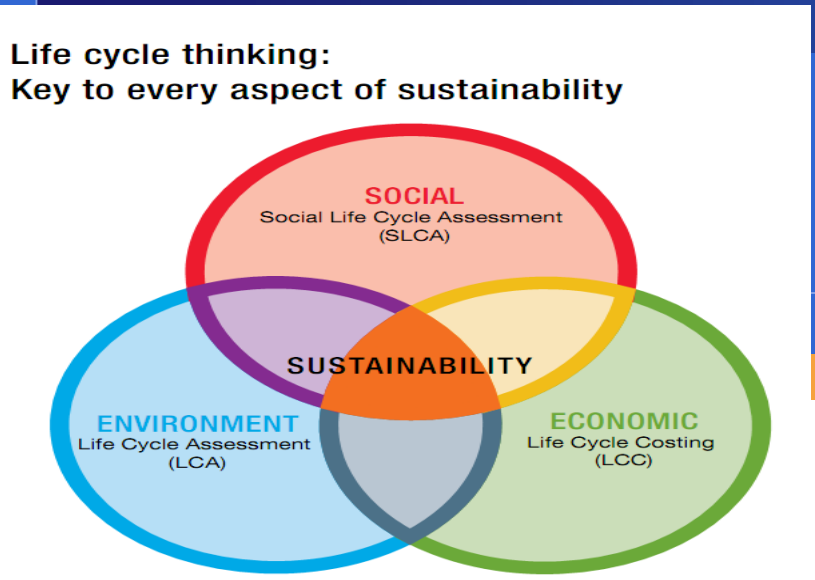
جایگاه فولاد در توسعه پایدار

ارائه دهنده: غلامرضا طاهری



شرکت فولاد مبارکه
معاونت فروش و بازاریابی

دی ماه ۱۳۹۸

چالشهایی تحقق کیفیت زندگی در آینده

challenges that must be solved to ensure a decent quality of life

مگاترندهای آینده

seven megatrends that shape the future development of our world

1 Demographic dynamics
- 01 Growth
- 02 Young vs. old countries
- 03 Migration
- 04 Urbanization

2 Globalization & future markets
- 01 Facets of globalization
- 02 Economic integration
- 03 BRICS and beyond

3 Scarcity of resources
- 01 Energy
- 02 Water and food
- 03 Other commodities

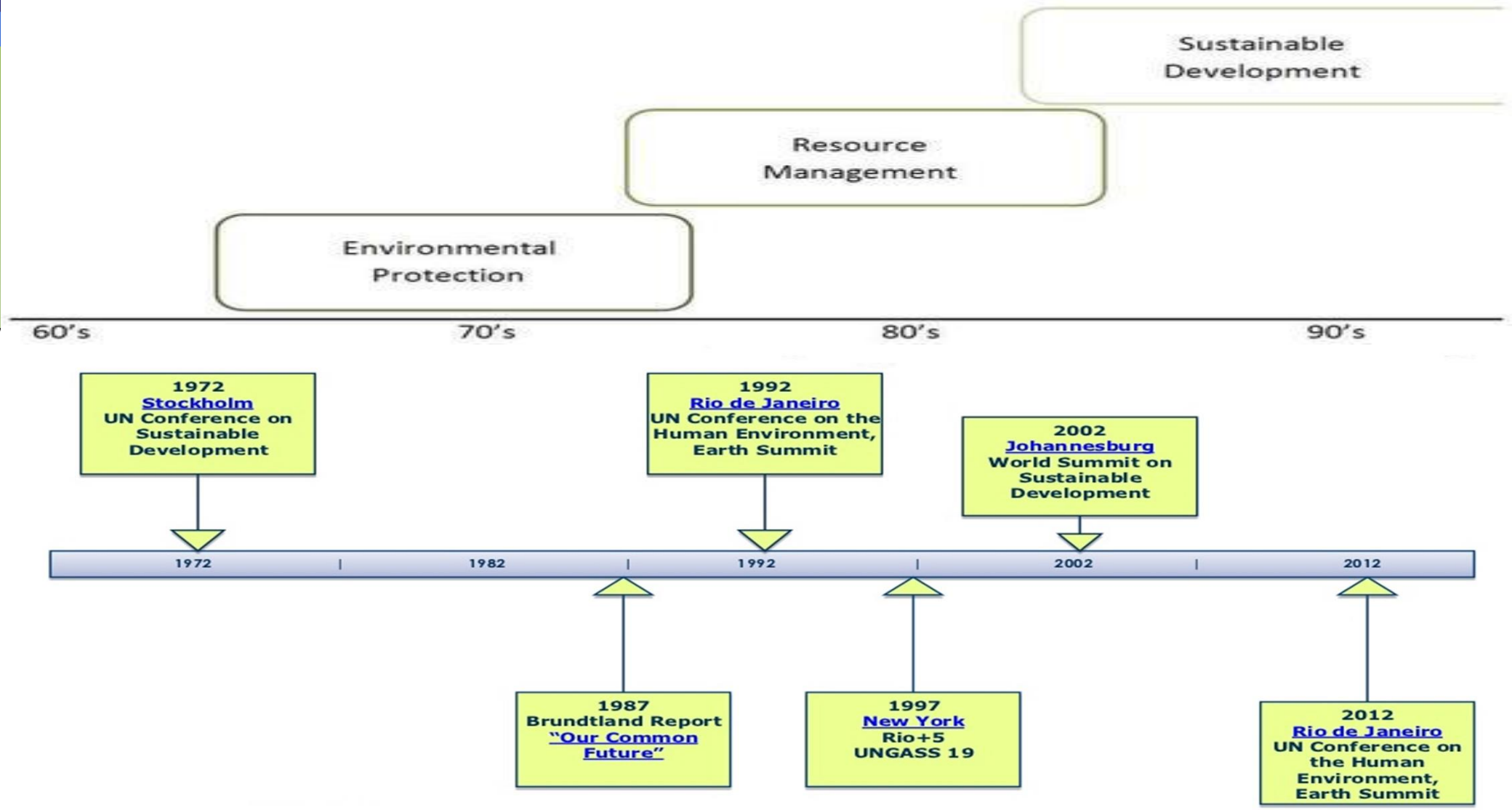
4 Climate change & ecosystem at risk
- 01 Global warming
- 02 Rising CO_2 emissions
- 03 Ecosystem at risk

5 Dynamic technology & innovation
- 01 Power of innovation
- 02 Life Sciences
- 03 Digital Transformation

6 Global knowledge society
- 01 Know-how base
- 02 War for talent
- 03 Gender gap

7 Sustainability & global responsibility
- 01 State
- 02 Society
- 03 Businesses

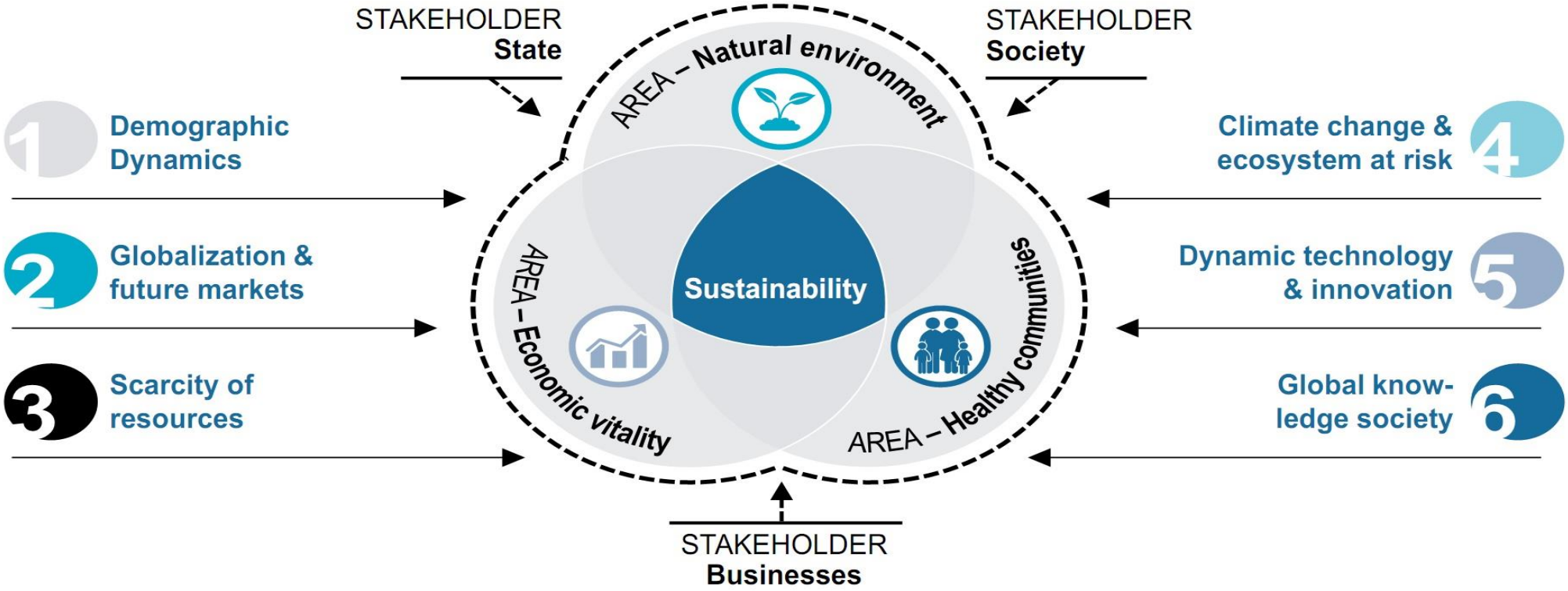
تاریخچه قوانین و الزامات زیست محیطی



ارکان توسعه پایدار

Sustainability

Sustainability comprises three actionable areas of responsibility, influenced by six megatrends and shaped by three stakeholders



"Sustainability is the responsible development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

(World Commission on Environment and Development – Brundtland Commission)

اهداف تعریف شده از سوی سازمان ملل در جهت دستیابی به توسعه پایدار

The Sustainable Development Goals (SDGs) were drawn up by a United Nations working group, together with thousands of stakeholders, and adopted by a UN General Assembly resolution during the United Nations Sustainable Development Summit in New York on September 25, 2015. 193 UN member states have signed up to the 17 goals and 169 targets for global sustainable development with its specific objectives.

The SDGs were implemented as of January 1, 2016, and are designed to cover a period of 15 years (to 2030). The role of the private sector in reaching these goals was explicitly highlighted.

For sustainable development, companies face a challenging decoupling of their economic growth objectives

Decoupling challenges for sustainable development

1. Economic growth and resource use

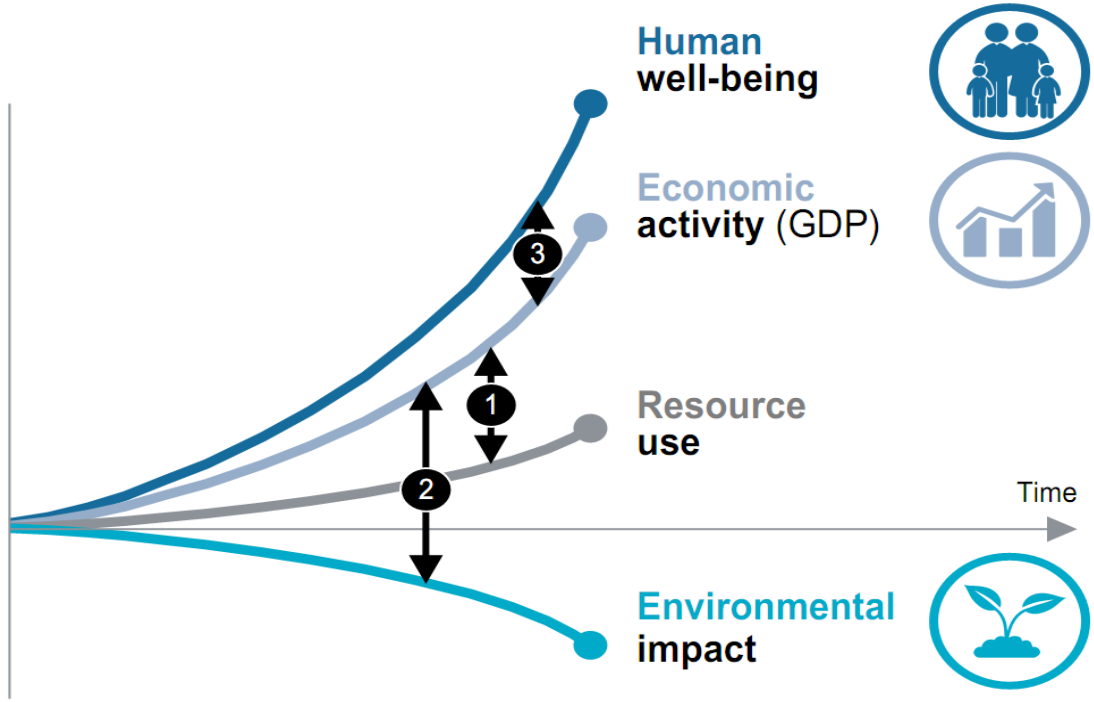
Scarcity of resources calls for a **decoupling of economic growth and resource use** e.g. via recycling efforts and collaborative consumption

