



International Copper
Association
Copper Alliance

2020 | Annual Report

Table of Contents

4

Message to Membership

Establishing copper and the copper industry as critical to key industries

6

Industry Reputation Building

Adjusting strategy and tactics to reach goals

8

The Copper Mark

Promoting responsible production practices with assurance framework

10

ICA China

Protecting the most critical markets for copper

12

Clean Energy Transition

Opportunities with climate-neutral technologies

14

Material Stewardship

Risks and opportunities remain top priorities

16

Antimicrobial Copper

Informing and advocating on copper health benefits

18

Global Partnerships

Maintaining a geographic presence

20

U.S. Government Relations

Educating on the essentiality of copper

22

Market Intelligence

Focusing on trending issues important to the market



VISION

The International Copper Association (ICA) is the leading advocate of the copper industry.

MISSION STATEMENT

ICA is a nonprofit organization that brings together the copper industry, and its partners, to make a positive contribution to the UN Sustainable Development Goals and to support markets for copper.

VALUE PROPOSITION

ICA is dedicated to championing the industry on issues critical to copper, now and in the future.

ICA provides a common platform for what is a nonintegrated industry. In this capacity, ICA, with its partners, connects the upstream (mining and smelting/refining) and downstream (fabricating) parts of the copper value chain.

Being commercially neutral, ICA is a credible advocate of the copper industry to defend its interest with policymakers, regulators and other key stakeholders (e.g., United Nations, NGOs, etc.).

By pooling resources through ICA, the copper industry can accomplish much more than any single company could on its own.

MEMBERS

As of 31 December 2020

Anglo American . Antofagasta Minerals S.A. . Aurubis . BHP Billiton Plc . Boliden AB . Buenavista de Cobre, S.A. de C.V. . Compañía Minera Doña Inez Collahuasi . Compañía Minera Zaldívar . CODELCO–Chile . Daechang Co., Ltd. . Freeport-McMoRan . Glencore . Golden Dragon Precise Copper Tube . KGHM Polska Miedź S.A. . LS-Nikko Copper Inc. . Metalurgica de Cobre S.A. de C.V. . Metso Outotec Oyj . Minera Antamina S.A. . Minera Antucoya . Minera Centinela . Minera Escondida Limitada . Minera Los Pelambres . Mitsubishi Materials Corporation . Operadoras de Minas de Nacozari, S.A. de C.V. . Pan Pacific Copper . Rio Tinto Kennecott . Sociedad Contractual Minera el Abra . Sociedad Minera Cerro Verde S.A.A. . Southern Perú Copper Corporation . Sumitomo Metal Mining Co., Ltd. . Teck

COPPER ALLIANCE® DIRECTORY

ANTHONY LEA, President

International Copper Association, Ltd.
799 9th Street, NW, Suite 1000
Washington, D.C. 20001 USA
Phone: +1 (646) 431-4315
Email: anthony.lea@copperalliance.org

ASIA

Richard Xu
ICA Regional Director – Asia
International Copper Association – Asia
Room 407, Tower E. Zhaotai
International Center
No.3 Chaowai West Street
Chaoyang District, Beijing, 100020
People's Republic of China
Phone: +86 (21) 6391-5816
Email: richard.xu@copperalliance.org

EUROPE

Bernard Respaut
ICA Regional Director – Europe
European Copper Institute
Avenue de Tervueren 168 b 10
1150 Brussels, Belgium
Phone: +32 (2) 777-7080
Email: bernard.respaut@copperalliance.org

UNITED STATES

Thomas Passek
President, Copper Development Association, Inc.
ICA Regional Director – United States
7918 Jones Branch Drive, Suite 300
McLean, VA 22102 USA
Phone: +1 (212) 251-7209
Email: thomas.passek@copperalliance.us
Market Development Programs:
United States

Message to Membership

As we write this message, the world remains firmly in the grip of the COVID-19 pandemic. The International Copper Association and its members, first and foremost, continue to ensure the safety of their employees and families. While the introduction of several vaccines offers promise of a safer and healthier tomorrow, our collective vigilance must remain strong.

ICA entered 2020 invigorated by the prospect of implementing on its new, three-year strategic plan. A simplified organizational structure and a streamlined program portfolio—the results of a collaborative member-management process that began in 2019—positioned ICA to deliver on its revised Mission Statement “to bring together the copper industry, and its partners, to make a positive contribution to the UN Sustainable Development Goals, and to support markets for copper.”

Of course, the world was turned upside down when the pandemic crossed the borders of nearly every nation on earth. All organizations needed to adapt to survive and ICA was no exception. Very rapidly, ICA and its Copper Alliance® partners worked to establish copper and the copper industry as critical to key industries (healthcare, in particular) and technologies, to infrastructure and to ongoing efforts to reduce greenhouse gas emissions, as well as a critical component of the economic stimulus plans governments worldwide created to restart their economies.

The content of this annual report will cover pandemic impacts but will also highlight the many achievements and successes from the past year, not the least of which was ICA's ability to make strong progress against the three key objectives of the 2020-22 Strategic Plan:

- **Enhance the reputation** of the copper industry, with a new baseline perception survey completed at the end of 2019.
- **Guard against** adverse regulations that would significantly impact the industry's license to operate and fair market access for copper products.
- **Provide members** with a strong return on investment in the form of increased copper demand in key geographies and end-use markets

Frequent collaboration during 2020 by members and management ensured these objectives remain highly achievable. The formation of a new Strategy Committee and three Strategic Program Councils—the key pillars in ICA's new governance structure—proved to be particularly effective. We offer our thanks to the individuals who serve on those committees and ICA's employees around the world for going the extra mile in 2020 in helping to keep ICA on course.

We invite you to read the pages of this report for an overview of the positive outcomes of the past year. In the remainder of this message, we will focus on the future.

A key objective in 2021 will be to start work on a Global Copper Decarbonization Roadmap. Climate change will continue to dominate the global agenda in the 21st century and the copper industry needs to be a part not only of the discussion, but of the solution. ICA already has done an excellent job in communicating copper (as a material) as indispensable to the technologies, products and solutions required to achieve the Paris Climate Change Agreement and the roadmap will strengthen this work.

Past efforts to unite the industry through ICA around large-scale challenges have proven successful. These efforts include the copper industry's response to REACH, and the launch of The Copper Mark—which in a short period of time is already providing a credible assurance framework to demonstrate the copper industry's responsible production practices and industry contribution to the UN SDGs. We see the development of a Decarbonization Roadmap as the next big challenge.

2021 will also see the launch of an expanded campaign to elevate the reputation of the copper industry. This is another important area where ICA is uniquely positioned to support not just its members, but the whole of the copper industry.

The new programs briefly highlighted above serve as an important reminder to those organizations that are not yet members of ICA: Challenges like climate change, reputation and responsible sourcing will be experienced by all companies, today and into the future. You can choose to face these challenges alone, but they are better addressed through a collective position and voice through ICA. We invite you to work alongside us to face these challenges together.



New ICA Chairman

In October, Ivan Arriagada's two-year term as Chairman of the Board of ICA concluded. Ivan led ICA during a critical juncture that saw a ground-up reorganization. The ICA he leaves behind is well-positioned for ongoing success. The members and management offer thanks to Ivan for his guidance and leadership.

At its Board of Directors Meeting on 19 October 2020, ICA's members elected Steve Higgins, Senior Vice President and Chief Administrative Officer, Freeport-McMoRan, as its Chairman of the Board. He will serve in this capacity for two years. Steve is no stranger to ICA and his long history with the organization includes five years as Chairman of the Advisory and Program Review Committees. At the time of his election, Steve said, "I am honored to begin my tenure as ICA's Chairman. I look forward to working with my copper industry colleagues and the ICA executive team to deliver value for the industry in high-impact, end-use markets."



IVÁN ARRIAGADA
Chairman



STEVE HIGGINS
Chairman-Elect



TONY LEA
President



"I am honored to begin my tenure as ICA's Chairman. I look forward to working with my copper industry colleagues and the ICA executive team to deliver value for the industry in high-impact, end-use markets."

—Steve Higgins
*Senior VP & Chief Administrative
Officer, Freeport-McMoRan*



AWARD WINNING VISUALS

ICA has sponsored Climate Week NYC for the past four years. Last year IRB's visual campaign in support of the event won several awards for its design, use of technology and impact, including Twitter winner for **Best PR Campaign** and "other" winner for **Best Use of Technology** from The Social Shake-Up, and Honorable Mentions from the PR News Digital Awards for **Best Twitter Campaign** and **Game Changer Campaign**! Check out one of our award-winning messages.



Member Activity Strengthens Reputation-Building Efforts

Times filled with adversity present both challenges and opportunities. When challenges are embraced, advances can be made, and growth becomes inevitable. With most of the global workforce pivoting to a remote work environment and international travel disappearing, ICA's Industry Reputation-building (IRB) team needed to adjust its strategy and tactics in its quest to reach the goal of increasing the industry's reputation by five percent over three years.

IRB closely aligned with other internal teams, such as Markets Outreach, Clean Energy Transition and the Copper Mark, to develop nine webinars sponsored by organizations such as The Climate Group, CRU and One Policy Place. Six thought leadership pieces were drafted over the year and published in online pubs such as *Euractive*, *Diplomatic Courier* and *Greenbiz*. In addition, the IRB team worked closely with the Copper Mark as they rolled out branding materials, grew their social media presence and became more visible in the responsible production space.

A key to successfully reaching ICA's reputation goals is the formation of the Industry Reputation-building Council. This unique group is comprised of member communication practitioners who make daily decisions about content, strategy and message development. This hands-on experience is invaluable in strengthening ICA's objective of uniting the industry to speak in one voice. These interactions allow ICA's messaging to become stronger because it is developed in conjunction with industry participants.

