Supervision and Administration (SAMR). Given the extremely wide scope of the research phase, research teams are travelling throughout the country and involving many local institutions, even hospitals and local museums. In 2018, the Standardization Administration of China (SAC) said they had selected 100 cities and 10.000 companies to actively join the project.[270] At the moment, the focus of research appears to be local standard-setting and how this process can be improved so that it contributes to better national standardization.

Name	Chinese name	Role	Web
Chinese Academy of Engineering (CAE)	中国工程院	Leads the scientific research	web
Standardization Administration of China (SAC)	国家标准化管理委员会	Research.	web
State Administration for Market Supervision and Administration (SAMR)	国家市场管理总局	Research.	web
General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ)	中华人民共和国国家质量监督检验检疫总局	Supports research with organization and coordination, and research funding.	web
Provincial entities involved in standardization and general economic affairs		Consultations. For example: • Qinghai Standardization Association. • Qinghai Provincial Market Supervision Bureau. • Zhejiang Standardization Association.	
Companies, on provincial level.		Consultations. For example: • Qinghai BYD Lithium Battery. • Huawei Qinghai New Energy Big Data Center[271] • Zhejiang Yunda Wind Power.	
Universities & research institutions on provincial level.		Consultations. For example: • Guangdong Open University • Guangdong Provincial Hospital of Traditional Chinese Medicine	

Table 31: Organizations involved in China Standards 2035

269 "State Administration for Market Regulation (SAMR) (国家市场管理总局)," *Thomson Reuters Practical Law* (blog), 2020, http://uk.practicallaw.thomsonreuters.com/w-014-1991?transitionType=Default&contextData=(sc.Default)&firstPage=true.

270 China Government Network, "'Chinese Standard 2035' will be released," Sina, January 11, 2018, http://finance.sina.com.cn/roll/2018-01-11/doc-ifyqptqv7516166.shtml.

271 "Huawei to Build Big Data Park in Qinghai," ChinaDaily, June 28, 2018, http://www.chinadaily.com.cn/a/201806/28/WS5b34beeda3103349141df910.html.

6.4. Rare Earth Standards Setting Organizations in China

Name	Chinese name	Parent	Web	Logo
Hunan Rare Earth Metal Materials Research Institute	湖南稀土金属材料研究院	Hunan Rare Earth New Energy Materials Co., Ltd.	web web	
Nonferrous Metal Techno-Economic Research Institute[272]	色金属技术经济研究院	China Nonferrous Metals Corp., China Nonferrous Metals Industry Association.	web	
Qiandong Rare Earth Group Company	虔东稀土集团股份有限公司	-	web	
Yiyang Hongyuan Rare Earth Company	益阳鸿源稀土有限责任公司	-	web	
China Rare Earth Company	中国稀有稀土股份有限公司	Chinalco > Chalco[273]	web	
Baotou Research Institute of Rare Earths (BRIRE)	包头稀土研究院	Baotou Iron & Steel (Group) Company	web	
Rare Earth Information Centre of China (CRE)	中国稀土_中国稀土网站	BRIRE	web	
National Engineering Research Centre of Rare Earth Metallurgy and Functional Materials (NERC/Ruike Center)	稀土冶金及功能材料国家工程研究中心	BRIRE	web	
State Key Laboratory [SKL] of Baiyunobo Rare Earth Resource Researches and Comprehensive Utilization	白云鄂博稀土资源研究与综合利用国家重点实验室	MIIT, BRIRE, Inner Mongolia Science and Technology Department	web	
The Chinese Society of Rare Earths (CSRE)	中国稀土学会	China Association for Science and Technology (CAST)	web	
Association of China Rare Earth Industry (ACREI)	中国稀土行业协会	-	web	
Baotou Rare Earth R&D Center [under] CAS (BTREC)	中国科学院包头稀土研发中心	Chinese Academy of Sciences (CAS)	web	
China Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters (CCCMC)	中国五矿化工进出口商会稀土分会常	-	web	

Remarks: Baotou, capital of Inner Mongolia, is China's rare earth mining capital, and therefore home to many large mining companies and important mining research institutions. The mines around Baotou offer cerium, neodymium, niobium, fluorite, and lanthanum. Besides rare earths, Baotou's mines also hold large deposits of iron ore, coal, quartz, apatite, and dolomite. Some of the rare earths found around Baotou are byproducts of iron ore.