2. Economic growth and environmental impact

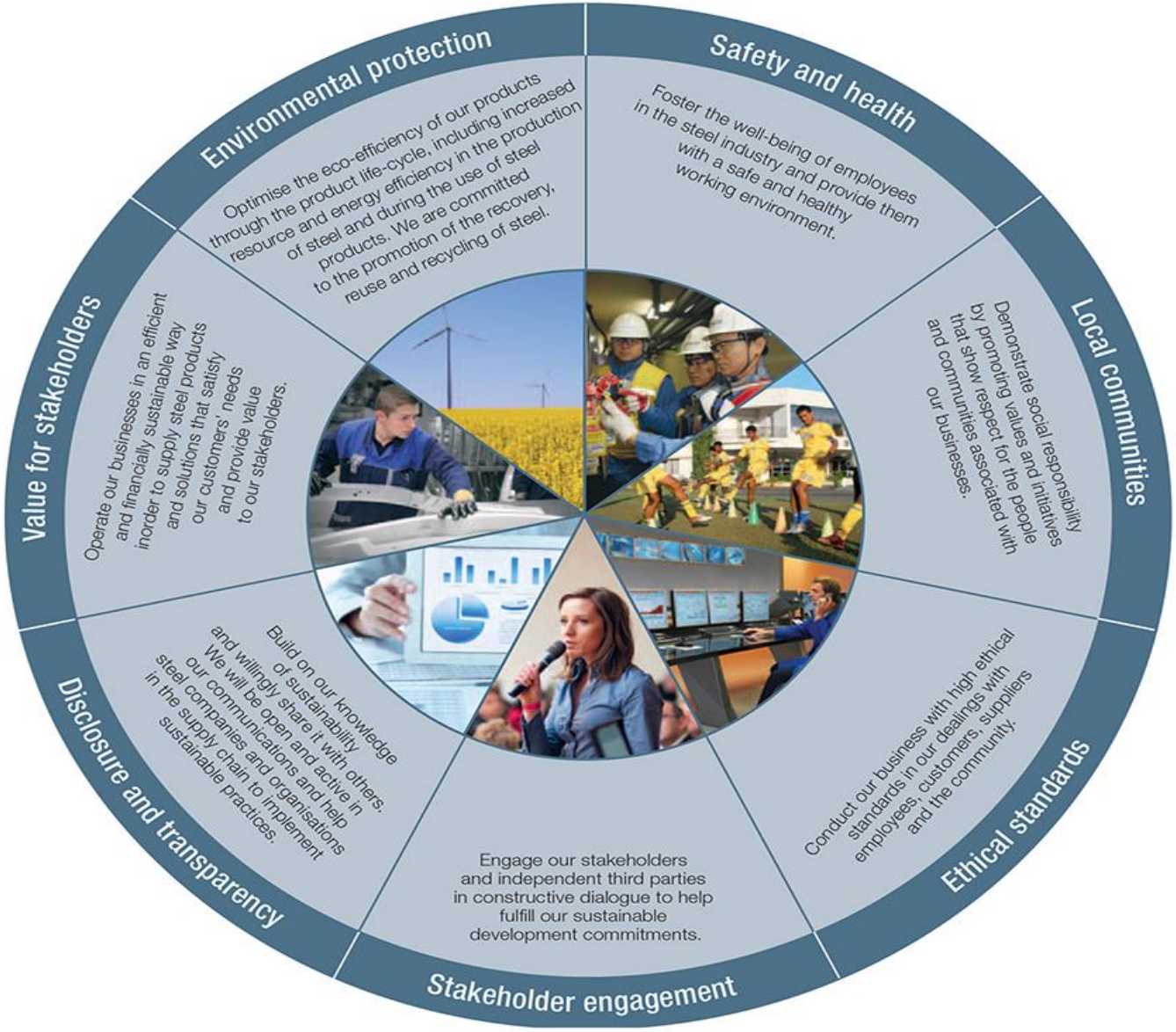
Since environmental impacts that can be safely absorbed by Earth's ecosystems are limited – **Economic growth needs to be decoupled from environmental impact**

3. Economic growth and human well-being

Compared to pre-crisis levels economic growth declined and there is a constant risk of future economic crises. It is therefore important to find ways to achieve **well-being independent of economic growth**



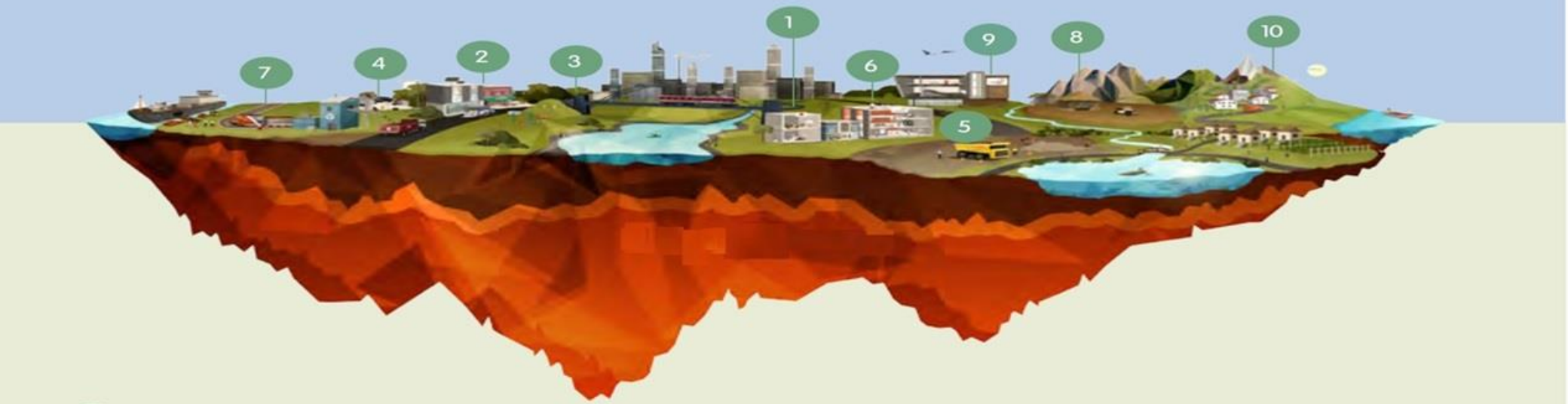
حوزه های تمرکز صنعت فولاد با نگاه پایداری



ارتباط اهداف پایداری SDGs با حوزه های تمرکز

7 AREAS COVERED	DIRECT AND INDIRECT CONTRIBUTION TO THE U.N. SUSTAINABLE DEVELOPMENT GOALS
SAFETY AND HEALTH	3 GOOD HEALTH AND WELL-BEING; 8 DECENT WORK AND ECONOMIC GROWTH; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION
VALUE FOR STAKEHOLDERS	3 GOOD HEALTH AND WELL-BEING; 4 QUALITY EDUCATION; 8 DECENT WORK AND ECONOMIC GROWTH; 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE; 10 REDUCED INEQUALITIES; 11 SUSTAINABLE CITIES AND COMMUNITIES; 17 PARTNERSHIPS FOR THE GOALS
ENVIRONMENTAL PROTECTION	6 CLEAN WATER AND SANITATION; 7 AFFORDABLE AND CLEAN ENERGY; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION; 13 CLIMATE ACTION; 14 LIFE BELOW WATER; 15 LIFE ON LAND
DISCLOSURE AND TRANSPARENCY	8 DECENT WORK AND ECONOMIC GROWTH; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION; 17 PARTNERSHIPS FOR THE GOALS
LOCAL COMMUNITIES	1 NO POVERTY; 2 ZERO HUNGER; 3 GOOD HEALTH AND WELL-BEING; 4 QUALITY EDUCATION; 5 GENDER EQUALITY; 6 CLEAN WATER AND SANITATION; 10 REDUCED INEQUALITIES
ETHICAL STANDARDS	12 RESPONSIBLE CONSUMPTION AND PRODUCTION; 16 PEACE, JUSTICE AND STRONG INSTITUTIONS
STAKEHOLDER ENGAGEMENT	8 DECENT WORK AND ECONOMIC GROWTH; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

حوزه های تمرکزی صنعت فولاد جهت استقرار پایداری با نگرش حاکمیتی



1 **People**
Safe, healthy and quality working environment for our people.

2 **Products**
Products that accelerate more sustainable lifestyles.

3 **Infrastructure**
Products that create sustainable infrastructure.

4 **Resources**
Efficient use of resources and high recycling rates.

5 **Air, land and water**
Trusted user of air, land and water.

6 **Carbon and energy**
Responsible energy user that helps create a lower-carbon future.

7 **Supply chains**
Supply chains that our customers trust.

8 **Community**
Active and welcomed member of the community.

9 **Scientists and engineers**
Pipeline of talented scientists and engineers for the future.

10 **Impact Measurement**
Our contribution to society measured, shared and valued.

All of them are supported by corporate governance based on good governance practices and transparency.

نمونه ای از انتخاب اهداف پایداری در شرکتهای فولادساز

Outcomes	1 People	2 Products	3 Infrastructure	4 Resources	5 Air, land and water	6 Carbon and energy	7 Supply chains	8 Community	9 Scientists and engineers	10 Impact
UN SDG										
					ArcelorMittal's SD outcomes					
	1	2	3	4	5	6	7	8	9	10
3 Health	●				●	●		●		
5 Gender equality	●									
6 Clean water and sanitation					●					
7 Affordable and clean energy						●				
8 Decent work and economic growth	●						●	●	●	●
9 Industry, innovation and infrastructure		●	●	●		●	●		●	
11 Sustainable cities and communities		●	●	●	●	●		●		
12 Responsible consumption and production		●	●	●	●	●	●	●		
13 Climate action		●	●	●		●		●		
14 Life below water					●			●		
15 Life on land					●			●		
16 Peace, justice and strong institutions								●		
	Transparent good governance – stakeholder relations									
17 Partnerships for the Goals	●	●	●	●	●	●	●	●	●	●