The IRB Council provided valuable guidance and input on the following reputation-building activities:

- **Messaging Architecture:** After examining ICA's content and the 2019 reputation survey results, the IRB team decided to develop a formal message architecture focused on three pillars: Climate and Environment, Society and Economy, and Health and Safety. Proof points, data and evidence related to these themes were developed, and one solid set of content and information was developed to ensure ICA was delivering similar messaging across the three key markets of Beijing, Brussels and Washington, D.C.
- **IRB Strategy:** Building on the strong Public Affairs foundation, a new strategy was formulated to align with member priorities. The strategy actively engages with the complete copper value chain to increase the positive reputation of the copper industry. A detailed editorial calendar will be available for members and partners, such as the International Wrought Copper Council (IWCC), to see how their planned activities can be combined with ICA's efforts. Additionally, IRB will focus its strategic efforts and resources on mini-campaigns—theme-based communications activities spread out over six to nine months.
- **Revised Website:** The new and improved strategy and messaging architecture present ICA with the opportunity to refresh content in all its tools and resources. ICA's main website, copperalliance.org, is undergoing a major rework to reflect the new strategy, including joining with its sister site, sustainablecopper.org, to become one powerful source of information on industry actions, member commitments and copper's essentiality.

Moving into 2021, the ICA's IRB function and the associated IRB Council are poised to become a powerful voice to represent the copper industry.

The Copper Mark®

A SOLID BEGINNING

On 30 March 2020, the Copper Mark was formally launched. The Copper Mark provides the first and only assurance framework to promote responsible production practices for copper producers and to demonstrate the industry's contribution to the United Nations SDGs. It goes beyond compliance and focuses on continuous improvement of responsible production.

With an initial goal of 10 mining, smelting or refining sites signing the letter of commitment in 2020, the Copper Mark counted **15 ICA member sites** among its participants by the end of the year. Four sites received the Copper Mark in 2020. The successful initial uptake demonstrates ICA members' commitment to responsible production.

To enable the onsite verification of copper producers' practices, the Copper Mark has now also approved 39 assessors globally to conduct assessments against the Assurance Process.

ICA developed and provided initial funding for the development of the Copper Mark, and in December 2019, the Copper Mark company was registered as a separate legal entity in the United Kingdom. ICA worked closely with the Copper Mark Board of Directors and staff to enable the transition to this new entity in the early months of 2020 and throughout the year.

Since May 2020, the Copper Mark's multi-stakeholder Advisory Council meets regularly to provide strategic guidance to the organization on the implementation of its mission and vision.

LAYING THE FOUNDATION

The Copper Mark company has established three working groups to carry out the development and implementation of workplans related to chain of custody, downstream entities, recyclers, and a concept to encourage and verify the positive contributions of the copper industry to the UN Sustainable Development Goals.

Of the three working groups established, two have already adopted a roadmap to meet their stated objectives in line with the five-year plan.

In a collaborative effort, the Copper Mark company partnered with the **International Lead Association (ILA)**, the **International Zinc Association (IZA)**, the **Nickel Institute** and the **Responsible Minerals Initiative (RMI)** to develop the Joint Standard to enable companies to comply with the London Metal Exchange (LME) **Responsible Sourcing Requirements**.

After extensive discussions with the due diligence working group, a public consultation and engagements with members of each partner organization, the Joint Standard draft was finalized in December 2020.

TECHNICAL SUPPORT

The ICA continued to lend support to the Copper Mark for the establishment of the assurance framework and the set-up of the Copper Mark organization. The Copper Mark also launched its social media channels in early 2020.

ICA members provided technical support for the finalization of the core documents of the Copper Mark's Assurance Framework enabling its launch in March 2020.

With the launch of the Copper Mark, ICA has positioned its members as leading the way in responsible copper production. For more information, please refer to the Copper Mark's first annual report coming in the spring of 2021.



RECIPIENTS OF THE COPPER MARK

Rio Tinto
Kennecott Utah Copper LLC

Rio Tinto
Oyu Tolgoi LLC

Freeport-McMoRan Inc
Atlantic Copper Smelter & Refinery

Freeport-McMoRan Inc
Sociedad Contractual Minera El Abra

Freeport-McMoRan Inc
Sociedad Minera Cerro Verde S.A.A

Freeport-McMoRan Inc
Miami Smelter & Mine

Freeport-McMoRan Inc
El Paso Refinery

PARTICIPANTS OF THE COPPER MARK

BHP
Minera Escondida Limitada

BHP
Minera Spence Limitada

BHP
Olympic Dam

Freeport-McMoRan Inc.
Morenci Mine

KGHM Polska Miedź S.A. Oddzial
Huta Miedzi Glogów

KGHM Polska Miedź S.A. Oddzial
Huta Miedzi Legnica

Aurubis Bulgaria AD
Aurubis AD

Antofagasta
Compañía Minera Zaldívar SpA

Antofagasta
Minera Centinela

The Copper Mark goes beyond compliance and focuses on continuous improvement of responsible production.





ICA China Programs— the Powerhouse of ICA Market Development

China in 2020 faced challenges from the pandemic and the resultant reorientation of policies. At the end of the year, the country recorded an increase in year-on-year gross domestic product (GDP) of 2.3 percent, which indicates that the economy has recovered steadily. However, the results are diverse across different industries: Wind power, new energy vehicles (NEVs), and the refrigeration industry showed noticeable increases, while home appliance segments such as air conditioners decreased by 5 percent.

The landscape of national strategies shifted significantly in 2020. Carbon neutrality goals for 2060 were announced, elevating the importance of technical capacity and supply chain security. ICA is working with key stakeholders in government agencies to understand the implications, and ICA will work to secure and protect the most critical markets for copper in China.

CODES AND STANDARDS

Distributed Wind Power

ICA worked with the China National Standardization Technical Committee of Wind Machinery to complete the first national standard for distributed wind turbines (DWPs), helping to facilitate DWP's importance to China's energy mix. In 2020, 1 gigawatt of DWP was installed, and the new standard will ensure the Chinese government's target of 15 GW by 2025 is met. This increase in DWP will create 65,000 additional tonnes of copper usage annually by 2025.

High-Efficiency Motors

ICA China partnered with the China National Institution of Standardization (CNIS) to formulate a new national standard to improve China's minimum energy performance standard (MEPS) for electric motors from IE2 to IE3. This will potentially bring an increase of copper use of 15 percent or more with each IE3 motor.

In another success on motors in China, large enterprises, including the China National Petroleum Corporation and China Copper, have deployed ICA-developed, high-copper-density "Super Premium Efficiency" IE4 motors.

Heat Pump Water Heater

ICA supported the development of an Air Source Heat Pump (ASHP) dryer standard for agricultural use in China, and successfully expanded heat pump use to this new sector of industrial use. In April 2020, Henan province announced a large-scale "coal to electricity" plan for its agricultural dryer furnaces. From 2020 to 2022, 30,000 ASHPs will replace coal-fired furnaces through investments by the local government, together with state-owned companies. This will result in an additional 7,200 tonnes of copper.

Room Air-Conditioners

ICA supported the standard of Minimum Allowable Values for the energy efficiency grades of Room Air-conditioners (RACs). It is expected this higher-efficiency standard will lead to an energy efficiency improvement of 13 percent, and at the same time increase copper density in each RAC by 10 percent.

Power Cable

ICA's Substitution Defense team successfully influenced the design code for low-voltage electrical installations to keep aluminum alloy cable (AAC) out of this critical market segment. The code is mandatory and will be take effect by the end of June 2021, and copper is recommended as the preferred material. This is a market that is growing, and copper's position in this code will increase usage by 3 percent.

PARTNERSHIPS

New Energy Vehicles (NEVs)

The ICA China team established a partnership with several associations and institutes to strengthen ICA's reputation in China's NEV industry. This includes the China Association of Automobile Manufacturers (CAAM), State Grid Corporation of China, Shanghai Electric Vehicle Public Data Collecting, Monitoring, and Research Center, the Shanghai International Automobile City Group, and Nanjing Aeronautic and Astronautic University and others.

Together with the above partners, ICA published the *Shanghai Big Data Research Report on New Energy Vehicles (Blue Paper)* at the 2020 World Autonomous Vehicle Ecosystem Conference. The content covers policy, driving mode, and charging habits for all types of NEVs sold and running in Shanghai. The report is utilized by the authorities and NEV OEMs, and it showcases ICA as a credible expert in this important space. The report provides ICA with a platform to increase the awareness of copper's reliability and efficiency in NEVs, and aims to support NEV industry decision-making on choice of materials.



Haier



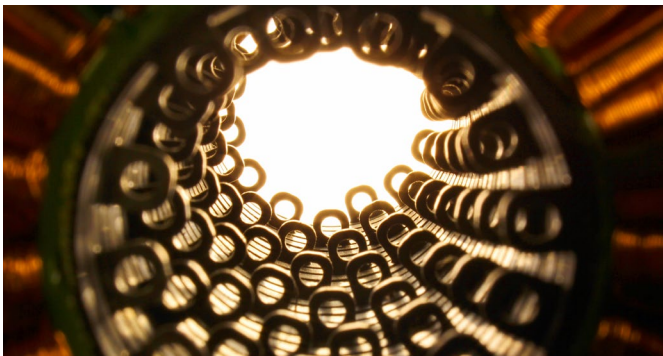
Appliance Defense

ICA expanded its partnerships to 17 home appliance manufacturers and 8 household radiator manufacturers. Notably, Midea and Haier joined the COPPER INSIDE campaign. The advantages of copper have been endorsed by the government in the form of an Energy Efficiency QR code. By the end of 2020, the "CU INSIDE" webpage attracted 69 million clicks from scanning energy efficiency QR codes on product packaging. The associated web content is managed by the China National Institute of Standardization (CNIS), adding a high level of credibility to the program. Partnerships with brands develops diverse platforms to reinforce copper's positive perception and secure copper's market share. To date, there are more than 100 models of home appliances with the CU INSIDE brand.

