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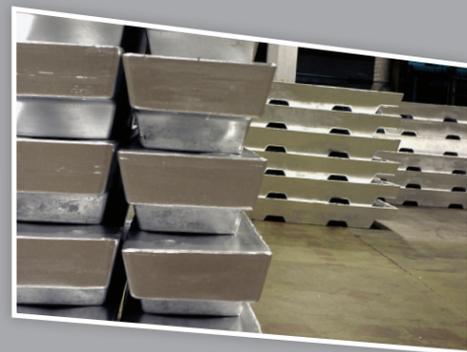
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Making a Difference

International Zinc Association
20 Years of Service to the World Zinc Industry



www.zinc.org



The International Zinc Association (IZA) was created in 1991 by a group of leading zinc producers and is guided by the principle of actions that positively influence the image and markets for zinc.

The Association's primary goal is to deliver value to its Members through innovative programs in its strategic focus areas of Environment and Sustainable Development, Technology and Market Development and Communications.

IZA provides a forum for zinc-industry executives to analyze and anticipate issues affecting zinc globally and to ensure a timely and appropriate response.

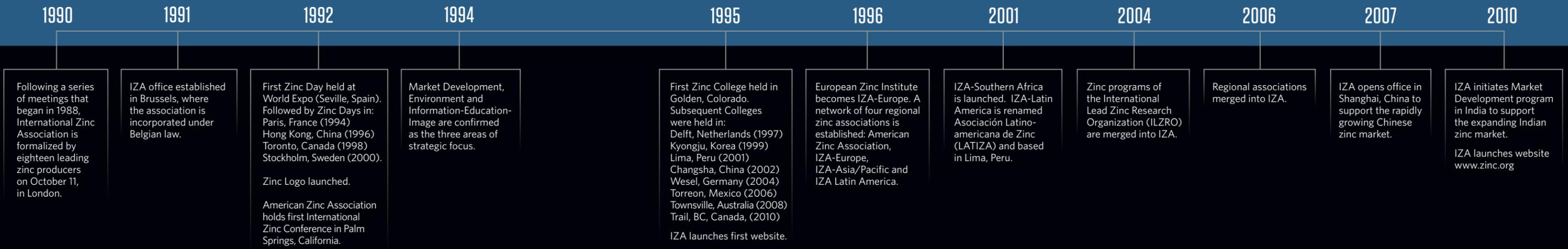
Using its leadership role in the world zinc industry, IZA cost effectively coordinates initiatives good for zinc—undertaken either directly or through involvement and support of customer groups and related stakeholders on the local, regional and global levels.

This publication describes IZA's remarkable journey over the last twenty years, its key achievements and the new issues—barely visible 20 years ago—that will shape its future.

Throughout its history, IZA has remained true to its strategy of working to enhance zinc's image, markets and contribution to sustainable development.

IZA Mission

IZA's mission is to support and advance zinc products and markets through research, development, technology transfer and communication of the unique attributes that make zinc sustainable and "essential for life".





IZA's market development program for continuously galvanized steel sheet is largely in partnership with the steel industry. Its focus has been on protecting and developing its use in automobiles and construction (roofing, facades and steel framing).

Work aimed at the automotive market is being directed by IZA's Galvanized Autobody Partnership (GAP). Light-weight high-strength steel has become the norm in automotive body-in-white applications. Galvanized automotive ap-

plications represent the cutting edge of zinc coating technology and the GAP program is addressing the processing and performance issues required to ensure these new steels can be galvanized with a view to protecting this important market.

Within the construction sector, IZA focuses mainly on galvanized product in light steel structures. Significant work has been done and is ongoing to develop long-term corrosion durability testing, including atmospheric mapping of

regions to enable prediction of product performance. IZA also partnered with the steel industry to educate and develop residential steel framing builder availability and competence, and develop and disseminate zinc-coated steel sheet information through venues such as the GalvInfo Center.

Significant effort is also directed towards providing marketing support and technology transfer to regions currently showing low intensity of use.