راهکارهای تحقق پایداری در صنعت فولاد

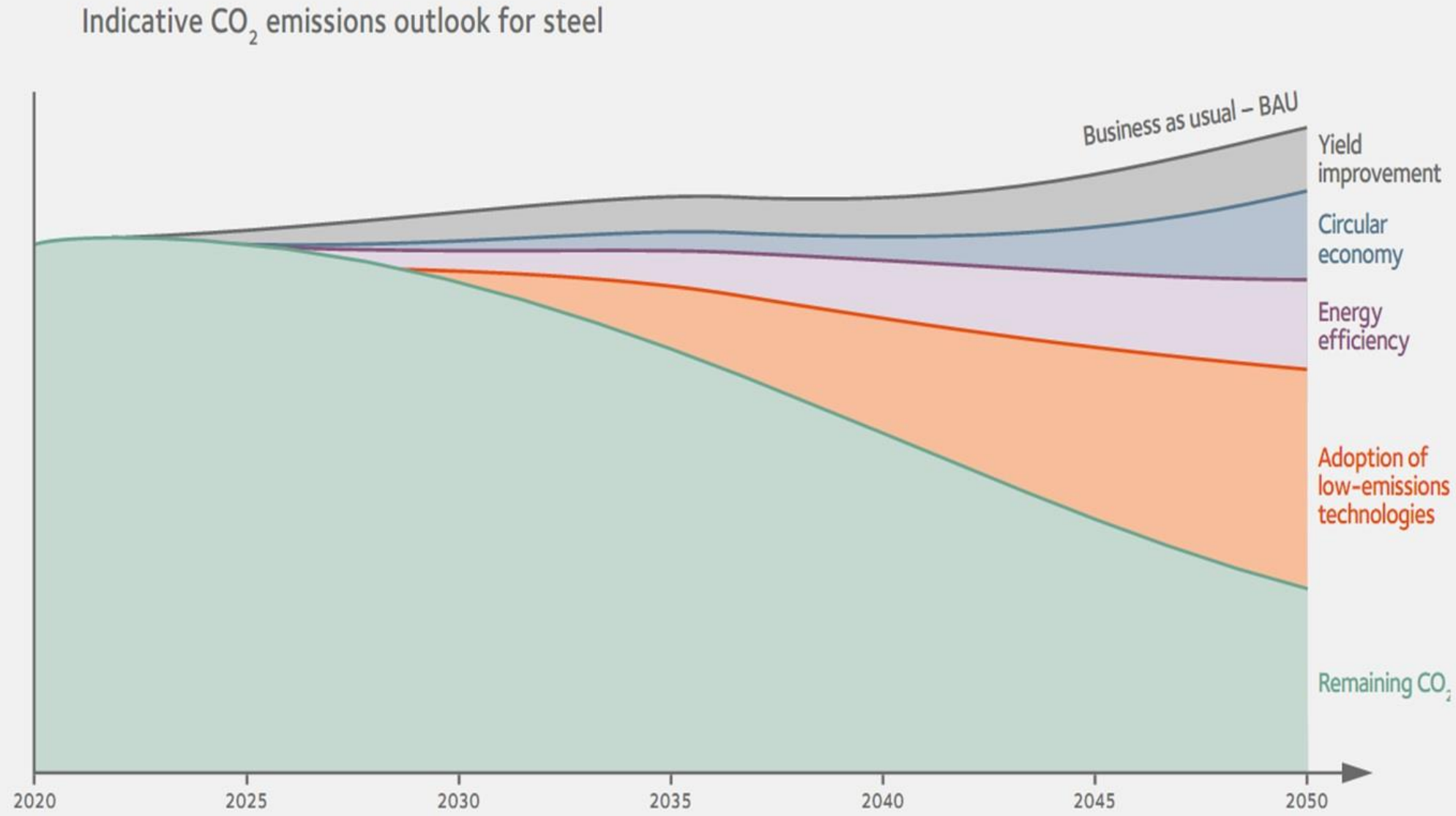
eco PRODUCTS

eco PROCESS

eco SOLUTION

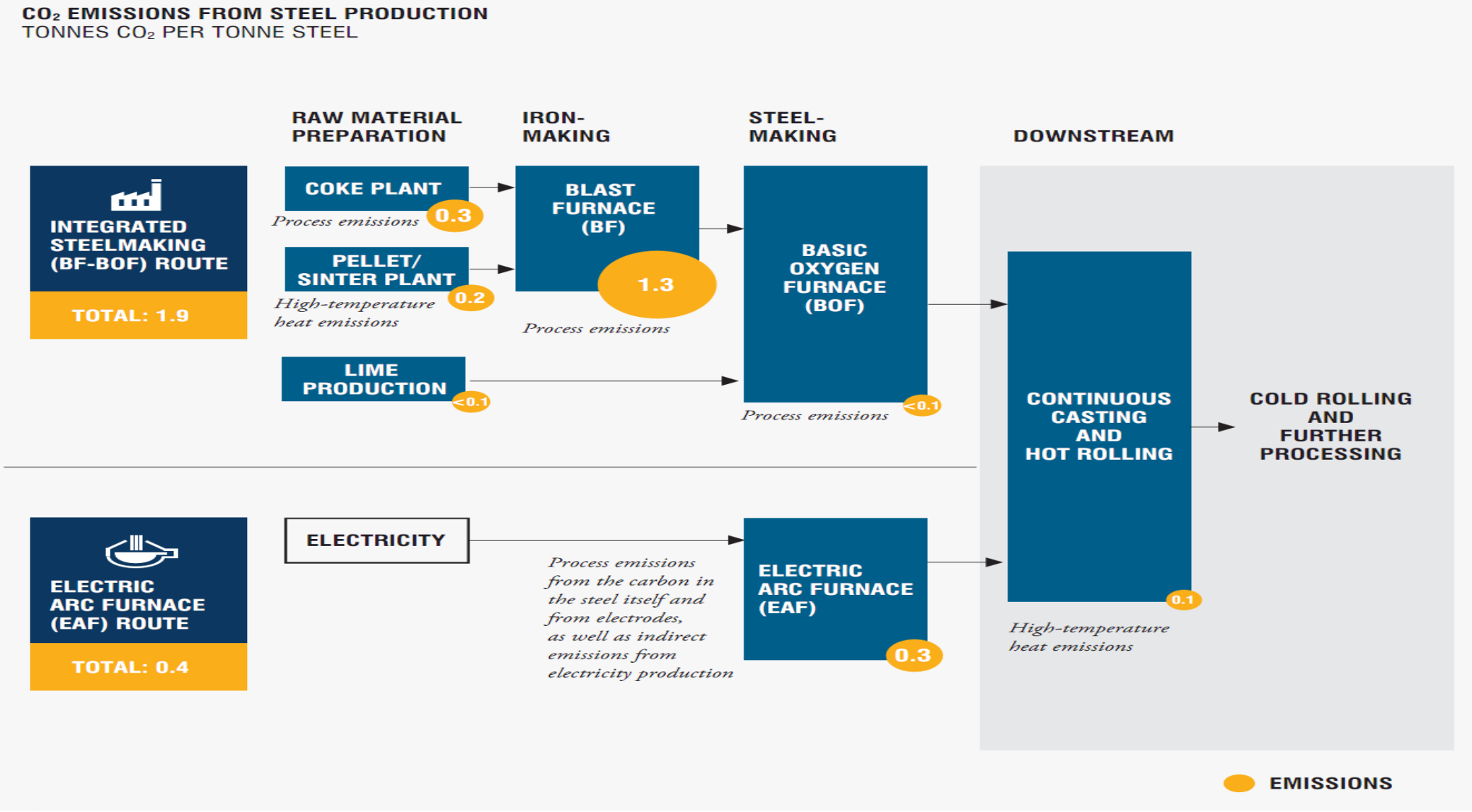
INNOVATION

اهداف پایداری در صنعت فولاد

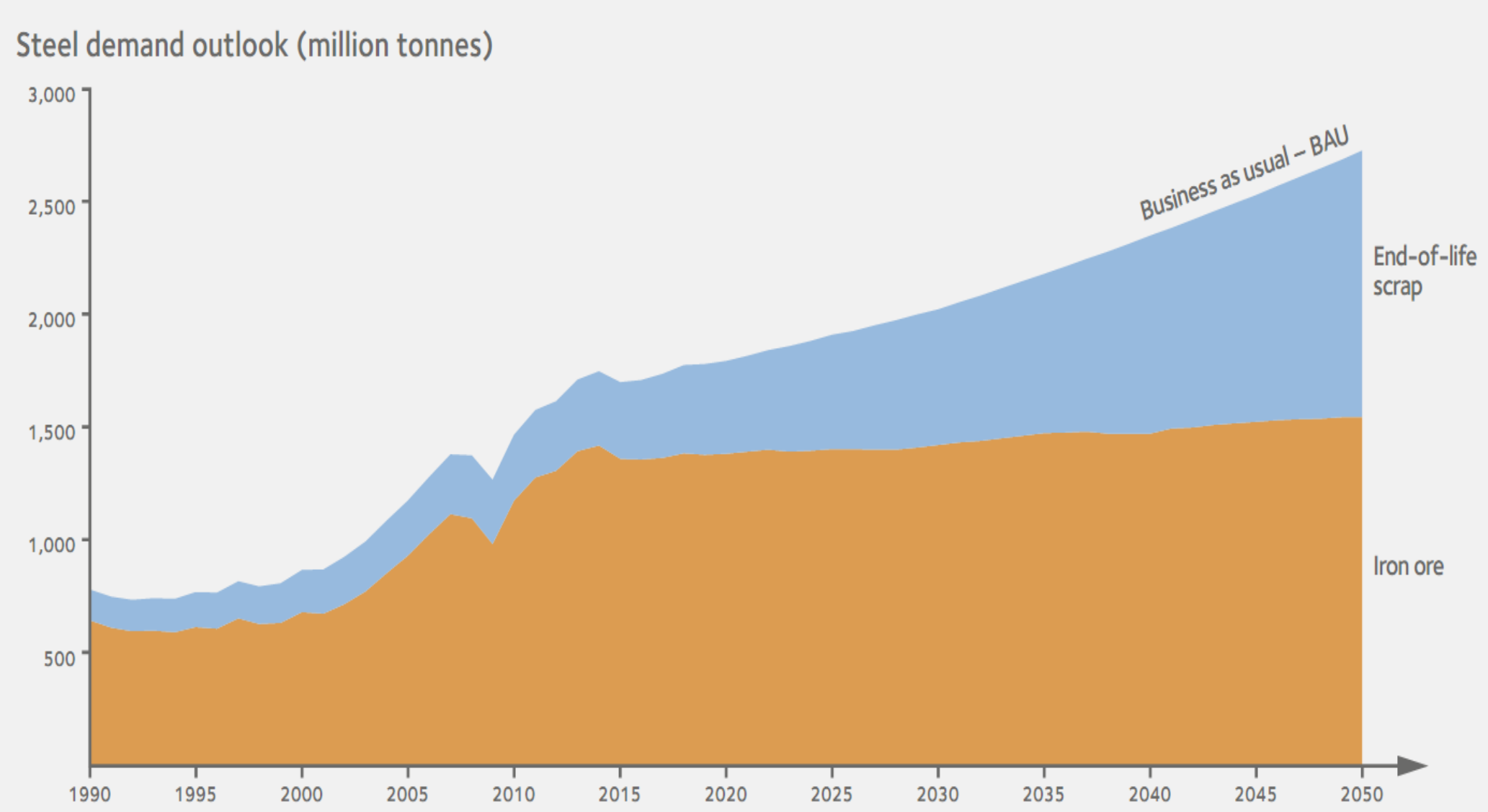


راهکارهای تحقق پایداری در صنعت فولاد