Building Wire

Expanded membership and partnership with EEO (Electrical Engineer Organization) and APQI (Asia Power Quality Initiative) networks enhances ICA's influence on codes and standards, and efficiently delivers tailored messages to targeted audiences. This has proven to be especially helpful during the pandemic. In 2020, activities and achievements included:

- **15 online training events**, supporting 2,016 engineers
- **First online broadcast** (EEO Star Shows), (169,000 views)
- **179 social media posts** (EEO WeChat Account) (65,939 hits)
- **148 articles uploaded to the EEO Website** (total of nearly 300,000 page views)
- **More than 15,000 followers for EEO WeChat Account** by the end of 2020
- **More than 1,100 new members** in 2020, increasing the total to more than 10,000



Clean Energy Transition

The Clean Energy Transition program achieved significant successes in 2020, across its three program pillars: opportunities in renewables, contribution to energy efficiency, and support to members in addressing the challenges of the energy transition.

In leveraging opportunities in the shift to renewable energy sources, ICA successfully promoted the adoption of new standards in China: in wind turbines, in room air conditioning, and in drying of agricultural produce with heat pumps. In these three cases, copper is referenced as the material of choice for reliable and energy-efficient equipment. Progress was also made for the use of copper in new energy vehicles (NEVs). ICA efforts on the acceleration of the development of e-vehicle charging infrastructure led to the adoption of the "Right to Plug" in the Netherlands (easy permitting of charging stations in multi-family dwellings). 2020 also saw the launch of the HELIOS project, aimed at developing smart and modular battery packs for e-vehicles. This four-year initiative, managed by a consortium including manufacturers, academia and ECI (the European branch of ICA), obtained a 10-million EUR grant from the EU Commission. ICA will actively contribute its expertise in copper-based technological solutions to this project.

In support of the global trend towards higher energy efficiency, ICA facilitated the shift to modern, higher-efficiency electric motors in India, as part of the National Motor Replacement Program. A joint development effort with a Chinese manufacturer led to the production of induction motors equipped with a copper rotor, reaching a "Super Premium" efficiency level (IE4). In addition, ICA was again instrumental in the establishment of a new energy efficiency standard in China for electric motors, increasing performance requirements (from IE2 to IE3) which can be achieved through a higher copper density in such motors.

ICA also continued to **support its members in addressing the challenges linked to the energy transition**. Intensive advocacy efforts led to copper being maintained on the eligibility list of sectors for indirect emissions compensation under the European Emissions Trading System (ETS). Indirect emissions compensation allows for a fair treatment of externalities linked to the carbon footprint of electricity production, an activity beyond the control by copper producers. Having maintained the eligibility of copper for such compensation keeps our industry on equal terms with other electricity-intensive metal sectors. The challenge is not yet fully addressed, as the free allowance in the ETS system is now up for revision in 2021. ICA will maintain its advocacy role in keeping the copper industry treated fairly when it comes to sharing the cost of the energy transition.

Prospects for 2021 are encouraging, as the global trend for cleaner energy sources and a more efficient use of energy maintains its momentum, especially now that China has embarked on its climate-neutrality roadmap towards 2060, and the United States has rejoined the Paris Agreement on Climate Change. Copper has a major role to play in enabling the growing deployment of climate-neutral technologies such as windmills, solar panels, and electric vehicles. Developments of hydrogen as an energy carrier also opens new opportunities, in the use of copper in electrolyzers.

Having maintained the eligibility of copper for such compensation keeps our industry on equal terms with other electricity-intensive metal sectors.

Material Stewardship

IMPROVED GOVERNANCE

For the Material Stewardship (MS) program, 2020 proved to be a productive year despite the pandemic. The MS team adapted to necessary changes in work practices and proceeded with implementation of the ICA 2020 strategy by simplifying and adapting the governance structure to one MS Council, thereby reflecting the global nature of ICA's members. The team reflected on how MS can add value to ICA members within the new structure and developed a set of team values and goals to better serve the ICA membership. Team integration and cross-program collaboration were key objectives for 2020 and will ensure a more-efficient delivery on our value proposition to members.

MATERIAL STEWARDSHIP PROGRAM

Inevitably, in the first half of the year, we saw delays in the announcement or implementation of some government regulations and initiatives in Europe and China. However, during the latter half of 2020, as governments shifted focus from near-term economic relief packages to longer-term goals of "building back better," it became apparent that risks and opportunities related to chemicals management and sustainability remain top priorities for the MS stewardship program. MS Council members and staff therefore continue to focus on continued access to markets and to position copper as a sustainable, responsibly sourced metal, while navigating the unprecedented uncertainty that the pandemic, and its economic impacts, have brought.

The European Union's Green Deal has brought a tremendous impetus for the scaling-up of the green and sustainability agenda, with widespread implications for the copper industry. Ambitious sustainability initiatives are also shared by China and the new Biden administration in the United States. In responding to our medium- to long-term goals and new developments we have:

- Launched a project to better understand the copper industry's contribution to global greenhouse gas (GHG) emissions in collaboration with the Clean Energy Transition Team.
- Initiated an in-depth look at impacts on copper markets and the industry's reputation of potentially negative hazard assessments of copper, i.e., as an active biocidal substance, endocrine disruptor, or classified as environmentally hazardous.
- Initiated updates to our global Life Cycle Inventories (LCI) for copper cathode and semi products (in collaboration with IWCC and CDA U.S.) to enable ICA to provide the best available data for sustainability initiatives globally.
- Completed the first ISO 14040-compliant aggregated cradle-to-gate LCI that evaluates the environmental impacts associated with copper cathode production in China.
- Delivered robust state-of-the-art science to authorities in the EU, U.S. and beyond evaluating the environmental and human health hazard potential of copper.
- Launched **copperghs.org** to support harmonization of copper hazard classifications under the UN's Globally Harmonized System for Classification and Labelling (GHS) and shared with industry groups, regulators, green and healthy product hazard screening method developers, and chemical alternatives assessment practitioners.
- Gathered data on global copper stocks and flows to broaden our understanding of movement of copper products and scrap, and the impacts on global and regional recycling rates
- Shifted focus from resource depletion to environmental dissipation as a more meaningful way to evaluate impacts of resource use of metals via a multi-metal collaborative initiative through the International Council on Mining and Minerals (ICMM).



ICA COMPLETES PIVOTAL RESEARCH ON HEALTH OF WORKERS EMPLOYED IN A COPPER FACILITY

Findings from ICA's research completed in Month 2020 show the health of workers employed at a large copper facility in Europe for over 25 years had no apparent adverse health effects. These findings provide a more comprehensive evaluation of the long-term effects of exposure to copper or copper compounds in the workplace.

This research was developed and executed in collaboration with recognized independent scientific experts from across the EU and USA, in response to the 2014 European Scientific Committee on Occupational Exposure Limits (SCOEL) recommendation for a lower level (OEL) for copper and its inorganic compounds in workplace air (0.1 mg/m³ respirable fraction). ICA's aim was to ensure that the industry could comply with the new proposed OEL in Europe and to reduce uncertainty in the conclusions of the SCOEL report by conducting new, targeted research in the areas of exposure monitoring of copper in workplace dust, toxicology and medical surveillance of workers. These activities fall within the high standard of worker protection and responsible care to which the copper industry adheres.

ICA has shared a summary of the outcomes of this research with the European Commission, and other government agencies globally that are reviewing their workplace standards. ICA is currently working with the study authors to publish the research in peer-reviewed journals.

Team integration and cross-program collaboration were key objectives for 2020 and will ensure a more-efficient delivery on our value proposition to members.

Antimicrobial Copper Pilot Takes Off

When the COVID-19 pandemic struck, researchers at the U.S. National Institutes of Health and the Centers for Disease Control and Prevention reported that the SARS-CoV-2 virus remained viable for up to two to three days on plastic and stainless-steel surfaces as opposed to only four hours on copper. This study created new interest in copper's inherent antimicrobial properties and its ability to continuously kill bacteria and viruses. This renewed focus sparked intense media coverage with more than 750 articles published in the U.S. on copper health benefits in media outlets such as *Business Insider* and *Fast Company*.

The International Copper Association (ICA) quickly identified its responsibility to inform and advocate for copper as a potential tool in mitigating the impact of current and future pandemics, enlisting the U.S. Copper Development Association (CDA) to develop a "pilot program" to deliver science-based information to educate, inform and influence key stakeholders. This pilot focused on:

- **Driving recognition and adoption of antimicrobial touch surfaces** as a contributory solution to slowing community spread of pathogens.
- **Engaging public health and public policymakers** to create and implement regulations that require, recommend or subsidize the use and application of antimicrobial copper (AMC) materials in high-touch surfaces.
- **Creating partnerships** between the copper value chain and essential/vulnerable industries' decision makers to develop and implement antimicrobial solutions.

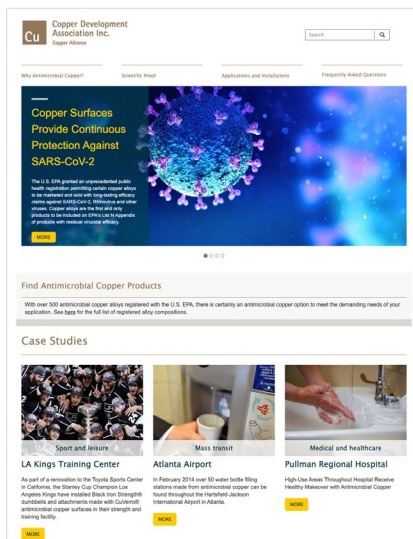
ICA worked to amplify third-party understanding and media exposure on the public health benefits of using copper to elevate the industry's reputation.