Table 32: Standards setting organizations relevant to rare earths in China

272 A research institute under the central government.

273 "Chalco Transfers Ga Assets to China Rare Earth," *Argus* Blog (blog), August 30, 2019, https://www.argusmedia.com/en/news/1968587-chalco-transfers-ga-assets-to-china-rare-earth.

Appendix 7: Excerpts from Main Points 2020

In the Main Points report some 117 points are addressed. A few recommendations stand out (bold by authors):

1.2: Support the Chinese Academy of Engineering to carry out the "National Standardization Development Strategy Research" project.

1.5: Strengthen the **interaction** between standardization strategies and major national strategies, and accurately grasp the major requirements for standardization of national strategies such as innovation-driven development, rural revitalization, regional coordinated development, and sustainable development. Continue to improve the level of universalization of **military** and civilian standards.

2.21: Vigorously promote the coordinated development of standardization in the Beijing-Tianjin-Hebei region, the Xiong'an New Area, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area, and actively build an internationally advanced standard system.

2.24: Carry out comprehensive pilot projects for **urban standardization**, and explore new models and new paths for standardization work involving the city as a carrier and the participation of governments, social organizations, and enterprises.

2.25: Carry out the standardization work of **metropolitan area and urban agglomeration** land and space planning, transportation, ecological environment protection, safety production, emergency linkage, etc., explore new models and new paths for the coordinated development of metropolitan areas and urban agglomerations, and cultivate new regional competitive advantages.

3.45: Improve the management standard system for the integration of industrialization and industrialization and promote the construction of an **industrial Internet** standard system.

3.46: Promote the construction of an independent nuclear power standard system.

3.47: Promote the development of standards for marine engineering equipment and **high-tech ships**, advanced rail transit, intelligent transportation systems, aviation, satellite space infrastructure, and commercial aerospace.

3.48: Carry out the development of **smart car** standards such as car information security, car operating systems, and communication protocols.

3.49: Promote the development of new energy vehicle safety, wireless charging, high-power charging, fuel cell and battery recycling and other related standards.

3.53: Deepen the piloting of new material standards and promote the development of standards in the fields of **carbon fiber, rare earths, and graphene**.

3.55: Promote the construction of standard systems in key areas such as **blockchain**, Internet of Things, new cloud computing, big data, 5G, new generation artificial intelligence, new smart cities, geographic information.

3.56: Speed up the development of standards for item coding and automatic identification. Develop general **military and civilian materials** and equipment coding standards and promote the construction of a military and civilian general standard system for material coding.

3.69: Improve the public security video surveillance network construction and application standard system.

3.70: Promote the formulation of national standards in the fields of meteorology, surveying and mapping

4.78: Actively fulfill my country's responsibilities as a permanent member of ISO and IEC, provide services and support for the IEC chairman to perform his duties and responsibilities, share Chinese practices and propose Chinese plans in the governance reform and governance improvement of international standards organizations.

4.80: Give full play to the organization and coordination of ISO and IEC China National Committee. Carry out extensive **international cooperation** in the fields of new energy, new materials, quantum computing, digital twins, intelligent manufacturing, industrialized construction and engineering construction, and accelerate the development of my country's superior technical standards. International transformation continues to promote the publication of the Chinese version of ISO and IEC standards.

4.82: Promote the establishment of the **BRICS standardization** cooperation mechanism, continue to deepen the construction of cooperation mechanisms with the EU, the African Union, ASEAN, Northeast Asia, Central Asia, and South Asia, and strengthen bilateral cooperation with France, Germany, Britain, the United States, Canada, Russia, Saudi Arabia and other countries.

4.85: Implement the action plan for standard connectivity to jointly build the “Belt and Road” and promote the “soft connectivity” of the “Belt and Road” construction standard.