Continuous Galvanizing

1995

First three-year phase of the Galvanized Autobody Partnership (GAP) is launched. Involves 26 steel companies, four equipment suppliers, two auto companies and twelve zinc producers. Goal is to ensure new steels being developed for auto industry can be galvanized.

GAP has been so successful in addressing auto industry needs for galvanized high strength steels that it is on its sixth three-year cycle, making it one of IZA's most successful and longest running programs. GAP remains funded at over 75% from the Steel and Automotive industries.

Virtually every major automaker now utilizes advanced steels galvanized with technology developed through the GAP program. More importantly, steel has positioned itself as the material of choice for body-in-white applications for the foreseeable future.

1996

World Continuous Galvanizing Committee is formed to oversee development of IZA continuous galvanizing market development efforts.

IZA sponsors formation of the Light Gauge Steel Engineers Association to provide technical support needed to capture and maintain a significant share of the construction market for light gauge steel.

1998

IZA commissions study on the Durability of Galvanized Steel Framing in Residential Buildings. The study, carried out by the NAHB Research Center, measured actual zinc and zinc-alloy coating corrosion rates of steel-framing samples in four different home environments in the US and Canada over a ten-year period.

Survey formed the beginning of a productive market development program with the steel industry's Living Steel effort to grow the light gauge steel construction market.

The Durability Study published in 2011 reported minimal corrosion at all four sites.

1999

The GalvInfo Center is created in North America to provide end users and designer/specifiers of zinc-coated sheet steel a dedicated resource for information on the manufacturing, performance, design and use of the product. 60% of GalvInfo's funding comes from North American steel companies and suppliers.

The Center conducts an annual Hot-Dip Galvanized Sheet Production course in the U.S. and elements of the course have been given in China, Brazil, Mexico, Turkey and India. The GalvInfo knowledge base has also been disseminated globally.

2011

Pilot testing begins on a new in-line galvanized rebar process in China. Early results indicate this continuous process could significantly reduce the costs and open new opportunities for expanding markets for galvanized rebar.

Steel Framing Alliance releases IZA-sponsored Life Cycle Analysis of Residential Steel Framing.



In general galvanizing, IZA has identified the building and construction, automotive underbody and the street and outdoor furniture sectors as offering the greatest growth opportunities. IZA works closely with regional galvanizing associations worldwide.

IZA supports targeted market development programs looking at specific markets such as galvanized steel poles as a replacement to wood or concrete electric transmission lines or the use of galvanized rebar in bridge decks.

In developing countries, technology transfer is a major area of focus.

Regional surveys indicate that where there is an awareness of general galvanizing, restraints to growth are often quality standards, service and price. As a result, IZA's regional general galvanizing initiatives have focused upon promoting and educating key decision makers about zinc's advantages in corrosion protection and other applications. To ensure long-term sustainability of these markets, this education also involves

training a local supplier base on modern and efficient galvanizing.

Since initial markets occur in infrastructure development such as railway, bridges and pipelines and support poles, this is typically where the outreach begins.

As with all IZA market development efforts, these programs are tailored to raise per capita consumption of zinc to developed world values.

General Galvanizing

1995

Galvanized Underbody Parts for Cars Program—Galvauto—launched. Objective is to increase use of galvanized parts in underbody components like engine cradles, suspension arms, sway bars, steering components, spring mountings and rear axle beams.

In 1999, Galvauto achieves breakthrough when researchers successfully develop coating that met the stringent requirements set for the program. A patent was granted in 2001 and work continued to further refine the coating and process.

International seminar on galvanizing underbody parts is held in Germany in 2002.

1996

World General Galvanizing Committee is formed to oversee development of IZA general galvanizing market development efforts.

IZA joins IZA-Europe and the European General Galvanizers Association in a series of market studies which lead to publication of the Fact Files, and improved the marketing efforts of galvanizers across Europe.

1998

IZA sponsors Steel CEO Survey, sparking a series of cooperative projects with steel industry organizations, notably a project with AISI to promote galvanized steel utility poles. U.S. seminars on the topic greatly increased demand in this sector and were adapted to Southern Africa and other regions, illustrating the benefits of transferring programs across the IZA regions.