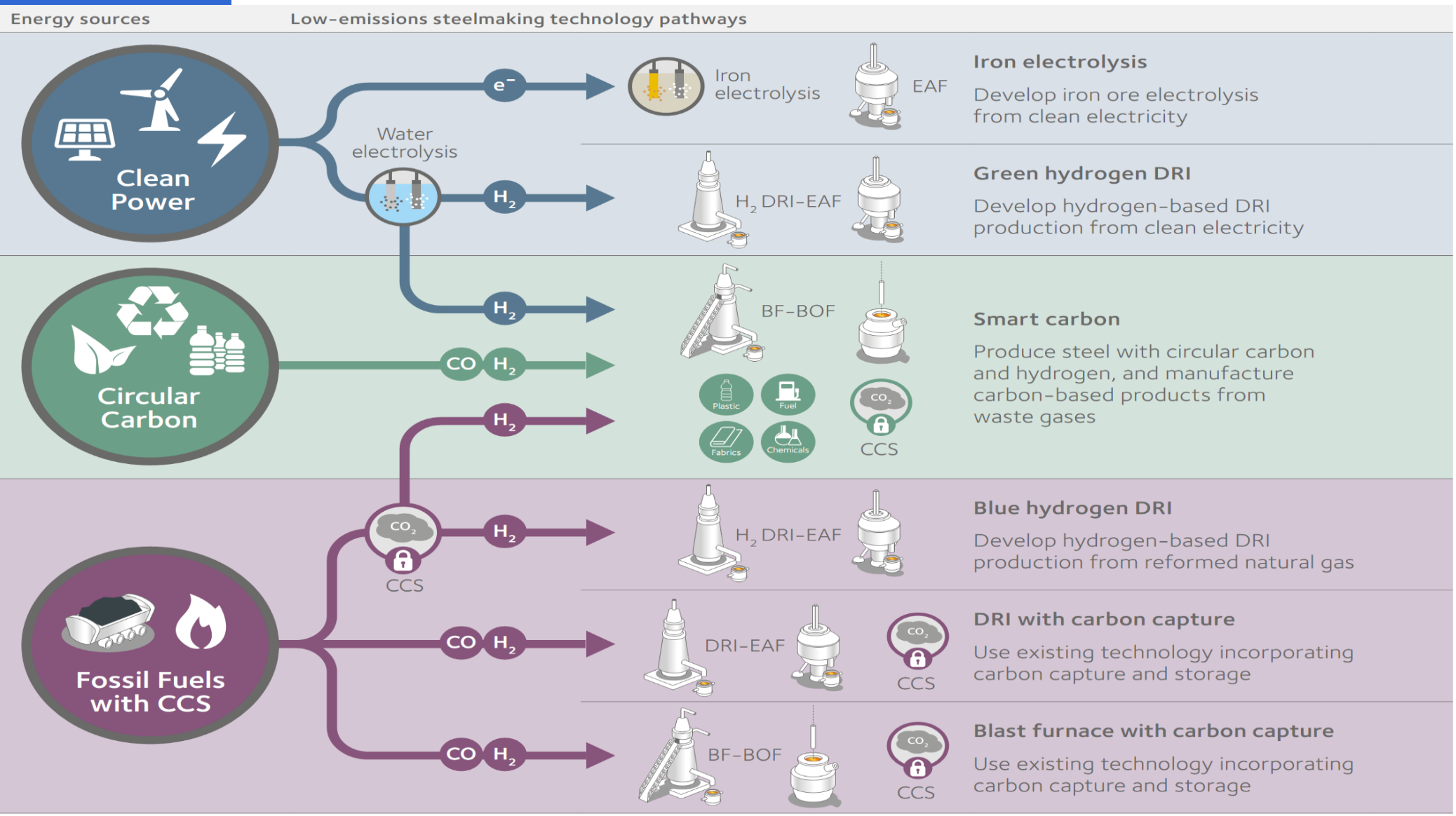
توزیع آلایندگی CO_2 در صنعت فولاد



روند استفاده از قراضه در تولید فولاد

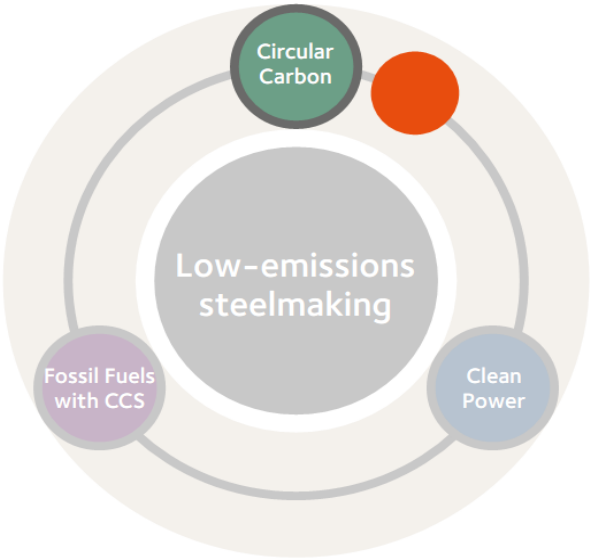


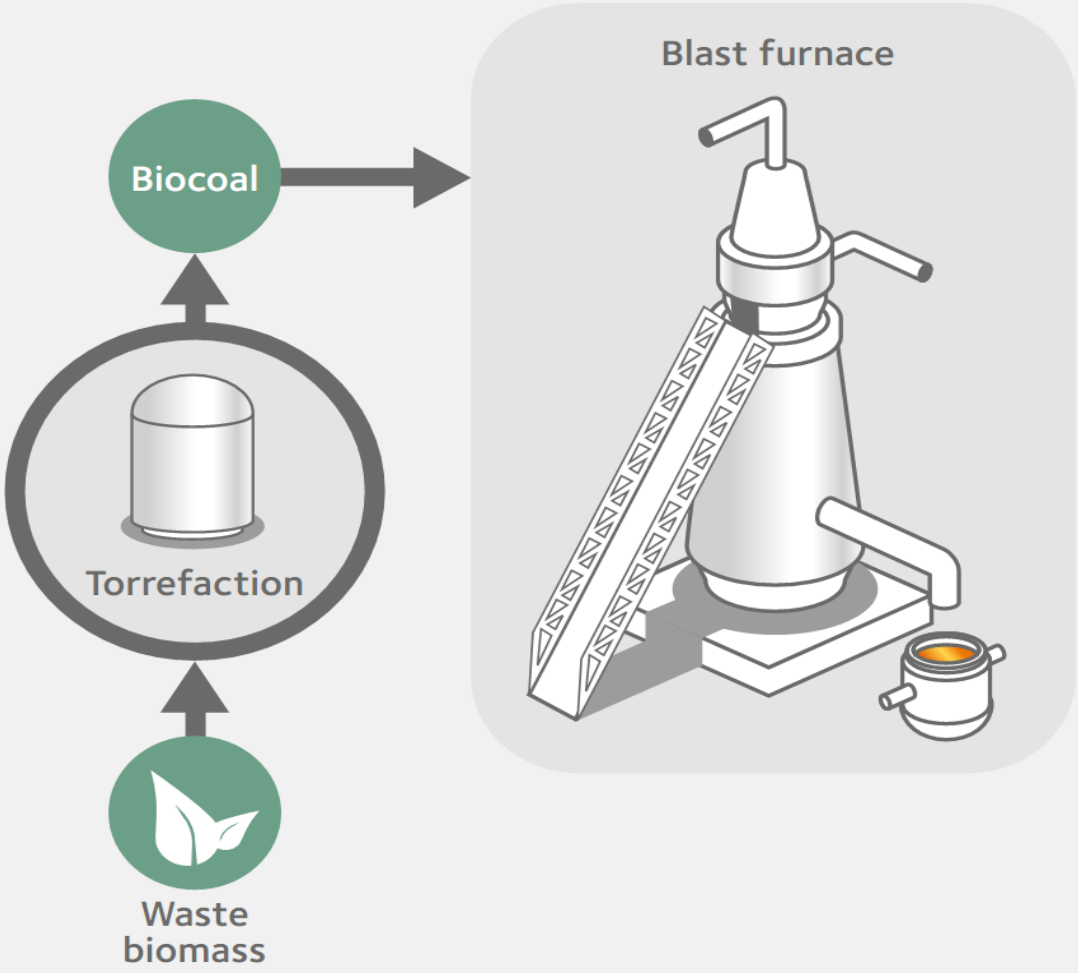
برخی از راهکارهای پیشنهادی



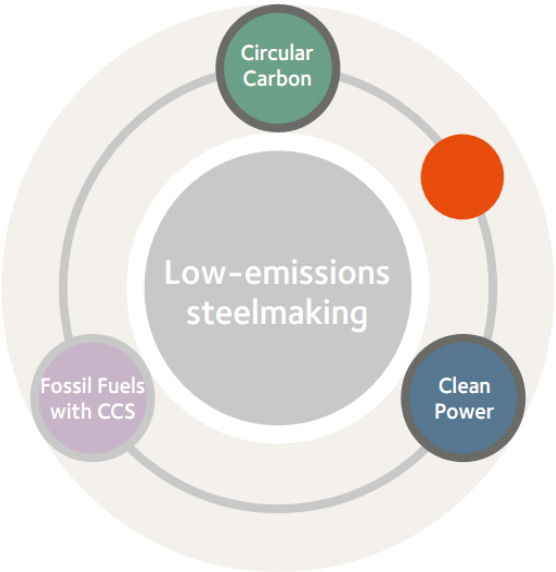
تکنولوژی های موثر در کاهش آلایندگی در بخش فولادسازی