ICA also worked to amplify third-party understanding and media exposure on the public health benefits of using copper to elevate the industry's reputation. CDA made research and science readily available online by reconstructing and relaunching the AMC website. On 02 September 2020, the U.S. Environmental Protection Agency (EPA) granted CDA formal permission to include a new "central library of peer-reviewed AMC studies" on the efficacy of copper alloys against viruses including SARS-CoV-2.

TARGETED OUTREACH

The U.S. pilot focused on decision makers, market leaders and thought leaders from public transportation systems and hubs, cruise lines, grocery and essential service retailers, and those influencing such markets. Key engagements included discussions with the NYC Metropolitan Transportation Authority, Bank of America, Estee Lauder, Royal Caribbean and others.

Based on this outreach several studies have been initiated, testing antimicrobial touch surfaces in mass transit applications. In addition, CDA facilitated the collaboration of copper-alloy fabricators with OEMs to manufacture antimicrobial solutions for a major airport expansion and continues to leverage existing science to change market interaction from push-to-pull and product-to-solution.





Several studies have been initiated, testing antimicrobial touch surfaces in mass transit applications.

U.S. REGULATORY DEVELOPMENTS

CDA has assumed a stewardship role with the U.S. EPA, Food and Drug Administration (FDA) and Federal Trade Commission (FTC) by informing them of “misleading or unsubstantiated claims in protecting against COVID-19” in relation to the antimicrobial properties of copper.

The U.S. EPA also encouraged CDA to submit a data package on copper’s antiviral results and agreed to accelerate the pathway to pursue antiviral claims. CDA has pursued claims against seven different viruses, including human coronavirus 229E, norovirus and rhinovirus, plus emergency claims for COVID-19. Final determination is expected in first quarter of 2021.

The EPA is conducting separate SARS-CoV-2 testing of materials that may include copper. In earlier tests led by the EPA on surrogates, copper experienced a 4-5 log reduction of the virus within 30 minutes. Once SARS-CoV-2 testing is completed, the EPA intends to share results with major transit authorities, federal/state public health officials and other stakeholders.

Global Partnerships: Advancements in Africa

Global Partnerships is a cross-cutting strategic program within ICA that provides a three-pronged value proposition:

- **Enhancing copper industry reputation** by making progress to support the UN Sustainable Development Goals
- **Developing or expanding market development programs** that positively impact copper end-use markets
- **Providing a geographic presence in countries underserved** by ICA by its other strategic programs



ICA's flagship program in this space continues to be United For Efficiency (U4E, united4efficiency.org). While the COVID-19 pandemic delayed some implementation activities (especially in-person training of energy efficiency practitioners and policymakers), U4E made strong progress—in particular, in Africa.



In 2020, U4E was awarded its first-ever funding from the Green Climate Fund (GCF) for "Readiness and Preparatory Support" projects in eight African countries. ICA authored the proposals which are focused on converting these markets towards energy-efficient distribution transformers and residential refrigerators. The lead partner is BASE (energy-base.org), a Swiss not-for-profit foundation and a Specialized Partner of the United Nations Environment Program (UNEP). ICA will lead implementation in four countries: Malawi, Namibia, Zambia and Zimbabwe.

In addition to U4E and in spite of the pandemic, two new projects were started by Global Partnerships in 2020. First, recognizing a gap in the energy access space, ICA formed a new partnership: CORE, or the Cornerstone of Rural Electrification. Today there are still more than 900 million people (a vast majority in Africa) without access to clean and affordable energy. As the world moves towards universal access to clean and affordable energy by 2030, CORE supports/improves the livelihood of rural communities by ensuring all decentralized electrification projects meet the highest standards of sustainability.



Through CORE, ICA and its partners will offer technical assistance to support rural electrification projects to ensure these incorporate increased efficiency, safety and reliability of power systems. ICA's lead partner is the Alliance for Rural Electrification (ARE, ruralelec.org), and other partners include UNEP and the UN Industrial Development Organization (UNIDO). Additional partners are expected during 2021.

Today there are still more than 900 million people (a vast majority in Africa) without access to clean and affordable energy.

The second new project is focused on stabilizing electrical grids in Africa. In many countries in Africa, blackouts are common and are even planned in some areas. This is due to the overstress of electrical grids as electrification rates increase and the purchasing power of individuals grows – and, along with it, the number of appliances in use on the continent.

An audit of the policy landscape in Africa showed that only one country (Egypt) of the 54 countries in the African Union have minimum energy performance standards (MEPS) in place for distribution transformers. This policy gap is a critical factor in grid instability in Africa, and ICA is developing a U4E project to address it. Because approximately one-third of electricity transmission and distribution losses take place in **distribution transformers alone**, there is significant potential to save energy, reduce costs and carbon emissions through policy intervention to increase distribution transformer efficiency.

Through the Global Partnerships program, ICA is able to maintain a geographic presence in Africa without the need to develop costly, permanent infrastructures. These projects also provide tangible socio-economic benefits through linkages to multiple UN SDGs.

In recent meetings of the African Union, a high-level agreement was made to harmonize on energy efficiency standards through use of the U4E "Integrated Policy Approach." This political commitment, along with in-house expertise on distribution transformers and the launch of Green Climate Fund projects in the region, provide a strong starting point for increased activity in Africa.



ICA is able to maintain a geographic presence in Africa without the need to develop costly, permanent infrastructures.





As the copper industry looks ahead to the Biden Administration and a Democratic Congress, climate change is no longer "off the table."

Advocacy Becomes Essential in the United States

The convergence of the global pandemic with a change in U.S. Administration makes public advocacy and education on the essentiality of copper a necessity. In the United States, ICA's strategic partner, the Copper Development Association (CDA), worked throughout 2020 to help copper production and fabrication survive COVID-19-mandated shutdowns and to position copper for a new political reality in 2021.

In March 2020, as the pandemic began to shut down large swaths of the U.S. economy, CDA began to discuss how a variety of industries, including manufacturing and transportation, depend on copper. CDA also developed resources speaking to copper's impact on 40,000 jobs at the Federal, state and local levels. An important part of the COVID-19 messaging was how medical facilities and frontline healthcare workers depend on copper for critical equipment and functions throughout the hospital and medical supply chains, as well as sharing the U.S. National Institute of Health study on the ability of copper to kill the SARS-CoV-2 virus.

The message of copper's essentiality also rang true in ICA's global reputation-building efforts. CDA worked alongside ICA to share positive messages and images on copper's essentiality. Copper has an important role to play in addressing issues critical to society, such as contributions to food supply, infrastructure, CO₂ reduction and sustainable development. In late 2020, a media campaign featuring "essentiality" messaging and graphics was shared across social channels. The digital ads communicated that copper remains a key component for important industries, resilient

infrastructure and supply chains, and is needed for the transition to clean energy and a sustainable economy. The infographics proved to be a huge success on both CDA's and ICA's social media accounts as well as with members of both organizations.

As the copper industry looks ahead to the Biden Administration and a Democratic Congress, climate change is no longer "off the table." The transition to clean energy, electric vehicles (EV) and carbon-neutral goals is already underway in political discussions. An infrastructure bill with EV charging stations and lead service line replacement as key priorities will be debated in Q2. While these developments are largely positive for copper, lawmakers and regulators need to know that minerals like copper remain essential.

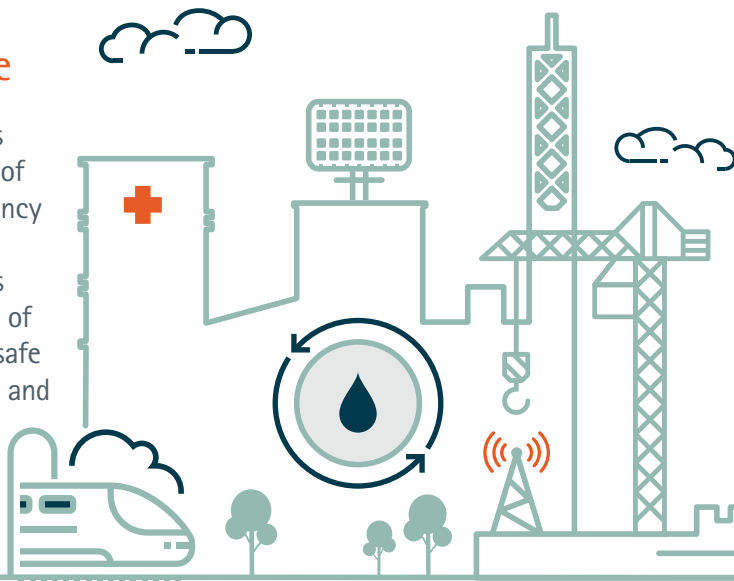
To that end, in 2021 CDA plans to investigate opportunities related to the Energy Policy Act of 2020. The legislation, which CDA actively supported throughout the last Congress, provides an option for copper to be officially added to the "Critical Minerals" list in the U.S. This list contains mineral commodities designated as vital to U.S. economic and national security. The Critical Mineral list aims to undertake legislative and regulatory positions supporting the discovery, production and expanded use of those minerals.

Regardless of party, ICA and CDA will continue to advocate and educate Congress, the Biden Administration, policymakers, NGOs and others on how essential copper is to the world today, and the clean energy future of tomorrow.

COPPER: ESSENTIAL FOR OUR FUTURE

Infrastructure

Infrastructure relies on copper because of its reliability, efficiency and performance. Copper's properties are vital for a range of activities including safe energy transmission and efficient transport.