This ongoing dialog with the steel industry is beneficial in other ways as IZA begins to address the subjects of steel recycling and zinc EAF dust to find sustainable solutions to these issues.

2001

IZA launches new interactive performance predictor for galvanized steel. The web-based program allows users to predict the performance of a galvanized coating based on key environmental variables and covers 44 countries, 710 cities and 3,000 sets of data.

The corrosion predictor complements the Life Cycle Cost Calculator and other comparative models developed by the American Galvanizers Association under IZA sponsorship.

2004

IZA launches market development program on Galvanized Rebar based on past research funded by the zinc industry and Common Fund for Commodities (CFC). Rebar workshops are held in Brazil, Cuba, Guatemala, Singapore, Taiwan, the United Arab Emirates, the United States, Mexico and elsewhere.

IZA sponsors Stephen Yeomans' book: Galvanized Steel Reinforcement in Concrete and launches the website www.galvanizedrebar.com.

2005

With CFC support, IZA launches the program: "Transfer of Technology and Promotion of Demand—Hot Dip Galvanizing in China." This entailed developing an audit and interactive training tool to bring Chinese galvanizers who participated in the program up to modern galvanizing standards.

IZA's Plant Upliftment Project is training other Chinese galvanizers on best practices. In 2011 IZA extended the program to India, Latin America and other regions.

2010 - 2011

IZA's market development program in China resulted in galvanized steel inspection standards being developed in partnership with the Ministry of Railways, and all new catenary rail systems in China will be galvanized. A similar target was set for freight lines. Beijing is investing US \$1 trillion in stimulus funding for infrastructure development. The estimated market for these new rail systems is one million tonnes of zinc. Additionally, all street furniture purchased through the stimulus package must also be galvanized—a market of 0.5m tonnes of zinc per year.

South Africa hosted the FIFA World Cup in 2010. IZA Southern Africa got involved early on and worked with local galvanizers, architects and developers to incorporate galvanized steel into the stadium specifications. The result of this effort is that nearly 40% of the overall steel structures were galvanized. A similar program is underway for the World Cup 2014 and the Summer Olympics 2016 in Brazil.



The comments that emerge from the market and perception surveys for the zinc die casting industry worldwide are that there are essentially two stages of development. The first represents that of the developing world (including the Far East) where the major focus is on price and where market feedback consistently identifies variable product quality as a major concern within the zinc die casting industry.

The second stage, seen in the developed world, has the industry countering the

threat from alternative materials such as engineering plastics and aluminum by either adopting new technologies (thin wall castings, high fluidity or creep resistant alloys) or the development of new markets (such as automotive under-hood components).

IZA's market development program for die castings addresses both scenarios. The first through increasing the awareness of zinc casting alloys at the designer, specifier and engineering levels. This entails developing and

disseminating essential user property data, including mechanical and finish properties and educating design and engineering students about zinc castings and their capabilities.

The second area involves the development of new alloys with improved properties to open new applications to zinc casting alloys.

Die Casting

1993-1994

A Pera Consulting Market Research Study reveals the new generation of component designers are largely ignorant of the versatility, strength and economics of zinc. IZA responds by sponsoring market development efforts in North America (Interzinc) and laying the ground work for future design centers in Europe.

The study also highlighted shortcomings of zinc die castings in terms of weight and their inability to operate in high temperature environments. This in turn led to new research projects to develop new high fluidity and creep resistant zinc alloys.

1996

World Die Casting Committee formed to oversee development of IZA die casting market development efforts.

1997

IZA releases interactive die casting training and process tutorials in the form of ZincCast—a training tool for die casting operators and DeZign—an internet-based design guide and database on zinc alloys for specifiers and designers.

1998

IZA begins establishing a network of technical support centers involving machine manufacturers, high schools, universities, die casters' associations and alloyers. Overall, six Die Casting Centers of Excellence are set up in Spain, Portugal, France, Germany, the UK and Italy.