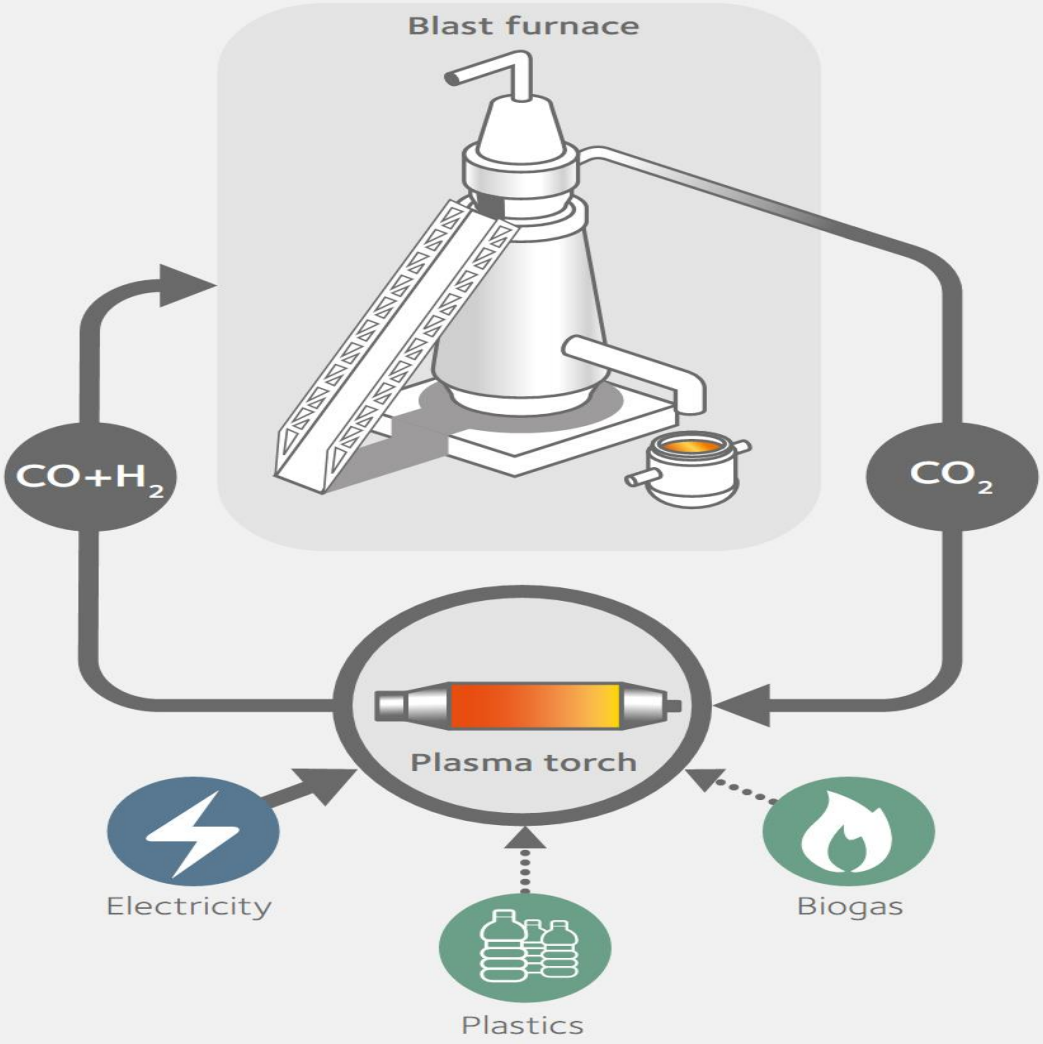
چرخه کربن – روش Torero



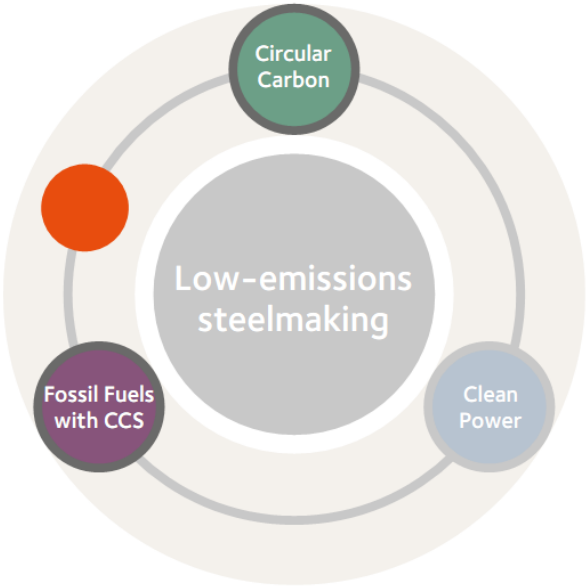


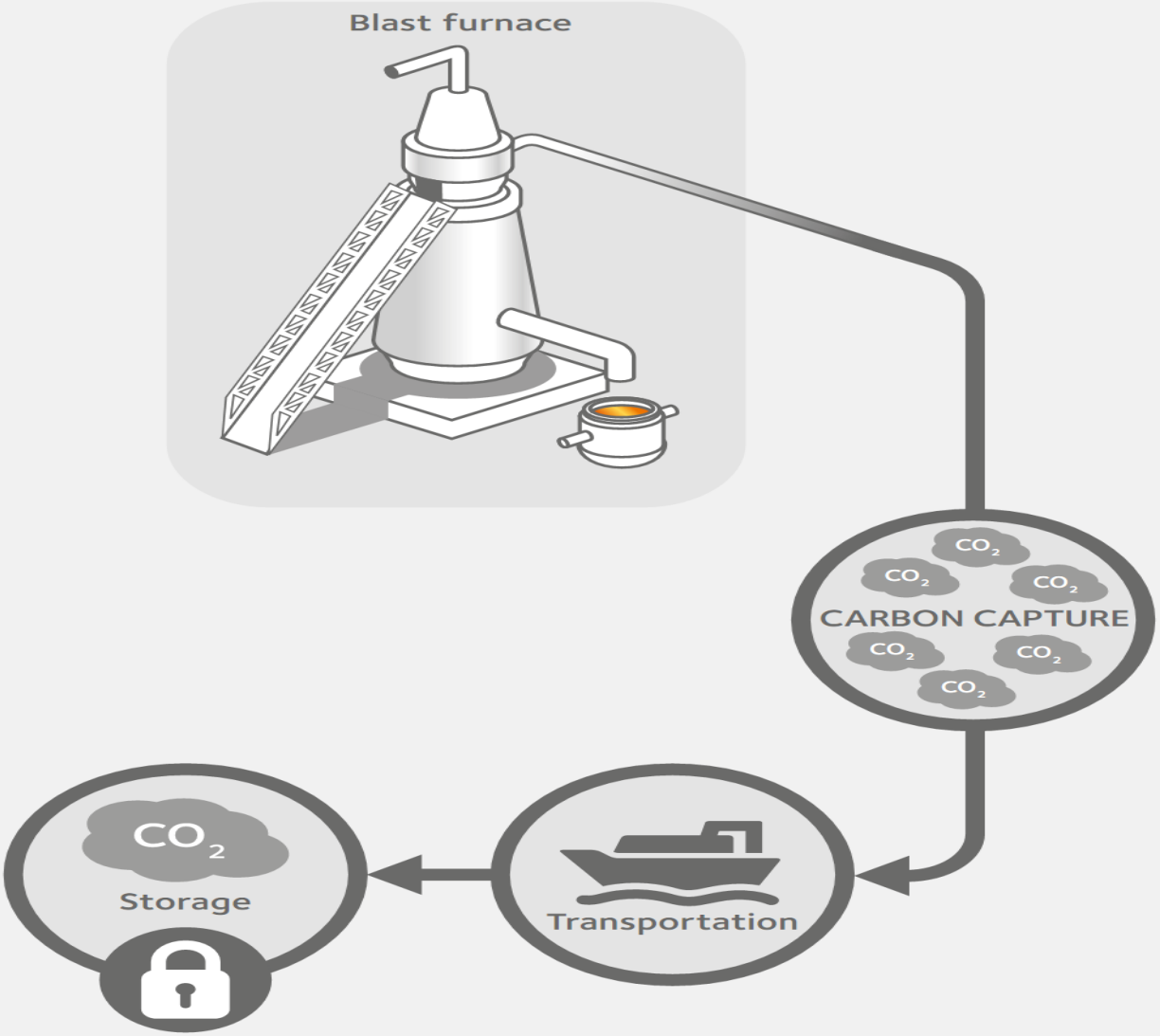
چرخه کربن – روش IGAR



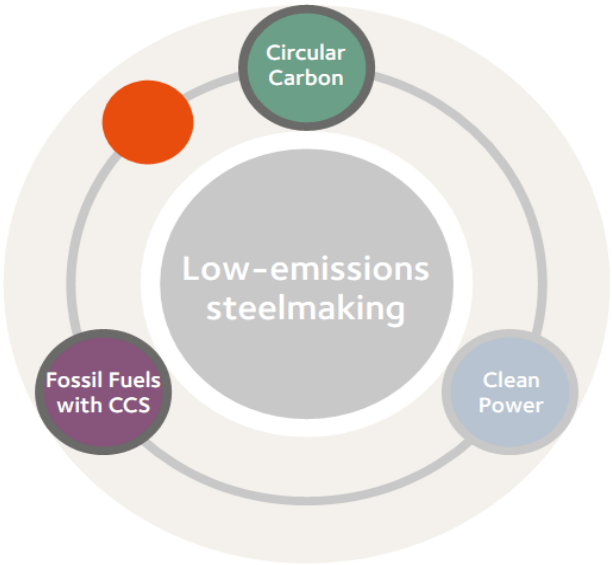


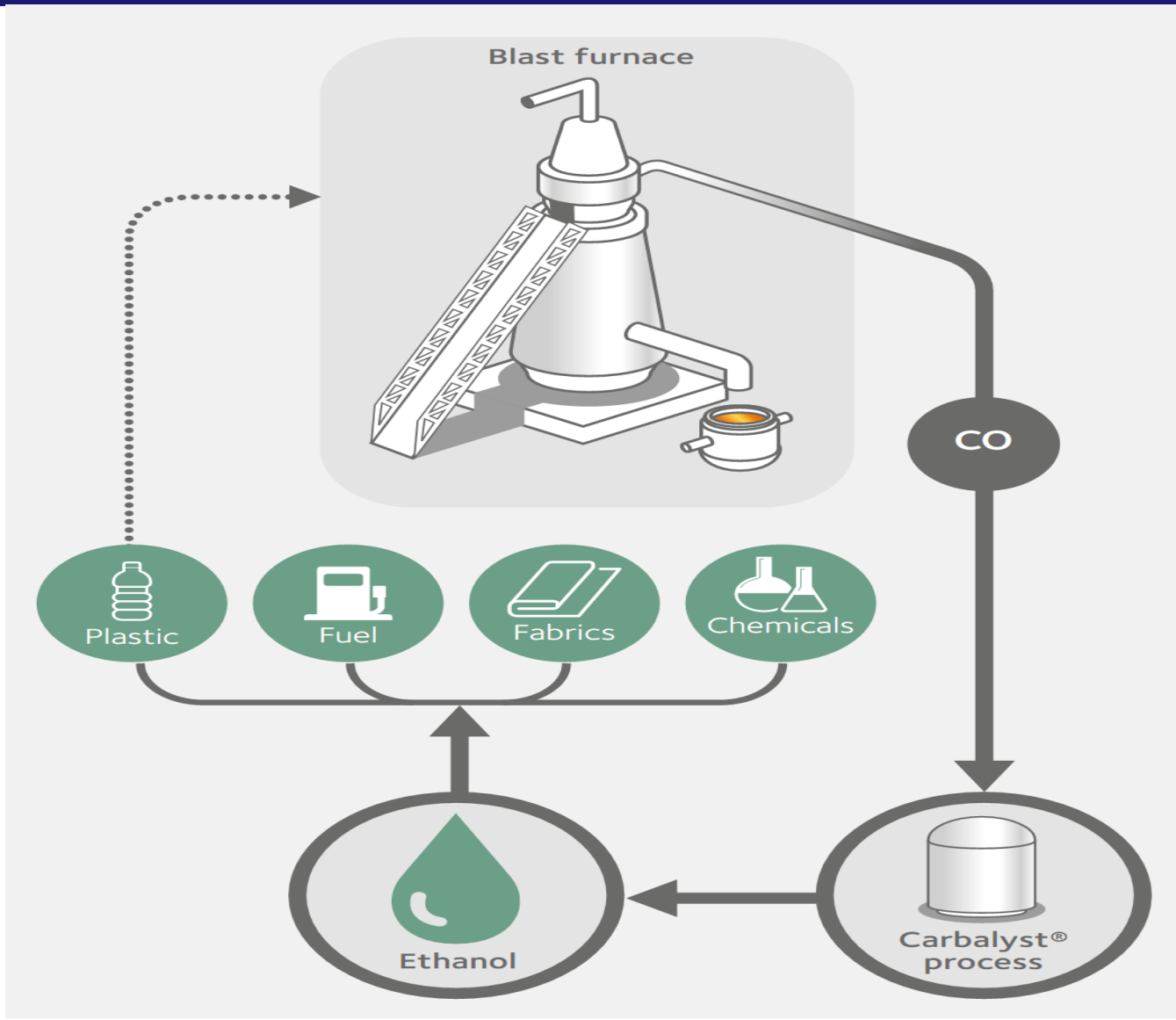
سوختهای فسیلی با استفاده از رویکرد ذخیره کربن



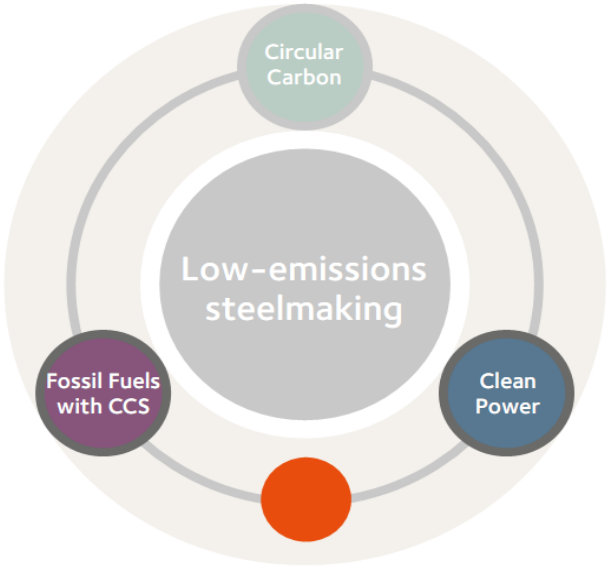


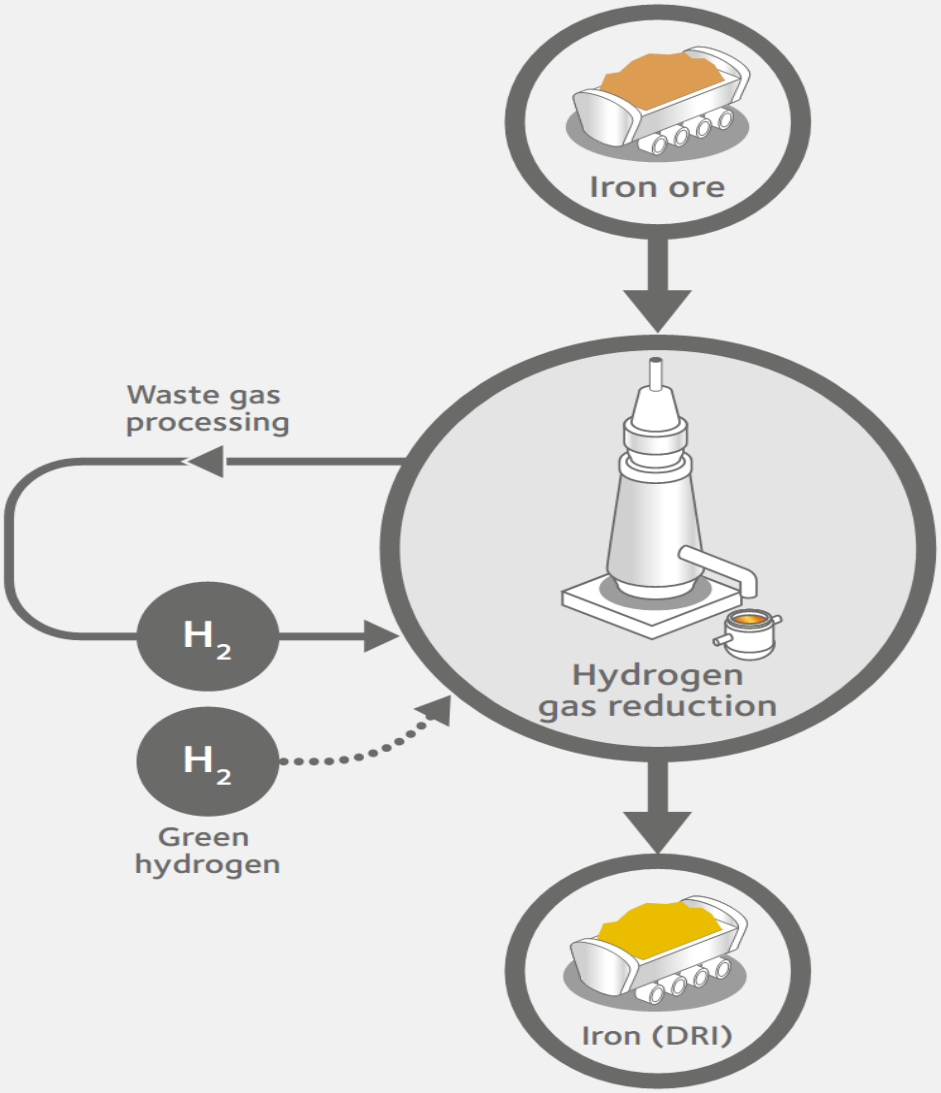
سوختهای فسیلی با استفاده از رویکرد ذخیره کربن–روش Carbalyst