- RAILWAYS
- ELECTRICAL GRIDS (production and delivery of energy and energy storage)
- TELECOMMUNICATIONS (data centers, networks, cell towers)
- WATER SUPPLY
- HEALTHCARE
- CONSTRUCTION

Technology

Critical minerals, like copper, keep us connected to each other and working more efficiently.

- SMART PHONES
- COMPUTERS and LAPTOPS
- ARTIFICIAL INTELLIGENCE (smart buildings - heating and cooling systems)
- RENEWABLE ENERGY GENERATION (solar panels and wind turbines)



[VIEW THE FULL INFOGRAPHIC HERE.](#)



Market Intelligence and Outreach

ICA is a trusted and vital provider of copper end-use intelligence among market commentators including analysts and journalists in all relevant fields from financial services to mining. Study topics commissioned and conducted by ICA are developed through robust processes focusing on trending issues important to the market and, in 2020, the broad emphasis was on the clean energy transition.

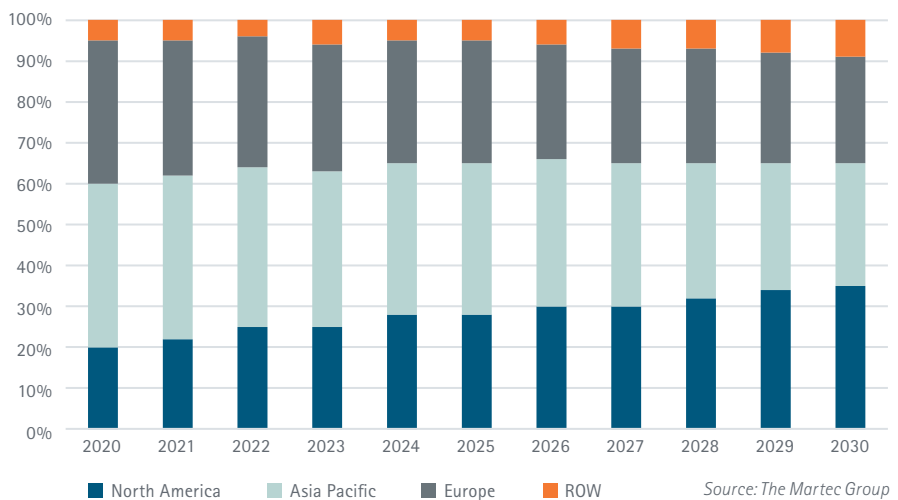
The biggest challenge in 2020 was not the market intelligence work itself, but how to disseminate the work in the face of the global pandemic. The answer was to move events online. ICA was the first organization to launch a new series of copper-focused webinars partnering with both CRU Group and FastMarkets conference organizers. The ICA webinars attracted participants from a wide range of countries and sectors. The webinar format has proven to be highly efficient and effective at reaching a very broad and diverse audience.

SMART CITIES

A global study, conducted by the Martec Group and commissioned by ICA, found that copper is the material of choice for smart city technology thanks to its unique conductive properties which lead to enhanced efficiency and sustainability. Copper demand is forecast to almost double cumulatively over the next seven years as cities around the world implement smart technologies.

ESTIMATED REGIONAL BREAKDOWN

Smart City Copper Demand by Region | 2020-2030



As of now, Asia and Europe lead in smart city development, and thus, copper demand from smart cities.

Over the coming 10 years, experts believe that North America will likely steal share from the other regions and become the leader in smart city technology implementation, and thus copper demand for smart city applications.

TYPES OF SMART CITIES

Essential Services

- Use mobile networks in emergency management programs and digital healthcare services; focus on communication infrastructure (and 5G)
- Examples include Tokyo and Copenhagen

Smart Transportation

- Emphasize initiatives to control urban congestion through smart public transportation, car sharing, smart parking, and self driving cars
- Examples include Singapore and Dubai

Broad Spectrum

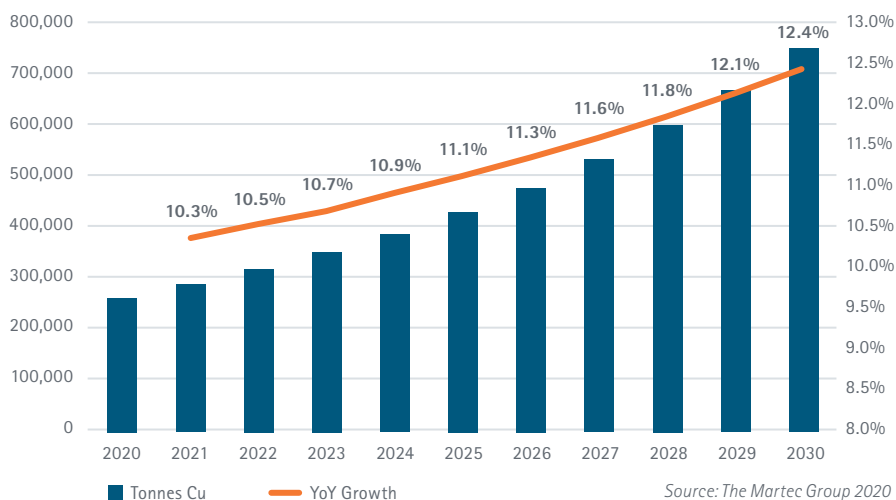
- Emphasize urban services such as water, sewage, waste, and pollution control; high civic participation
- Examples include Barcelona, Beijing, and Vancouver

Business Ecosystem

- Use information and communication technologies to jumpstart economic activity
- Examples include Amsterdam, Edinburgh, and Cape Town

ANNUAL COPPER DEMAND FROM SMART CITIES

Annual Copper Demand from Smart City Technologies (tonnes) | 2020-2030



Martec conservatively expects copper demand to grow from 250k tonnes in 2020 to 750k tonnes in 2030.

Figures are on an annual basis, not a cumulative sum.

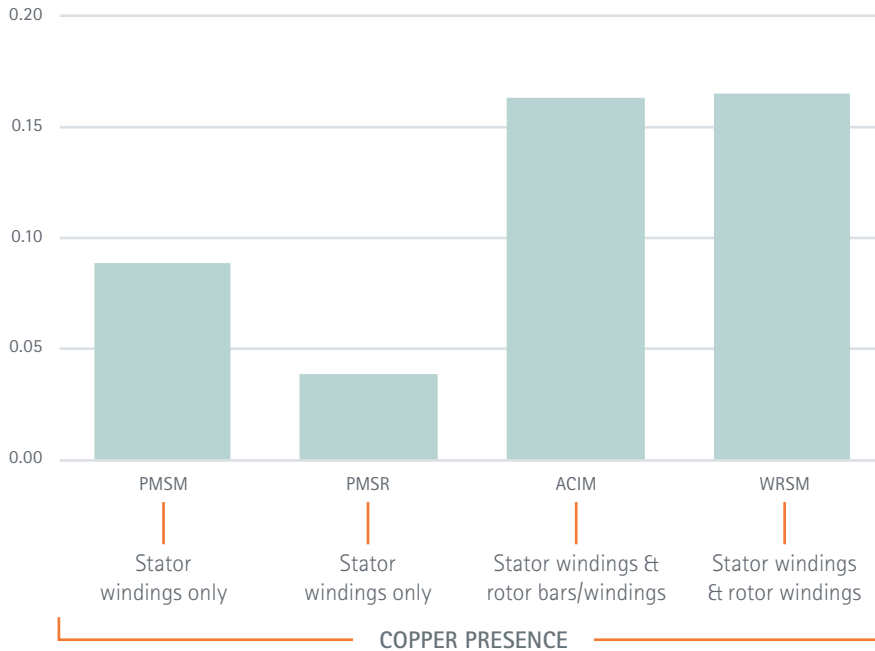
Annual growth stretches from ~10 percent to ~12 percent in the next 10 years.

EV MOTORS

Over the next decade, the widespread adoption of electric traction motors in on-road vehicles will yield a significant increase in copper demand, according to new findings by IDTechEx. The global research found that by 2030 more than 250,000 tonnes per annum of copper will be used within the windings of electric traction motors of on-road electric vehicles.

COPPER CONTENT IN MOTOR TYPES

Average Cu kg per kW in selected electric traction motors for commercialized cars



ACIM and WRSM have greater copper intensity due to copper presence in both stator and rotor.

As a result, any shift away from ACIM and WRSM could lower overall copper demand.