1999-2003

US Department of Energy funds research to develop a creep resistant alloy. Two new alloys show promise. Development continued to further optimize these alloys leading to the 2009 commercialization by Eastern Alloys of the EZAC™ alloy. EZAC™ has 300% greater creep resistance (than the next closest zinc alloy, ACuZinc), opening a sizable new market to zinc in the automotive under-hood and other high-temperature applications.

2004

Finishing Specifiers Guide published based on IZA-sponsored work by Corrosion and Materials Research Institute which evaluated modern protective and decorative finishes commonly used on zinc die castings. A comparison of the performance of different finishes used to protect and provide an aesthetic finish to zinc die castings is provided. An update to this publication, which includes performance characteristics of several new environmentally favorable finishes, was released in 2011.

2006-2007

The North American Die Casting Association joins with IZA in sponsoring a new high fluidity (HF) alloy. The HF alloy can be used to cast parts with thicknesses as thin as 0.3 mm, including ultra-thin wall electronic parts and complex shapes which are difficult or impossible to fill with other metallic alloys. The market impact of this alloy is that zinc can now compete favorably in terms of cost and weight with aluminum and magnesium alloys, while retaining zinc's superior finishing properties.

2008

International Zinc Die Casting Conference held in Nanhai, Foshan City, Guangdong Province, P.R. China.

IZA organizes a zinc die casting conference in Barcelona, and follows up two years later with a conference in Vienna.

www.zinc-diecasting.info is launched featuring a zinc die casting engineering database, case studies, and various zinc die casting publications.

2010-2011

IZA highlights the new Creep Resistant and High Fluidity Alloys during an INTERZINC session at the SAE 2011 International World Congress.

The new alloys were also highlighted at the 2011 Zinc Die Casting Development Conference in Chongqing, the epicenter for automotive manufacturing in China.



IZA's market development program for zinc energy storage is mainly an awareness effort in support of individual zinc battery and zinc fuel cell companies working on electric vehicle (EVs) and large-scale energy storage projects.

Primary zinc-carbon and alkaline batteries compete well in the standard AAA, AA, C and D-size consumer battery market. Similarly, button cell Zinc/Air and Zinc/Silver batteries are

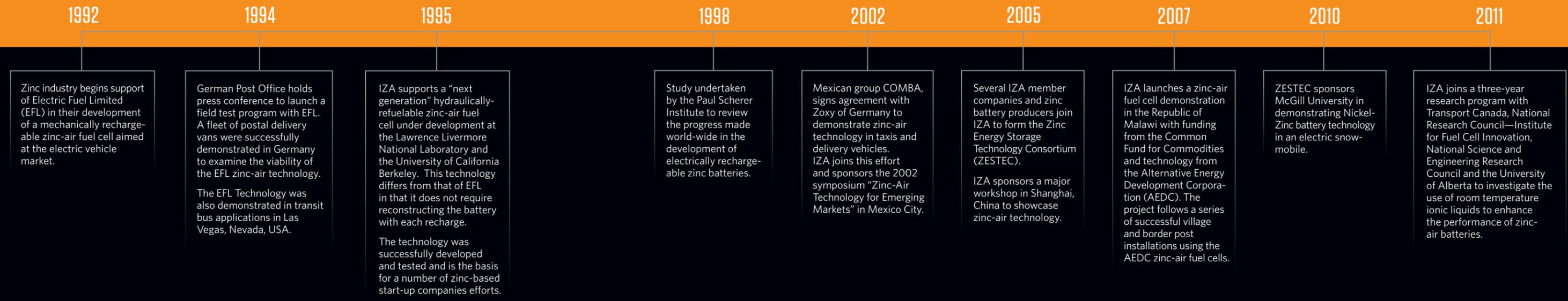
widely used in the electronics industry to power items like hearing aids, wrist watches and calculators.

Although EVs and adding substantial electricity storage to the electric grid are recognized as key elements for future energy independence and sustainability, these large energy storage opportunities have, until now, failed to realize their market potential. Nevertheless, zinc technologies are well placed for large-scale energy storage because they

offer unmatched performance, cost, safety and availability, provided some specific technical issues are solved, such as cathode durability.