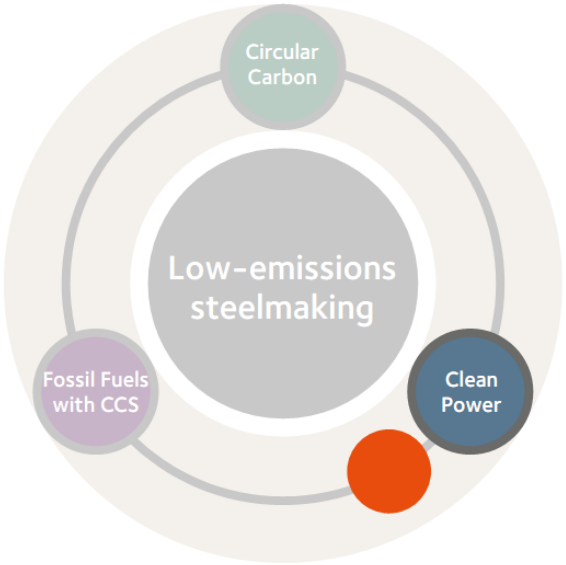


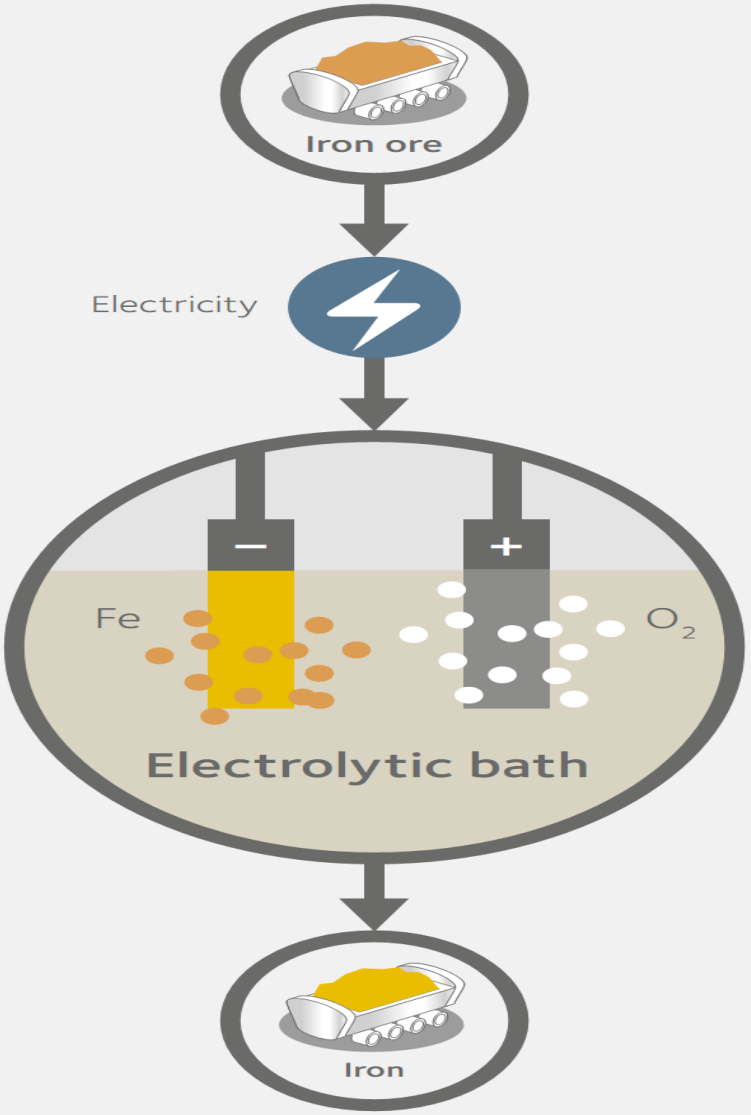
سوخت های پاک–احیاء هیدروژن





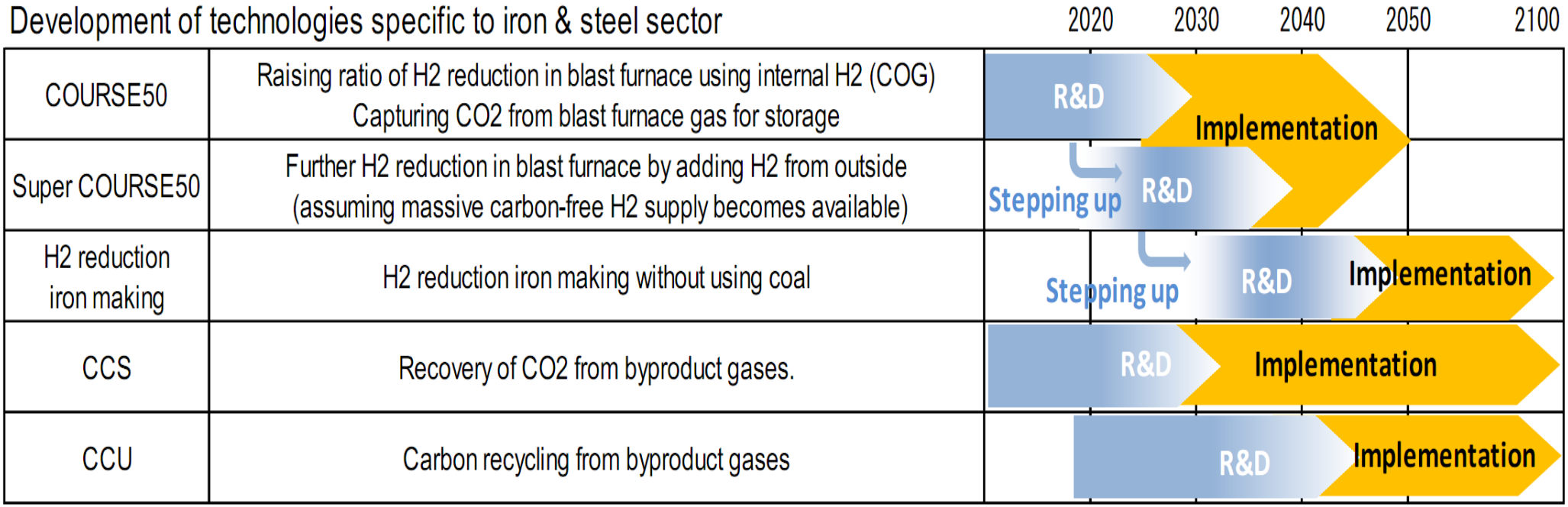
سوخت های پاک – روش الکترولیز Siderwin



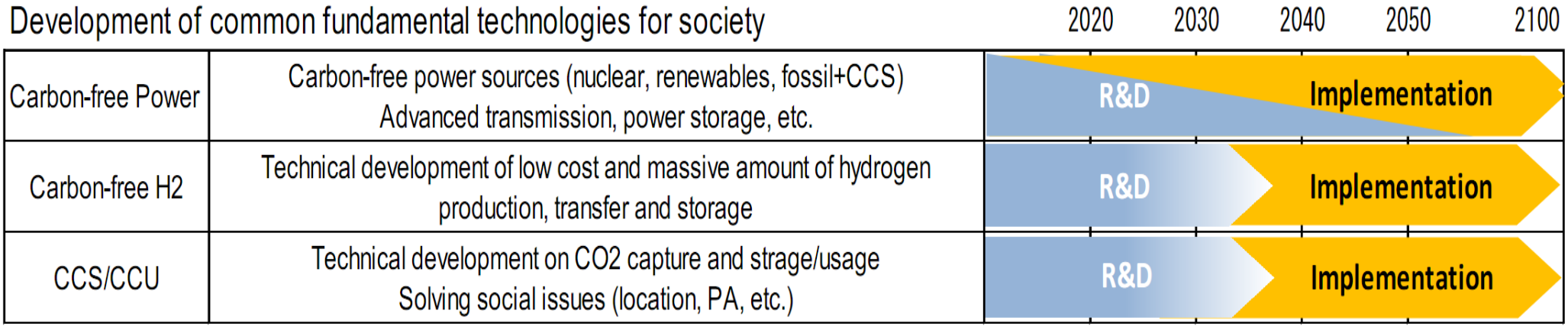


برنامه زمانی استفاده از تکنولوژی های کاهش آلودگی در صنعت فولادسازی

Development of technologies specific to iron & steel sector

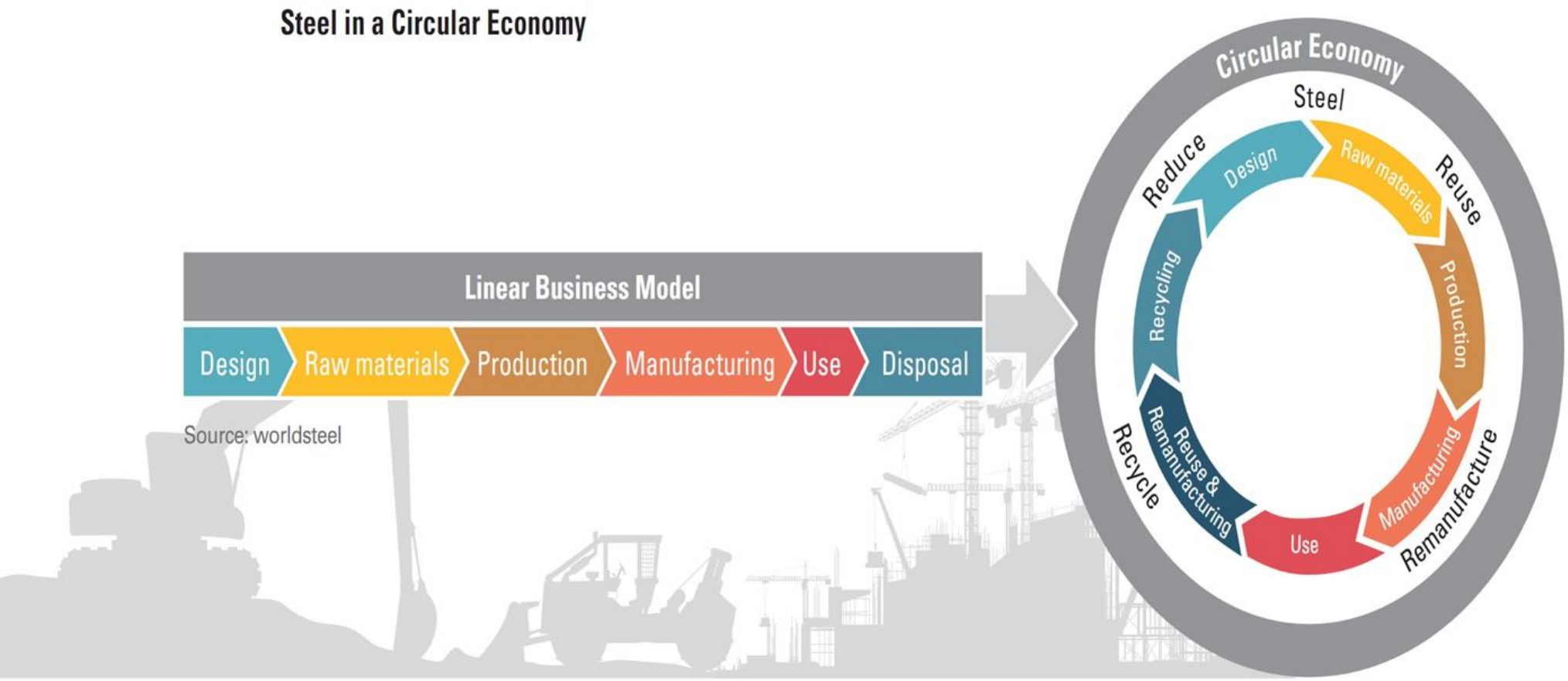


Development of common fundamental technologies for society



راهکارهای تحقق پایداری در صنعت فولاد

Circular Economy



BETTER PROCESSES AND IMPROVED PRODUCT DESIGN HELP REDUCE RESOURCE USE

- Energy consumption and CO_2 emissions **per tonne of steel produced have been reduced** by over 50% since 1960. Production has been completely decoupled from CO_2 emissions and energy use.
- European-made, high-tech **steel can save 6 times as much CO_2** in use than is emitted in production, depending on its CO_2-mitigating application.
- Using newer, higher grades of steel can help deliver **lighter, stronger parts**, improving lifetime efficiency – **mitigating CO_2 during a product's lifecycle**.
- There are **thousands of different types of steel made in Europe**, each with different tailor-made properties and specific uses, all of which help improve product efficiency.
- Product design should recognise the **importance of optimising material use** when designing parts or components.

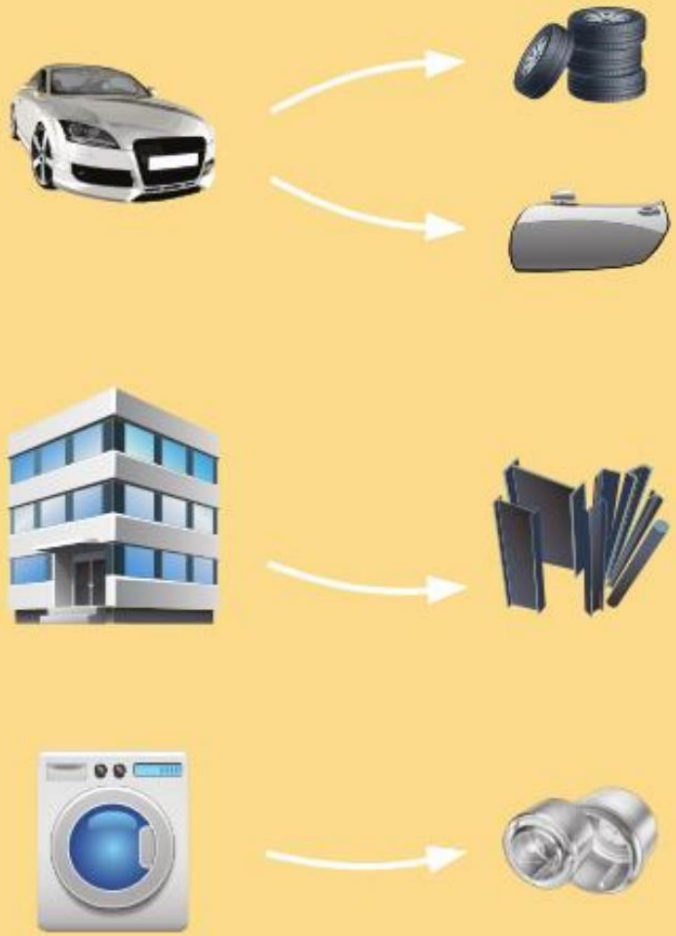
STEEL PRODUCTS ARE LONG-LASTING AND CAN BE EASILY PUT BACK INTO SERVICE

In products made of different materials, **the steel components are often the most versatile**.

Steel elements such as construction beams, cladding, automotive parts, household equipment and fastenings can be **used, reused and remanufactured** without the need to enter back into the production cycle.

Remanufacturing helps **moderate the need to produce new parts**, saving millions of tonnes of CO_2 annually on 'primary' production.

Requirements on durability, re-use, reparability, dismantling and recyclability **should be part of product design**. This will help ensure parts are **easier and more cost-effective** to reuse.