Notes: PMSM averages historic data from models dating back to 2004, including HEV and BEV models. PMSR electric traction motors are newer to the market and are based on Cu kg estimates from the Model 3 released in 2017. Source: IDTechEx 2020

AUTOMAKERS' MOTOR CHOICES

Electric Traction Motors

PMSM



ACIM



Model 3, possible inclusion in future versions of Model S, Model X

PMSR



E-tron



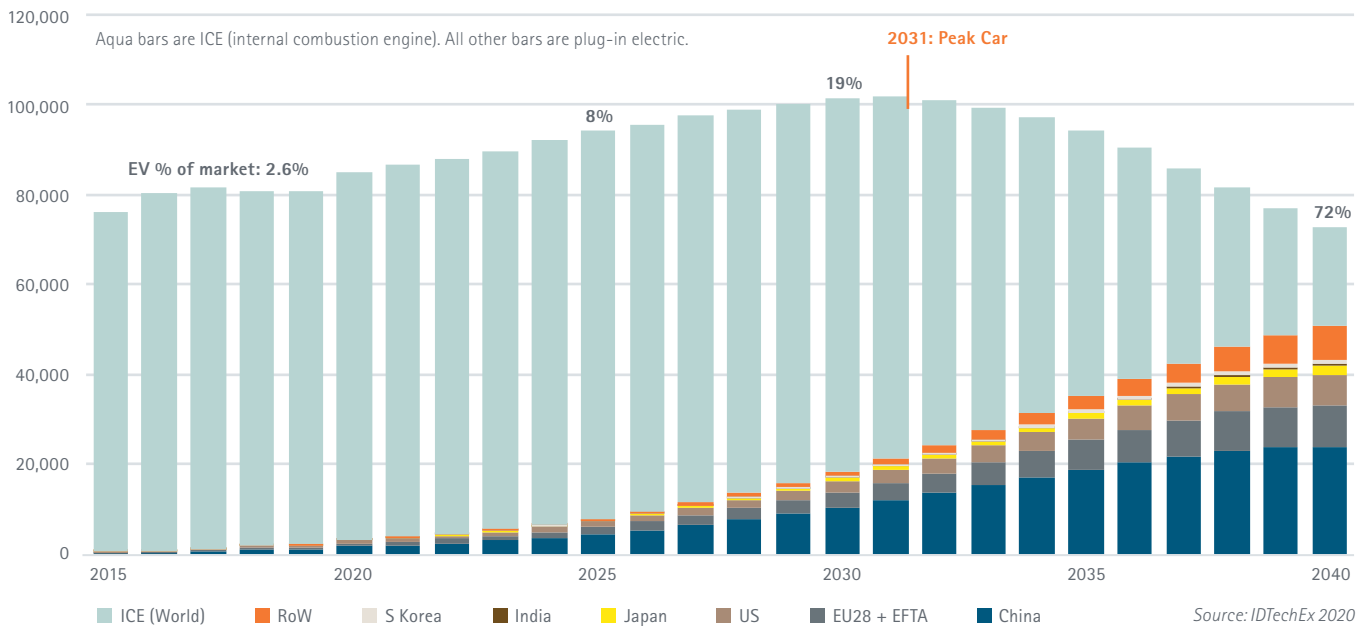
Model S, Model X, Dual motor Model 3

WRSM

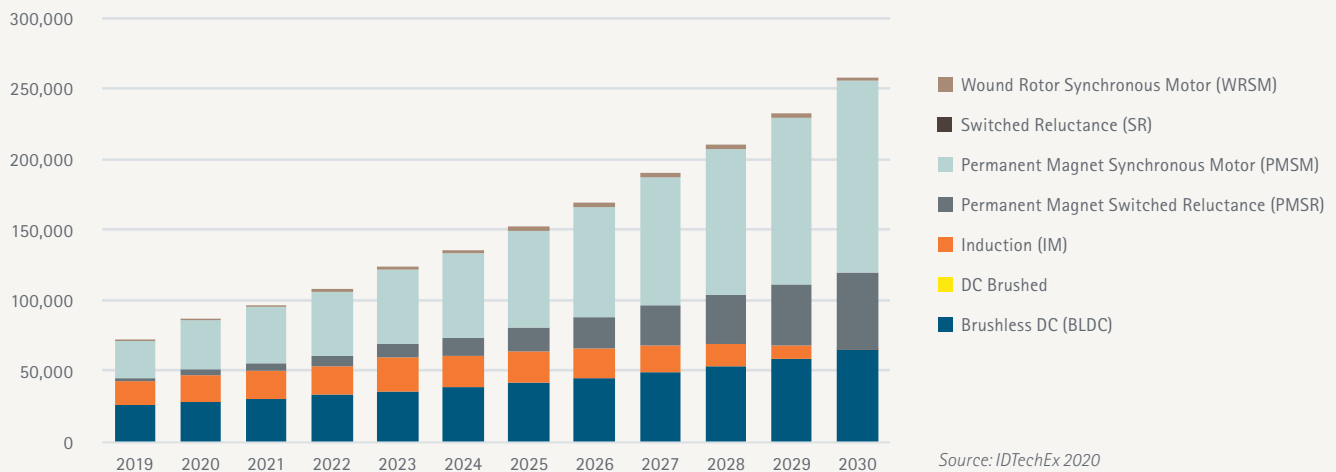


THE GLOBAL RACE FOR ELECTRIC CARS AMID PEAK CAR

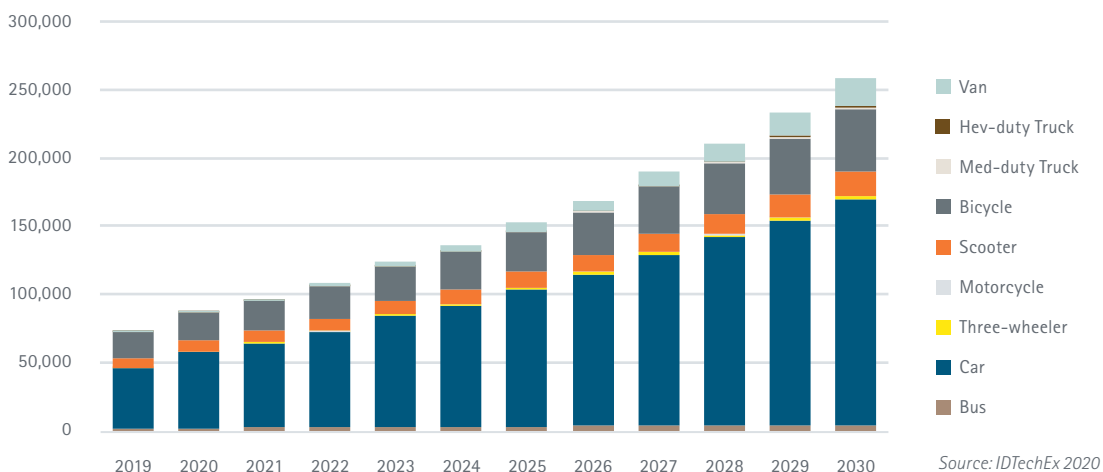
Plug-in electric cars extract value from a declining car market (cars, thousands)



COPPER DEMAND BY ELECTRIC TRACTION MOTOR TYPE IN ON-ROAD ELECTRIC VEHICLES (TPA)



COPPER DEMAND FROM ELECTRIC TRACTION MOTORS FOR ON-ROAD ELECTRIC VEHICLES (TPA)



CLIMATE-BASED RETROFITTING

As the global climate continues to change and we experience more extreme weather, demand for climate-based retrofitting such as air conditioning (AC) installation, heating/heat pumps, and renewable energy systems is set to rise. This will drive demand for copper, according to new research conducted by the Building Services Research and Information Association (BSRIA). One of the many benefits of copper is its ability to facilitate the efficient delivery of electricity and cooling. Therefore, copper remains the preferred material for heat exchangers, wiring and motors, essential components for climate retrofitting.

COMMERCIAL BUILDING RETROFIT

Resilience vs. carbon reduction

RESILIENCE

Uninterrupted Power Supply	Minimized Downtime
Flood Resistance	Fire and Environmental Hazard Monitoring
Employee Safety and Comfort	Building Envelope
Supply Chain Continuity	

CARBON REDUCTION

Green Energy and Cogeneration	Free Cooling
HVAC Efficiency	Measure Carbon Footprint
Lighting Efficiency	From Gas to Electricity
Building Envelope	

GREEN REGULATION

← MANDATORY

VOLUNTARY →

BUILDING CODES
and other mandatory regulations



Prescriptive or outcome based



National policies; local regulation



Require enforcement capability

BUILDING STANDARDS
such as ASHRAE (USA), Eurocodes (EU)
and other country-based rules



Set of norms or guidelines



National or international



Not mandatory if not in codes

CERTIFICATIONS
such as LEED (US Green Building Council), Green Star (Australia), CASBEE (Germany), BREEAM (UK BRE)