4.88: Establish a working mechanism for tracking and transforming international standards to promote the simultaneous development of national standards and international standards.

5.101: Select certain areas to carry out the optimization and reorganization of standardization technology organizations, increase the joint construction of military and civilian standardization technology organizations, and better meet the needs of technological innovation and industrial development.5.116: Promote cooperation in standardization education with co-construction of the “Belt and Road” countries.

Appendix 8: Chinese Standard Examples

8.1. Example Standard for REEs

The most recent national (GB) standard for Rare Earths is GB 39176-2020

CSS: H65.

ICS: 77.120.99.

Name: Rare earth products packing, marking, transport and storage.

Release date: 2020-07-23.

Standard status: To be implemented.
Implementation date: 2021-08-01.

Developer: Ministry of Industry and Information Technology.

Administrative organization: Ministry of Industry and Information Technology [由 339].

Issued by: State Administration for Market Regulation (SAMR), China National Standardization Administration (SAC).

Main drafting units: Hunan Rare Earth Metal Materials Research Institute, Nonferrous Metal Technology and Economic Research Institute, Qiandong Rare Earth Group Co., Ltd., Yiyang Hongyuan Rare Earth Co., Ltd., China Rare Rare Earth Co., Ltd.

Comment

The information of just this single standard shows the complexity of the standards setting operation. It involves three large central-government entities, semi-independent and independent research institutes, private and (local) state-owned companies, spread over several provinces.

Viewing the standard

New standards are published in China, in Chinese. New standards are not immediately translated into English. Commercial entities offer paid translations of new standards. Access from abroad to the standard's full Chinese text is blocked by the Great Firewall of China, while from inside China, the Chinese text can be viewed and downloaded. The only way to view the full text of new standards is by being in China, or by paying a commercial entity.

8.2. Example Standard for the Mining Industry

The most recent National Standard (GT/T - Voluntary) for the mining industry is GB/T 13908-2020.

CSS: D10.

ICS: 73.020.

Name: General requirements for mineral exploration.

Release date: 2020-04-28.

Standard status: Current.

Implementation date: 2020-05-01.

Developer: Ministry of Natural Resources

Administrative Organization: National Standardization Technical Committee on Land and Resources (SAC/TC 93)

Issued by: State Administration for Market Regulation (SAMR), China National Standardization Administration (SAC).

Main drafting units: Mineral Resources Reserve Evaluation Center of the Ministry of Natural Resources, Mineral Resources Protection Supervision Department of the Ministry of Natural Resources, Henan Mineral Resources Reserve Evaluation Center, Hunan Mineral Resources Reserve Evaluation Center, China Ruilin Engineering Technology Co., Ltd., Yunnan Mineral Resources Reserve Evaluation Center , China Building Materials Industry Geological Exploration Center, Yunnan Provincial Geological and Mineral Exploration and Development Bureau.

Comment

The standard drafting structure is slightly less complicated than in the case of the rare earth standard example above. Most drafting units are affiliated to the MNR or provincial mineral resources departments, and the involvement of companies is less obvious. Yet this particular standard is a very general one – the order could be different in the case of more specialized standards.

Viewing the standard

The above standard for sale online, $24 for a Chinese version and $459 for a translation.

8.3. Example Publication of Standards for a Beer Bottle

To demonstrate the level of detail and complexity regarding standards and its publication, the example of a beer bottle standard is discussed.

Each publication has a Serial number/Announcement number/Announcement title and an Announcement date (see Figure 2).


请输入标准编号或名称关键字 查询

国家标准公告 408

序号	公告号	公告标题	公告日期
1	2020年第19号	关于批准发布《小麦粉粉质曲线-稳定时间检测用标准样品》等88项国家标准样品的公告	2020-08-07
2	2020年第18号	关于批准发布《啤酒瓶》等13项强制性国家标准和2项强制性国家标准修改单的公告	2020-07-23
3	2020年第17号	关于批准发布《印刷、书写和绘图用原纸尺寸》等199项推荐性国家标准和3项国家标准修改单的公告	2020-07-21
4	2020年第16号	关于批准发布《儿童口罩技术规范》等23项国家标准外文版的公告	2020-06-24
5	2020年第15号	关于批准发布《绿色产品评价 快递封装用品》等3项推荐性国家标准的公告	2020-06-21

Figure 2 Example of the publication of new Chinese standards.