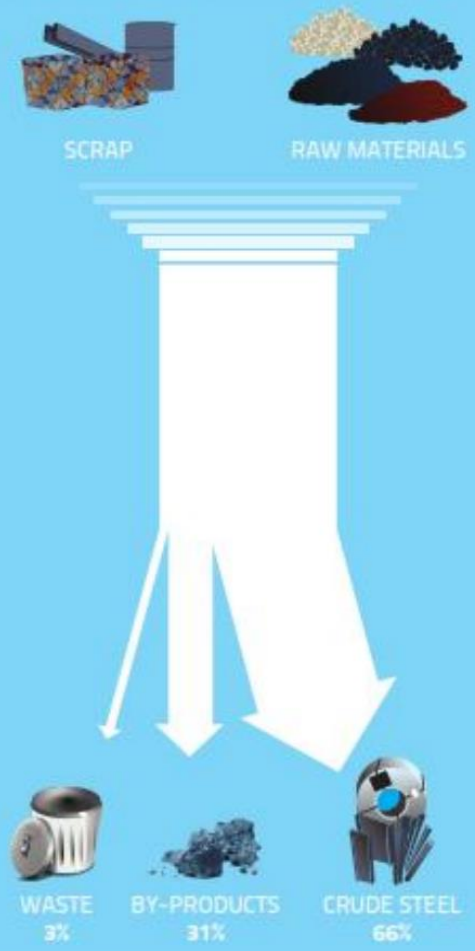
MATERIAL RECOVERY AND STEEL RECYCLING UNDERPIN THE CIRCULAR ECONOMY

- Steel is separated from other materials and reclaimed from waste before being reprocessed. This is called **material recovery**.
- Recycling happens after material recovery.
- Continued recycling is essential to keeping **scrap in a constant loop** inside the European economy.
- There is not enough scrap available to satisfy world demand. Rising demand past 2050 means that **primary steel production** will also continue to **play an important role**.
- Existing **EU waste rules do not actually promote material recycling** inside the EU. Around 20% of scrap from Europe – a strategic 'secondary' resource – is exported onto international markets.
- Primary and secondary **steel production routes are complementary and interdependent**. Both have fundamental roles in the circular economy.

EUROFER based on WV Stahl

STEEL'S BY-PRODUCTS HELP SAVE ON NATURAL RESOURCES IN OTHER INDUSTRIES

- **Steelmaking also results in useful by-products** – such as process gases and ferrous slag – which substitute for natural resources in other sectors and contribute to resource efficiency.
- **Process gases are used for electricity generation** for industrial and domestic applications, replacing fossil fuels and natural gases.
- Ferrous **slag is used in a range of applications** (e.g civil engineering, fertiliser and cement production etc), saving millions of tonnes of natural resources annually.
- Existing **criteria on by-products in the Waste Framework Directive** should be put into practice to incentivise the use of industrially 'co-generated' by-products.
- **Steel production is an almost closed-loop system.** Only a tiny share of what emerges from production can be assessed as waste.

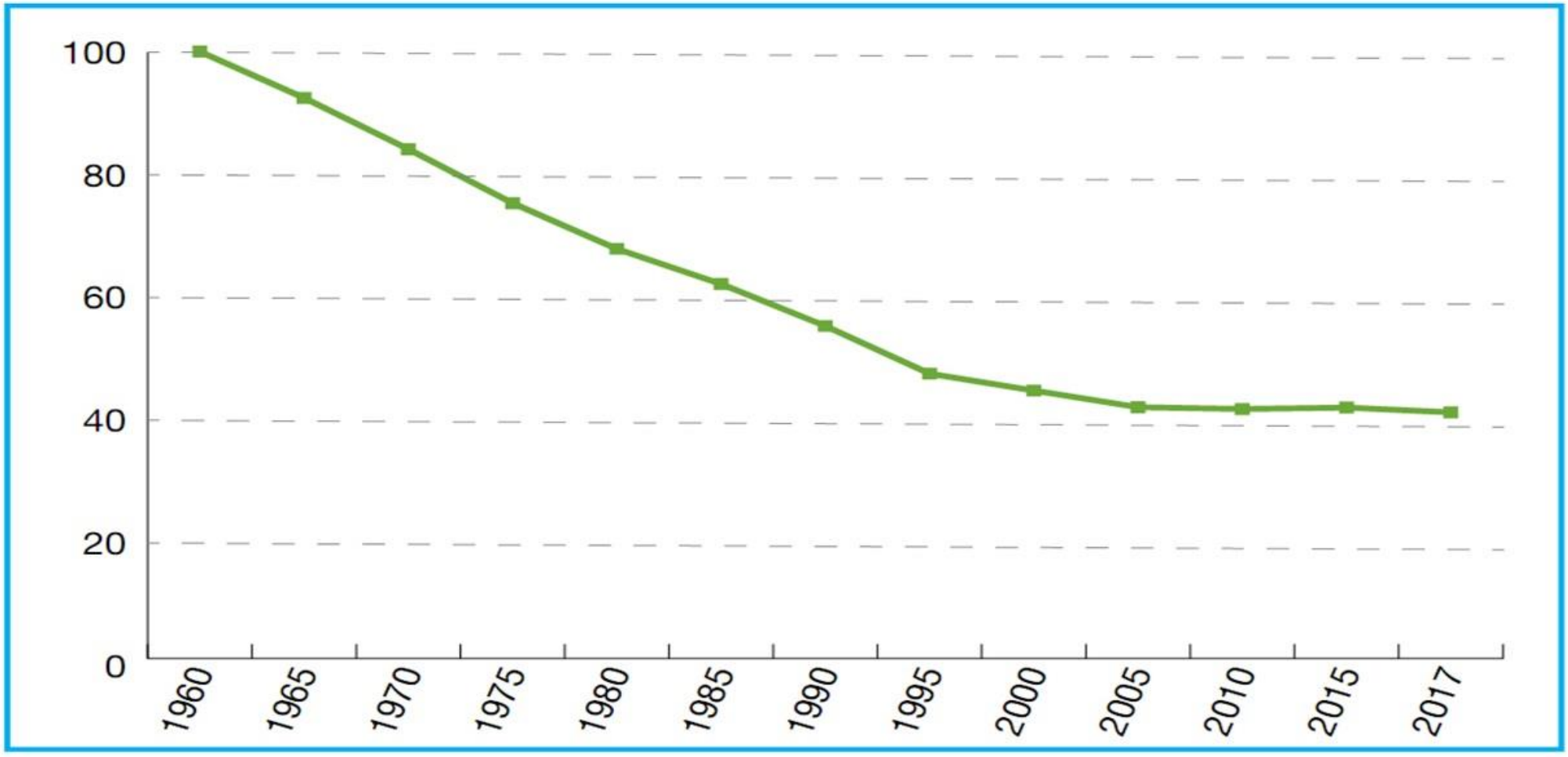


EUROFER based on worldsteel calculations

راهکارهای تحقق پایداری در صنعت فولاد

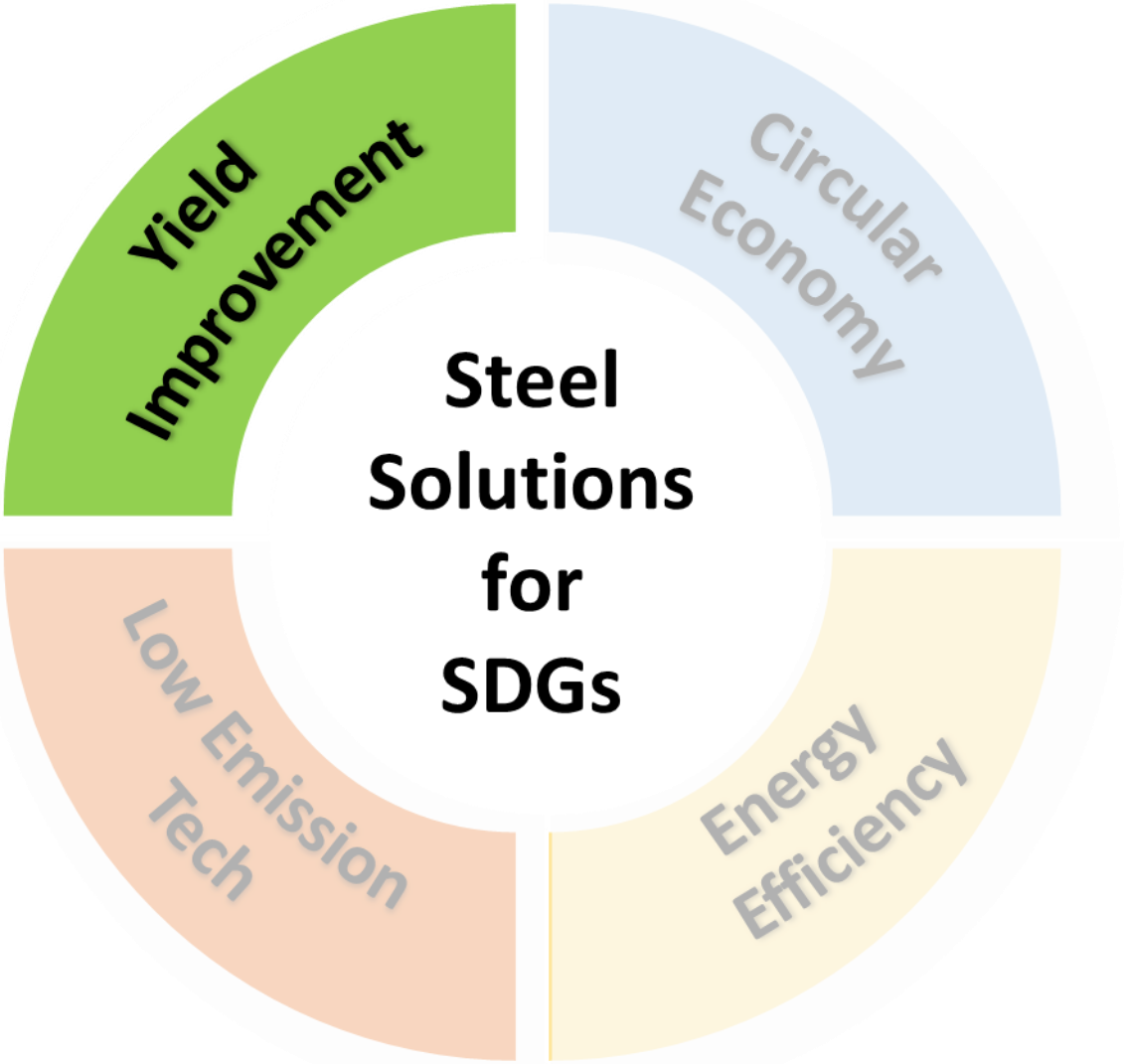
مراحل استفاده موثر از انرژی در صنعت فولاد

تغییرات مصرف انرژی در صنعت فولاد



Indexed global energy consumption/tonne of crude steel production

راهکارهای تحقق پایداری در صنعت فولاد



مهمترین تغییرات مفهومی در صنایع مختلف بواسطه تاثرات مگاترندها

Automobile

Electrification

- Hybrid, Electric, Fuel Cell Vehicle
- 41mil. Units: 35% of new cars sold in 2040 (Source: BNEF)

Autonomous Cars

- Google, NVIDIA-Audi, Intel-BMW
- 21mil. Units: 15% of cars sold in 2035 (Source: IHS Markit)

Sharing Economy

- Car Sharing(Zipcar etc.), Ride Sharing (Uber etc.)
- Absorbing 27% of mobility demand (Source: Roland Berger)

Energy & Shipbuilding

New Transportation Flow

- Natural Gas, CO_2 Storage and Transport
- New Arctic Routes

Eco Ships

- Energy efficient super container and tanker
- LNG, Fuel Cell Engines

Smart Ships

- Connected ships
- Unmanned ships

Construction

Mega Cities

- Growing cities
- Super skyscrapers
- Super Structures: bridge etc.

Green Cities

- Urban farming
- Eco-friendly design: LEED*

*Leadership in Energy & Environmental Design

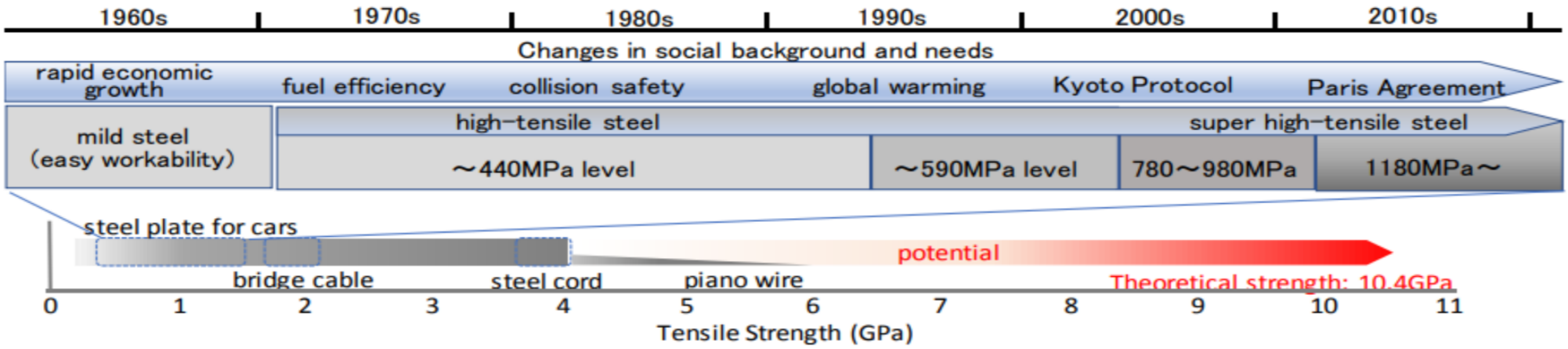
Smart Cities

- Digital, virtual, information, intelligent, ubiquitous city
- IT infrastructures: cables, data centers

Customers' needs become sophisticated and varying
Demand is rising for high strength/toughness, corrosion resistant & performance steel