IZA has focused on monitoring this emerging market and seeking opportunities to educate the industry about zinc's inherent advantages to encourage investment and product development of zinc technologies.

Energy Storage





Zinc is essential for the normal healthy growth and reproduction of plants, animals and humans. When the supply of plant-available zinc is inadequate, crop yields are reduced and the nutritional value of crop products is impaired.

Research and field experience have demonstrated that the addition of zinc to fertilizers can significantly enhance soil fertility as well as crop quality and yield, thus supplying more zinc to people's diets. Applying zinc-containing

fertilizers to soils and crops is a simple, rapid and cost-effective solution to correct zinc deficiency in soils and crops and combat malnutrition in humans. Zinc-containing fertilizers increase crop productivity and yield and provide better crop nutrition and improved human health.

IZA's objective in crop nutrition, in addition to realizing a large new market for zinc, is to increase the productivity and nutritional content of crops by promoting the use of zinc-containing

fertilizers as a long-term solution to human malnutrition. Initial focus of this work is countries with large agricultural infrastructure and zinc-deficient soils, notably, China, India and Brazil.

The strategy is to work through government agencies, agricultural extension offices and the fertilizer industry to highlight and educate on the beneficial effect of zinc fertilizers for crop productivity, food security and human health.

Crop Nutrition

2004

"Zinc in Soils and Crop Nutrition" by Brian Alloway is published electronically on the ZincWorld website. It contributes significantly to understanding the complexities of zinc dynamics in soil and plant systems. It is geared for a wide audience, including students, agronomists and scientists who are involved in research, extension or education in soil science, plant mineral nutrition, plant physiology and also human nutrition.

In 2008, IZA joined with the International Fertilizer Industry Association (IFA) to update and print the 2nd edition.

2005

A special symposium on "Micronutrient Deficiencies in Global Crop Production", was organized in Adelaide, Australia, with support from the International Council on Mining and Metals and the International Copper Association. Nine leading experts delivered papers and the symposium was attended by over 60 scientists. The symposium was particularly successful in helping scientists who are normally engaged in studies on the toxicity of zinc to better understand its essentiality and the problems of zinc deficiency in agricultural soils.

2007

Zinc-Crops 2007 held in Istanbul Turkey. An international scientific conference to review the latest knowledge and best agricultural practices in addressing zinc deficiency and its impact on global crop production and human health.

Zinc Crops 2011 was held in New Hyderabad, India in 2011.

2009

Zinc Nutrient Initiative launched with the goal of increasing the use of zinc fertilizers. Strong initial focus on advancing the initiative in India and China, two countries where zinc deficiency is a significant issue in both soils and people and also where the market potential for zinc fertilizers is greatest.

A complete package of supportive communication materials was created, including: website, fact sheets, newsletters, case studies, and technical reference materials.

Crop trials were conducted in China, India, Thailand, Laos, Brazil and South Africa.

2010

Zinc Fertilizer Training Program developed to assist fertilizer companies in developing, marketing and selling zinc fertilizers.

Regional zinc fertilizer conferences held throughout India and China.

In-country Program Directors for India and China were engaged to lead ZNI activities in their respective countries.

Collaboration with key government, academic and industrial partners to discuss the benefits of adopting zinc fertilizer use in the target countries.

India adds zinc to its national fertilizer subsidy program and adopts other policy changes benefiting the zinc fertilizer market.

2011

Zinc Nutrient Initiative expands to include Brazil, with an in-country Program Director.

IZA and the International Fertilizer Development Center (IFDC) launch initiative to develop and test zincated urea and zincated UDP briquettes.

IZA joins with Thailand's Departments of Rice, Agriculture and Land Development and several universities to discuss collaborative activities aimed at increasing awareness of zinc's importance to agriculture and human health.

Chinese government joins IZA in a cooperative project to include zinc as a fertilizer nutrient in the nationwide fertilizer recommendations.