Third party confirmation
compliance/excellence



Marketing tool

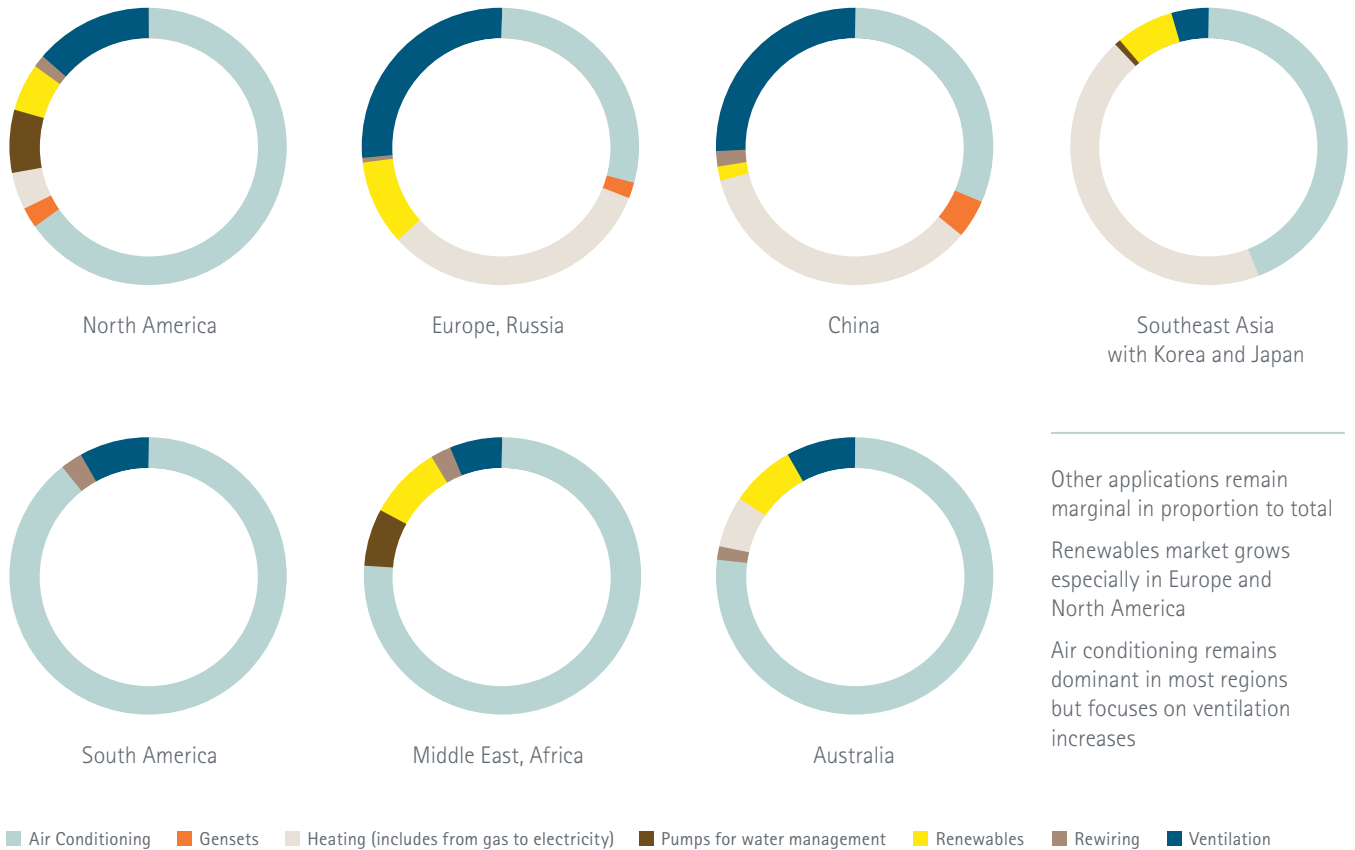


International



COPPER AND CLIMATE RETROFIT BY REGION/EQUIPMENT

Copper demand from climate related commercial retrofit by region and equipment in 2035



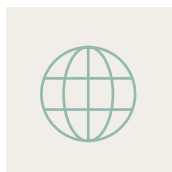
SUMMARY



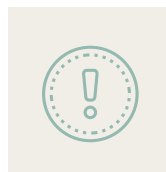
Global demand for copper in climate related commercial retrofit will **grow from 40KT in 2020 to 160KT by 2035** (9.9 percent CAGR)



By application, **AC (75KT Cu in 2035)** and **Heating/Heat Pumps (35KT Cu in 2035)** will provide the highest contribution. Renewables will have the highest CAGR (19.7 percent)



In terms of regions, the EU with Turkey and Russia will be the biggest contributor to demand (**62KT Cu in 2035**). The highest CAGR for the period will be in **North America (11.4 percent)**

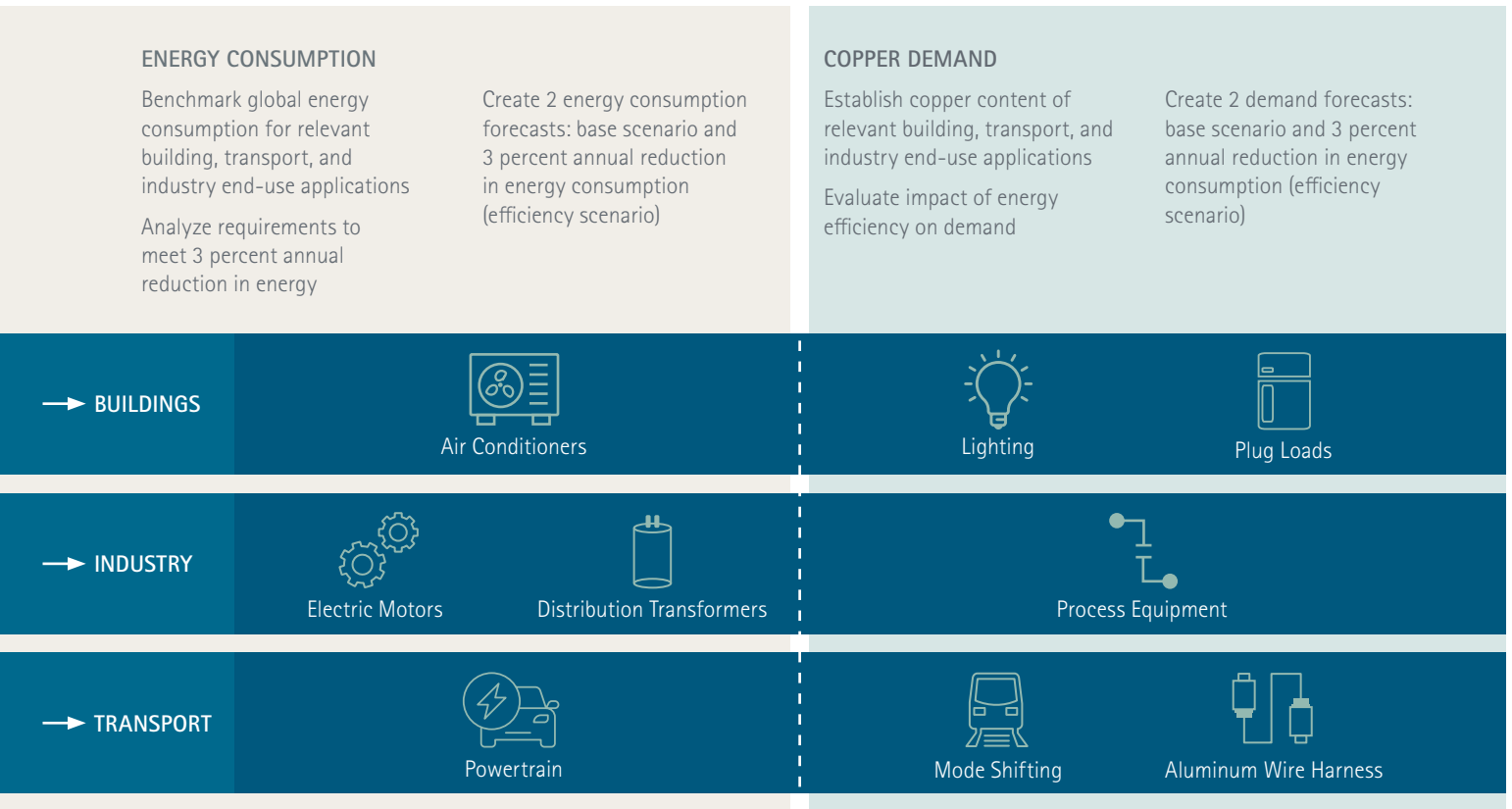


Factors affecting market growth will be **availability of resources** for resilience and carbon reduction policies, **regulation, income growth** in developing countries, **retrofit vs. new construction** approach

ENERGY EFFICIENCY

According to the International Energy Agency, energy efficiency has the greatest share of actions (more than 40 percent) required to meet the goals of the Paris Climate Change Agreement—more than either renewables or electrified mobility. This will require a global rate of improvement in energy efficiency of three percent each year, and it is under these auspices that the Three Percent Club was formed. ICA is proud to be a founding member of the Three Percent Club, which works with governments and large companies to help them to vastly improve their energy efficiency commitments in the context of achieving climate change goals.

Under a scenario where global energy consumption reduces by three-percent annually through energy efficiency improvements, copper demand would experience a cumulative increase of around 18 million tonnes over 10 years against a base level, according to a study by Navigant/Guidehouse Research. Based on the activity of the Three Percent Club, the new research found copper demand would grow in six technology groups across transport, buildings and industry sectors.

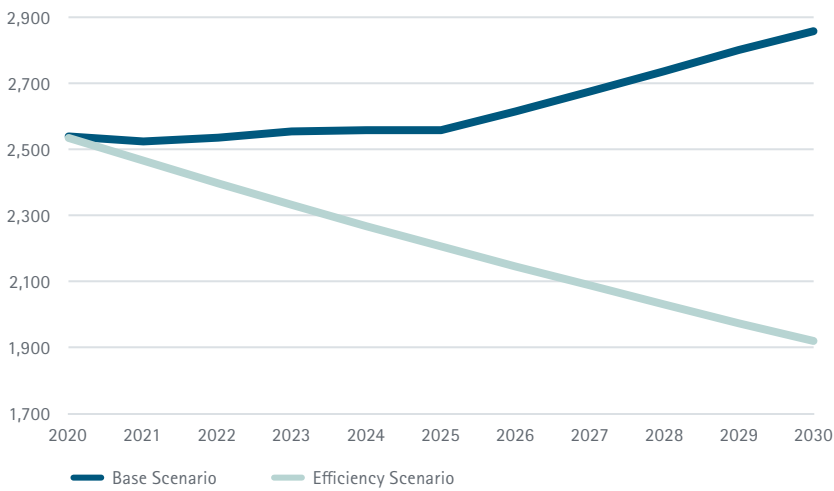


Goal: To understand the impact on copper demand through an annual increase in energy efficiency, of three percent, in buildings, industry, and transport.