A publication may include several standards. For example, the second publication on this list is called: "*Announcement on Approving the Release {{beer bottle}} of 13 Mandatory National Standards and 2 Mandatory National Standard Amendments.*"

The name of this announcement is 'Beer Bottle' but only the first of these standards is actually about beer bottles (see Figure 3).


附件文件下载：2020年第18号

关于批准发布《啤酒瓶》等13项强制性国家标准和2项强制性国家标准修改单的公告

国家市场监督管理总局（国家标准化管理委员会）批准《啤酒瓶》等13项强制性国家标准和2项强制性国家标准修改单，现予以公布。

国家市场监督管理总局 国家标准化管理委员会

2020-07-23

序号	标准编号	标准名称	代替标准号	实施日期
1	GB 4544-2020	啤酒瓶	GB 4544-1996	2021-08-01
2	GB 8965.1-2020	防护服装 阻燃服	GB 8965.1-2009	2021-08-01
3	GB 9706.205-2020	医用电气设备 第2-5部分：超声理疗设备的基本安全和基本性能专用要求	GB 9706.7-2008	2023-05-01
4	GB 9706.206-2020	医用电气设备 第2-6部分：微波治疗设备的基本安全和基本性能专用要求	GB 9706.6-2007	2023-05-01
5	GB 14232.1-2020	人体血液及血液成分袋式塑料容器 第1部分：传统型血袋	GB 14232.1-2004	2022-02-01
6	GB 15892-2020	生活饮用水用聚氯化铝	GB 15892-2009	2021-08-01
7	GB 20653-2020	防护服装 职业用高可视性警示服	GB 20653-2006	2021-08-01
8	GB 21027-2020	学生用品的安全通用要求	GB 21027-2007	2022-02-01
9	GB 21148-2020	足部防护 安全鞋	GB 12011-2009,GB 21146-2007,GB 21147-2007,GB 21148-2007	2021-08-01
10	GB 24850-2020	平板电视与机顶盒能效限定值及能效等级	GB 24850-2013,GB 25957-2010	2021-08-01
11	GB 28234-2020	酸性电解水生成器卫生要求	GB 28234-2011	2021-08-01
12	GB 39176-2020	稀土产品的包装、标志、运输和贮存		2021-08-01
13	GB 39177-2020	电压力锅能效限定值及能效等级		2021-08-01
14	GB 20300-2018	道路运输爆炸品和剧毒化学品车辆安全技术条件《第1号修改单》	GB 20300-2006	2020-07-23
15	GB 30509-2014	车辆及部件识别标记《第1号修改单》		2020-07-23

Figure 3 Examples of Chinese standards and Amendments

Below are the 13 standards and 2 amendments translated from Figure 2:

Serial number	Standard number	Standard name	Standard number	Implementation date
1	GB 4544-2020	beer bottle	GB 4544-1996	2021-08-01
2	GB 8965.1-2020	Protective clothing Flame retardant clothing	GB 8965.1-2009	2021-08-01
3	GB 9706.205-2020	Medical electrical equipment Part 2-5: Specific requirements for the basic safety and basic performance of ultrasonic physical therapy equipment	GB 9706.7-2008	2023-05-01
4	GB 9706.206-2020	Medical Electrical Equipment" Part 2-6: Specific requirements for the basic safety and basic performance of microwave therapy equipment	GB 9706.6-2007	2023-05-01
5	GB 14232.1-2020	Bag-type plastic containers for human blood and blood components Part 1: Traditional blood bags	GB 14232.1-2004	2022-02-01
6	GB 15892-2020	Polyaluminum chloride for drinking water	GB 15892-2009 2021-08-01	
7	GB 20653-2020	Protective clothing Occupational high-visibility warning clothing	GB 20653-2006	2021-08-01
8	GB 21027-2020	General requirements for the safety of student supplies	GB 21027-2007	2022-02-01
9	GB 21148-2020	Foot protection safety shoes	GB 12011-2009, GB 21146-2007, GB 21147-2007, GB 21148-2007	2021-08-01
10	GB 24850-2020	Energy efficiency limit values and energy efficiency grades for flat-panel TVs and set-top boxes	GB 24850-2013, GB 25957-2010	2021-08-01
11	GB 28234-2020	Hygienic requirements for acidic electrolyzed water generator	GB 28234-2011	2021-08-01
12	GB 39176-2020	Packaging, marking, transportation and storage of rare earth products		2021-08-01
13	GB 39177-2020	Energy efficiency limit value and energy efficiency grade of electric pressure cooker		2021-08-01
14	GB 20300-2018	Road Transport Explosives and Highly Toxic Chemicals Vehicle Safety Technical Requirements "No. 1 Amendment"	GB 20300-2006	2020-07-23
15	GB 30509-2014	Vehicle and component identification marking "No. 1 Amendment"		2020-07-23