Zinc is an essential micronutrient for human health. It is vital for the proper functioning of the immune system and crucial for growth, and physical and brain development in infants, children and teenagers.

In spite of the proven benefits of adequate zinc nutrition, approximately 2 billion people still remain at risk of zinc deficiency.

Zinc deficiency is a major health problem in developing countries but it is one which can be readily addressed

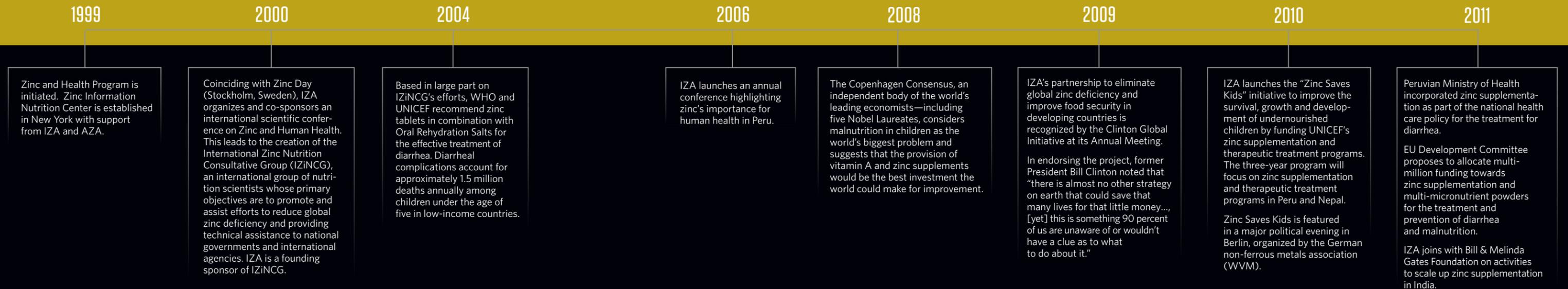
with inexpensive, simple and existing tools such as zinc supplements. Young children are most impacted. Zinc deficiency weakens their immune system and leaves them vulnerable to diarrhea and infections such as pneumonia which claim millions of lives of children under the age of five every year. Zinc deficiency is also accountable for growth retardation or stunting, and impaired intellectual capacity preventing children from developing to their full potential.

IZA is taking a global lead in advocating for programs aimed at addressing zinc

deficiency. The goal is to ensure that information about zinc and health is globally available to nutritionists, health professionals, public-health policymakers, the media and the general public, and to stimulate zinc-deficiency intervention programs through promotion of dialogue between zinc nutrition experts, nutrition programs and public-health agencies.



Health and Nutrition





Environment issues play an influential role in the shaping of zinc markets. While much progress has been made, industry continues to face scrutiny and challenges from local, national and international regulatory agencies.

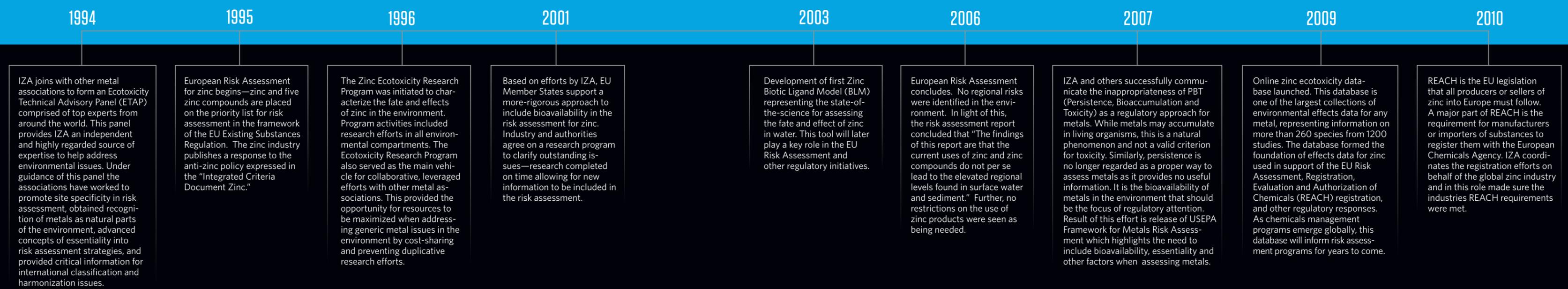
IZA has maintained a core program on zinc-related environment and health issues for most of its 20-year existence. The primary focus of this program is to provide a global and regional framework to assess regulatory challenges to zinc use, and to coordinate industry responses based on a strong program of applied