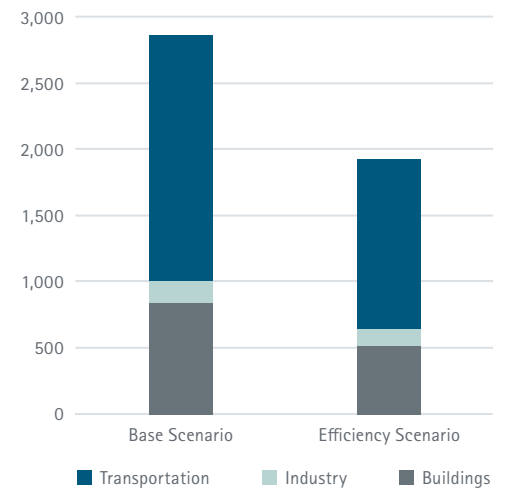


ENERGY CONSUMPTION FROM SHIPMENTS

By Scenario, World Markets (TWh) | 2020-2030



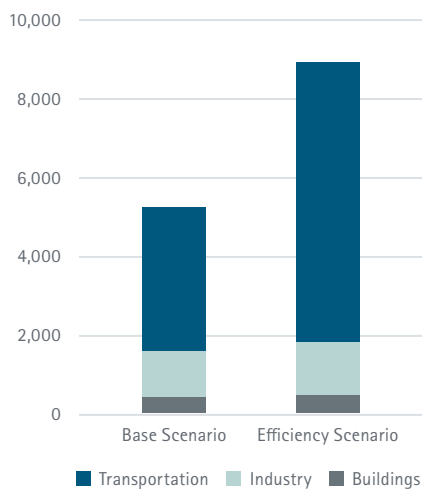
By Segment & Scenario, World Markets (TWh) | 2030



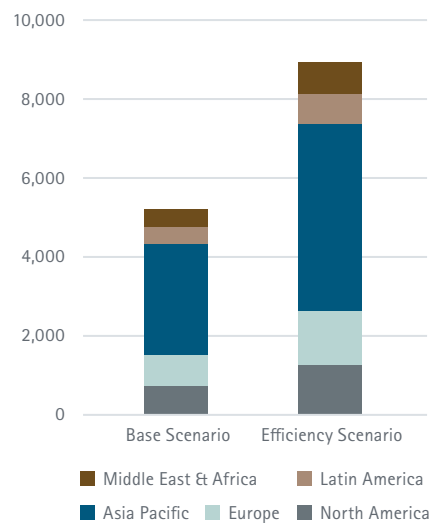
Under the base scenario we expect energy consumption to grow 13 percent between 2020 and 2030. In the efficiency scenario, energy consumption declines 24 percent between 2020 and 2030.

BASE & EFFICIENCY SCENARIOS

Demand by Segment & Scenario, World Markets (TWh) | 2030



Demand by Region & Scenario, World Markets (TWh) | 2030

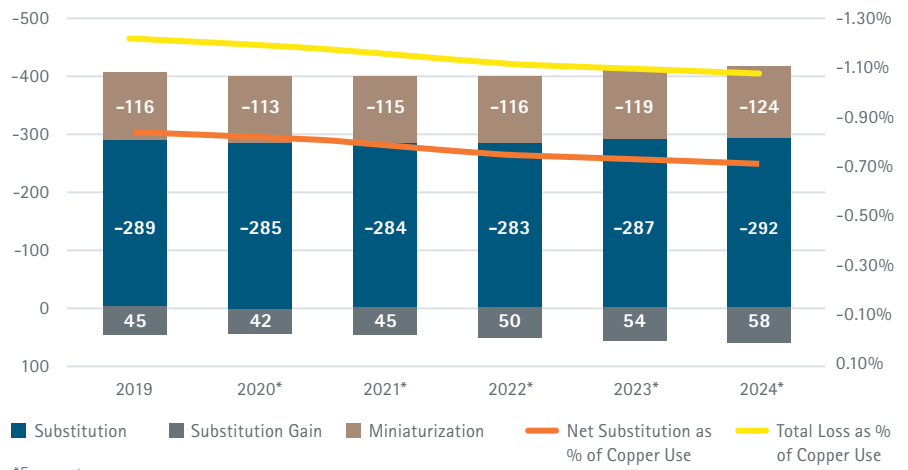


SUBSTITUTION

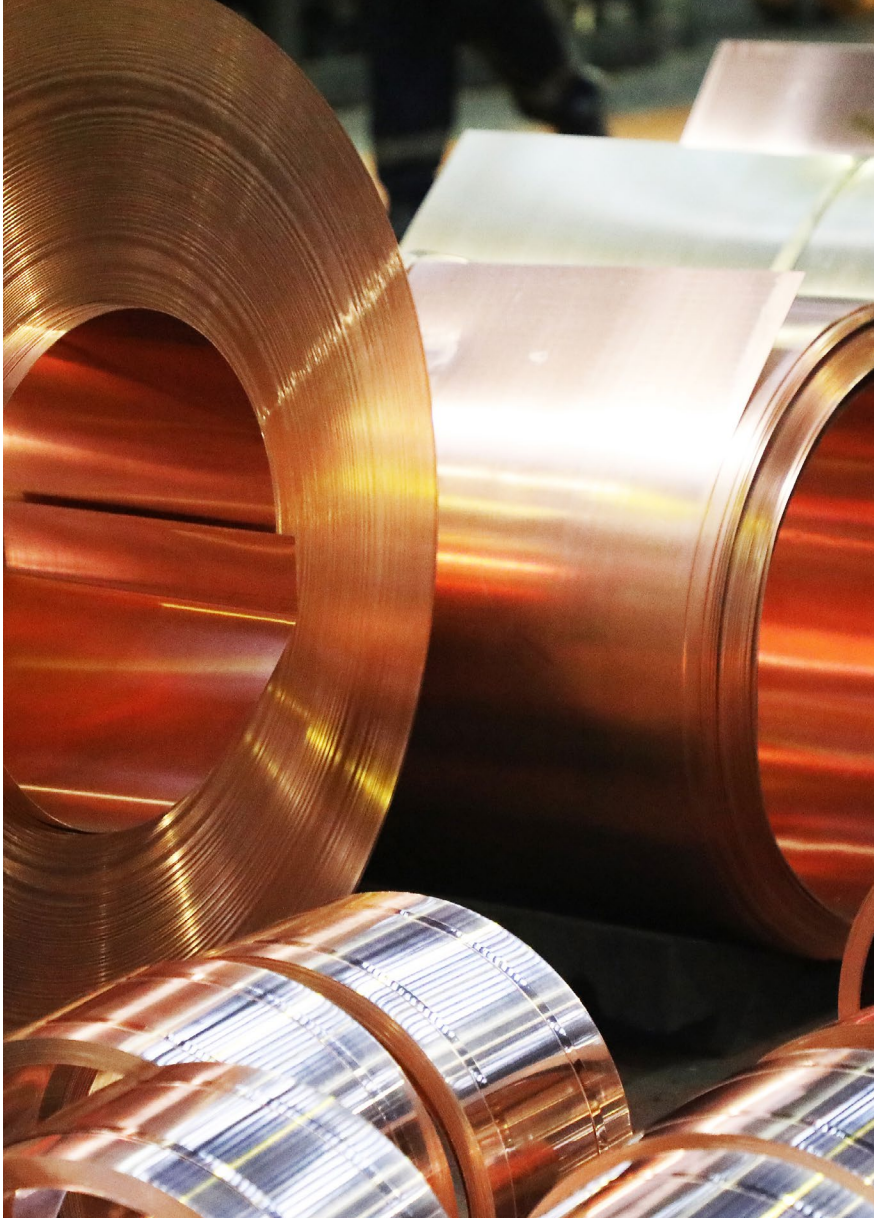
New trends supporting the usage of copper have resulted in substitution remaining low. In 2019, net substitution stood at 0.83 percent and losses due to miniaturization at 1.23 percent of total copper use. Critical applications rely on copper and its alloys for performance, making it difficult for alternative materials to replace copper. The 2020 annual substitution survey, conducted by the DMM Advisory Group, finds that China, the largest market for demand, has the lowest relative net substitution across the world at 0.5 percent of total copper use. China's reliance on copper is due to prudent procurement policies and regional product specifications. Conversely, in Latin America, where net substitution is the highest, manufacturers have experienced increased pressure to reduce costs.

COPPER SUBSTITUTION & MINIATURIZATION

In kt and % of Copper Use | 2019-2024



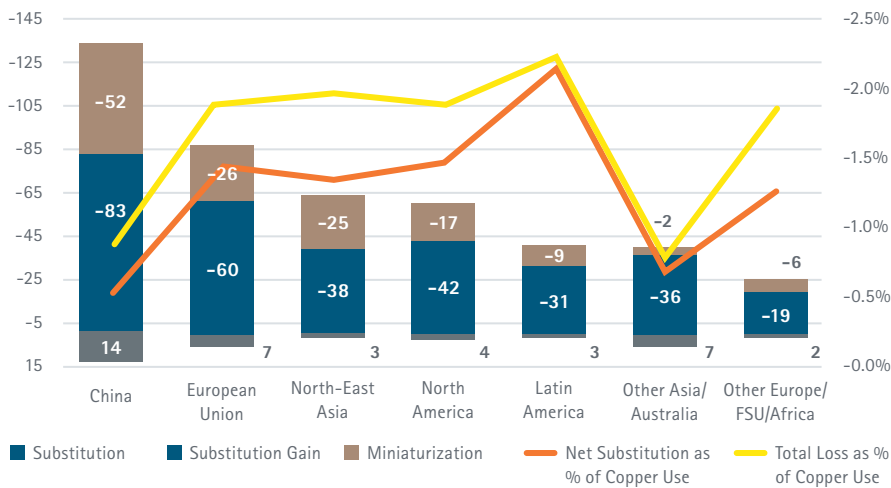
China, the largest market for demand, has the lowest relative net substitution across the world at 0.5 percent of total copper use.



Critical applications rely on copper and its alloys for performance, making it difficult for alternative materials to replace copper.

SUBSTITUTION & MINIATURIZATION BY GEOGRAPHIC REGIONS

In kt and % of Copper Use | 2019





International Copper Association

Copper Alliance

799 9th Street, NW, Suite 1000
Washington, D.C. 20001
Phone: +1 (202) 974-5600
info@copperalliance.org

copperalliance.org
sustainablecopper.org

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