When hovered over number 1 a pop-up screen appears:

Figure 4. Example of Pop up screen over number 1

When clicking on the blue button a new screen appears:

Figure 5 Example Pop up of the blue button

Figure 5 translated:

Standard number: GB 4544-2020
Chinese standard name: **啤酒瓶**

English standard name: Beer bottles
Standard status: upcoming
China Standard Classification Number (CCS): Y22
International Standard Classification Number (ICS): 55.100
Release date: 2020-07-23
Implementation date: 2021-08-01
Competent authority: Ministry of Industry and Information Technology
Focal point: Ministry of Industry and Information Technology
Issued by: State Administration for Market Regulation, China National Standardization Administration

One step back to the list. Instead of hover-over, *click* on number 1 and a new screen appears with a very detailed development history of the standard:

Figure 6 Example of Click On screen of number 1.

Figure 6 translated:

Beer bottles
National standards are mandatory and will be implemented soon.

The national standard “Beer Bottle” is under the jurisdiction of 339 (Ministry of Industry and Information Technology).

The main drafting units are Donghua University, the National Quality Supervision and Inspection Center for Spectacle Glass Enamel Products, Shanghai Aolian Glass Co., Ltd., Shandong Jingyao Glass Group Co., Ltd., Shanghai Spectacle Glass Enamel Product Quality Supervision and Inspection Station.

The main drafters Sun Huanbao, Zhang Guoxiu, Sang Yi, Lin Yongzhi, Tang Yong, Dai Qi, Xu Xiaojian, Wu Jiaxu, Wang Likun, Gong Miao

Posted on 2020-07-23. Implemented on 2021-08-01

Basic information:
Standard: GB 4544-2020
Release date: 2020-07-23
Implementation date: 2021-08-01
Replace all standards: GB 4544-1996

Standard category: product
China Standard Classification Number: Y22
International Standard Classification Number: 55.100
Focal point: Ministry of Industry and Information Technology
Replace the following standards: All GB 4544-1996

Drafting unit

Donghua University
Shanghai Aolian Glass Co., Ltd.
Shanghai Quality Supervision and Inspection Station for Glasses and Enamel Products
National Quality Supervision and Inspection Center for Glasses and Enamel Products
Shandong Jingyao Glass Group Co., Ltd.

Drafters: Sun Huanbao, Zhang Guoxiu, Tang Yong, Dai Qi, Wang Likun, Gong Miao, Sang Yi, Lin Yongzhi, Xu Xiaojian, Wu Jiaxu

Similar standards (planned)

20011173-Q-607 beer bottle
GB 4544-1996 beer bottles
DB37/T 1270-2009 Beer bottle burst analysis specification
QB 1080-1991 Beer bottling production line
DB62/T 1673-2007 burst beer bottle quality identification technical specification
20079581-Q-469 Polyethylene terephthalate (PET) beer bottle
QB/T 4254-2011 ceramic wine bottle
20142733-T-607 glass container white wine bottle
GB/T 24694-2009 Glass container Liquor bottle
Glass container.

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