research. IZA can and has produced the critical information needed for the regulatory agencies to base their decisions on sound science. A key part of this work is to communicate and open dialog to disseminate information and outcomes from these research programs.

This commitment, and the quality of the research, has earned IZA a global reputation as a reliable source of information for not only IZA members, but also for regulatory agencies, international organizations and other industry associations. This standing has allowed

the zinc industry to participate in regulatory discussions providing a conduit for industry concerns and ideas to be heard by the regulatory community, ultimately resulting in a more-balanced approach to environmental regulations. It also connotes corporate responsibility and serves to build public trust through the industry's active participation in environmental and health stewardship programs.

Environment





Increasingly, the zinc industry is being asked to provide information to downstream users of zinc, and zinc-containing products, on the environmental footprint of the materials it produces. Material specifiers and product engineers in key end-use markets like building, construction and automotive, are more and more interested in selecting materials that have the best environmental profile while meeting traditional cost, quality and technical performance criteria.

Understanding the environmental footprint of zinc starts with documenting

the resource requirements and environmental releases associated with upstream metal production operations, but it also involves understanding the impacts and benefits of using zinc during other stages in the product life cycle. These benefits can arise in use (e.g., extending the life of galvanized steel products) and through end-of-life recycling (e.g., by utilizing recycled zinc to create new products).

IZA, working on behalf of the global zinc industry, is committed to continually assessing the sustainability of zinc and

zinc products through the development of sound scientific information, and communicating this information to the key markets and stakeholders.

Through the *Zinc for Life* initiative, recycling program and other activities, IZA will continue to develop and communicate information on the sustainability aspects of zinc and zinc products to position zinc as a material of choice and to meet the changing needs of the markets and stakeholders.

Sustainability

1999

Task Force on Zinc and Sustainable Development is formed.
Ecoprofile of primary zinc production is completed.
Initial IZA recycling database for Europe initiated. In 2011, this database is expanded to other parts of the world.

2000

Sustainable Development Workshop (Toronto, Canada) sets the basis for IZA's sustainable development strategy. Work begins on drafting IZA's Sustainability Charter and Codes of Practice.
Zinc Day (Stockholm, Sweden) launches IZA's Sustainable Development Policy.

2001

IZA Sustainability Charter is adopted unanimously by IZA members during the Annual General Meeting.

2004

Guiding Principles are developed providing guidance, success stories and additional resources for nine critical issues including: Business Ethics, Employee Health and Safety, Mine Tailings and Residue Management, Community Consultation, Environmental Management, Managing Minor Elements, Sustainability Reporting, Mine Closure and Product Stewardship.

2006

IZA launched *Zinc for Life* initiative which developed sound scientific information about the sustainability performance attributes of zinc products. *Zinc for Life* generated cradle-to-gate Life Cycle Inventory (LCI) studies for primary zinc (from mine to ingot) and for first-tier uses (such as zinc sheet). These LCI datasets will be used as building blocks of various Life Cycle Assessment (LCA) studies which then consider the whole product system of an application, for instance roofing, and also calculate the environmental impacts for the full life cycle.

2009

Zinc for Life program delivers first global primary zinc and zinc sheet LCIs.
Numerous publications and communication materials are developed, highlighting zinc as a sustainable material of choice.
Zinc industry ranks high on sustainability performance assessment and IZA shown to be a leading non-ferrous metals association in sustainability activities according to independent benchmark study.

2011

IZA Sustainability Charter is revised to include Climate Change and Children's Rights.
New Guiding Principle is issued on Climate Change.