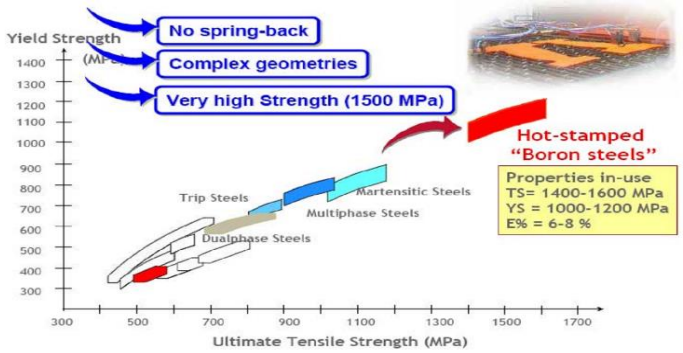
Industry	 Automobile	 Energy & Ship Building	 Construction
High strength & high toughness	▪ **Expanded application of giga-pascal AHSS for lighter cars** - DP, CP, HPF, TWIP, etc.	▪ **High strength & low-temperature toughness steel for deep-sea & polar exploration** : BCA, TMCP, etc.	▪ **High strength steel for skyscrapers/ super-long span bridges** - High strength bar, section, cable
High corrosion resistant	▪ **Heat resistant Stainless steels for exhaust systems** - 429EM, high Cr, 310S	▪ **Sour(H2S) resistant steel for extream conditions** - API steel for linepipe	▪ **High corrosion resistant steel for high temperature, high humidity environ.** - PosMAC, ZAM, Super Dyma, etc
High performance	▪ **High efficient hyper NO for EV motors, bio-shield steel for sensors, vibration damping steel**	▪ **Thick plate, radiation shield plate**	▪ **High performance steel for buildings** - Thermal insulation, self-cleaning, anti-bacterial, sound-proof

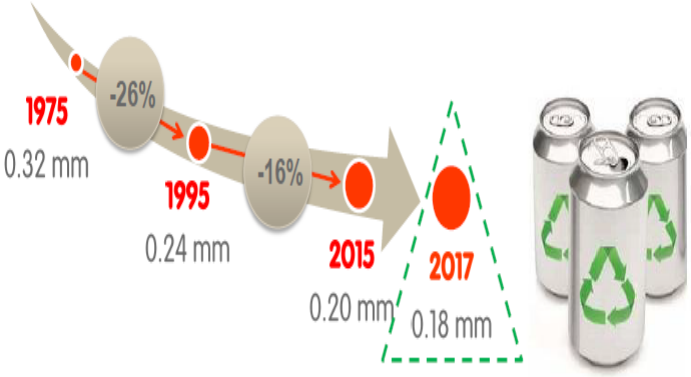
روند تولید محصولات پایدار در صنعت فولاد



(a) Skelton (b) Self-drilling connection

Fig. 14 Outline of steel-framed house





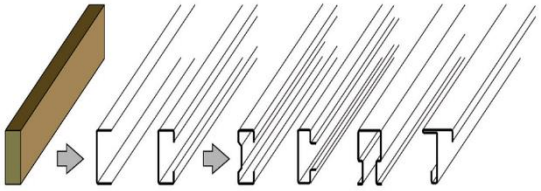
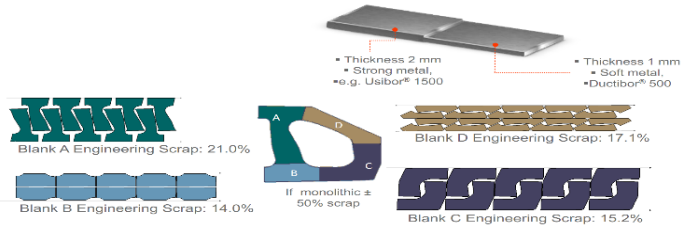


Fig. 15 Light-gauge steel shapes as substitutes to wooden member



Light weighting potential of at least 20% still to be exploited

آیا صنعت فولاد در توسعه پایدار موفق خواهد بود؟

materials production and recyclability

Global materials production has grown significantly over the past three decades; steel is the only manufactured material that can be fully recycled.

Figure 1: global production (1990=100)

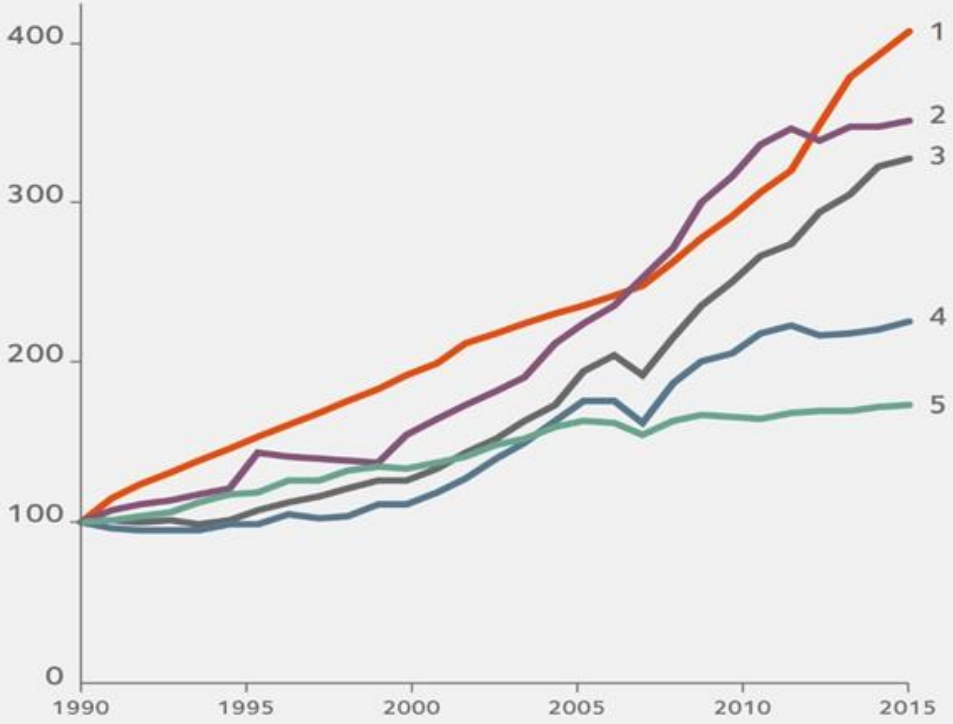


Table 1

Material group	Recyclability*	Made from end-of-life material
1 Plastics and synthetic fabrics	◒	5–10%
2 Cement[5]	○	0%
3 Aluminium	◔	21%
4 Steel	●	22%
5 Paper and cardboard	◔	50–60%

*Ability to make same material again at end of life

- ● Fully recyclable, low risk of downcycling
- ◔ Highly recyclable, risk of downcycling
- ◒ Partially recyclable, risk of downcycling
- ○ Little or no recyclability

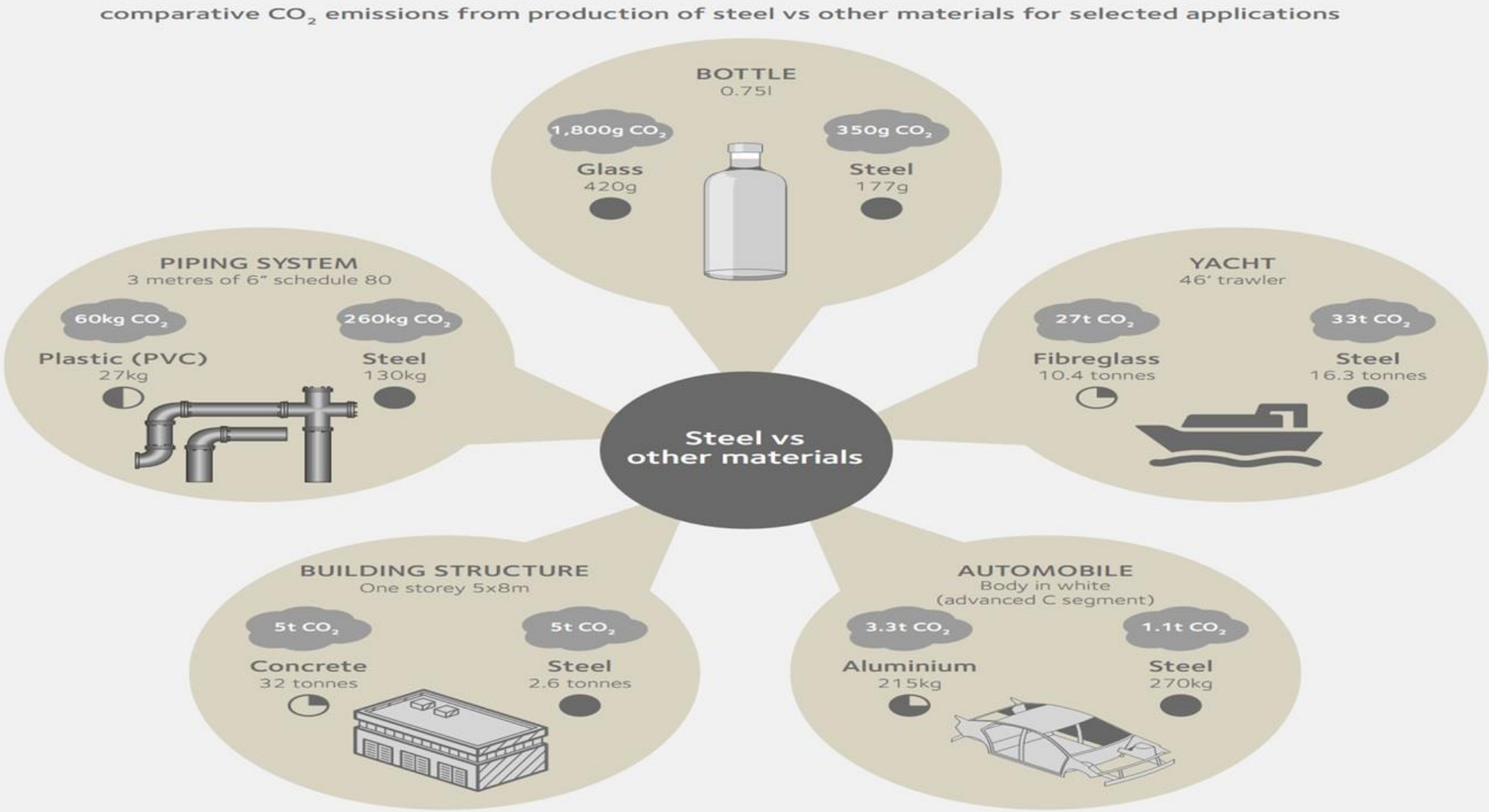
Source: ArcelorMittal corporate strategy

Steel recycling

Sector	2007 (est.)	2050 (target)
total	**83%**	**90%**
Construction	85%	90%
Automotive	85%	95%
Machinery	90%	95%
Appliances	50%	75%
Containers	69%	75%

Today every steel product contains on average 30% recycled

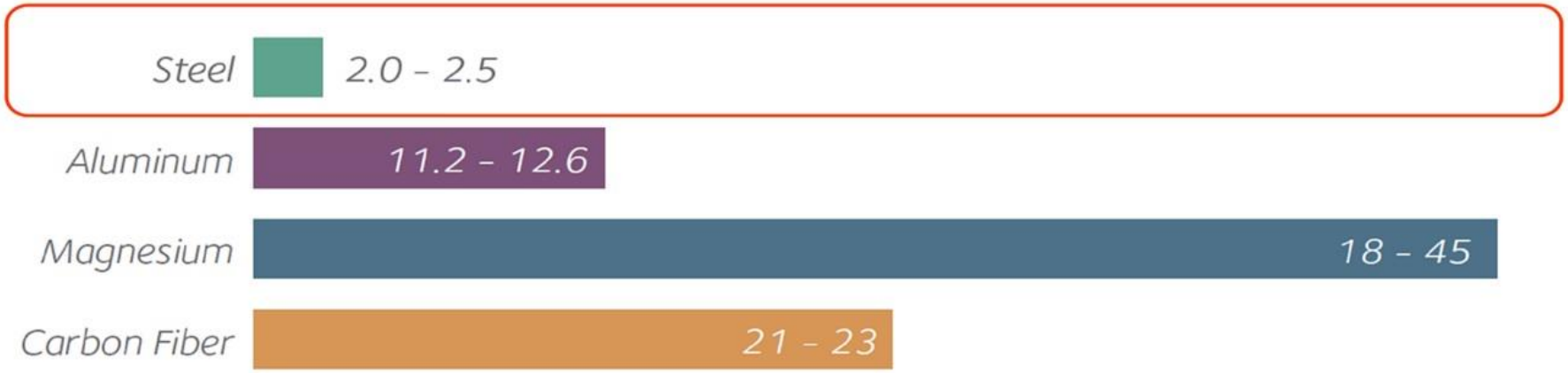
آیا صنعت فولاد در توسعه پایدار موفق خواهد بود؟



Icons represent the level of recyclability as in Table 1 on page 7.
*Figures relate only to emissions from production of material from primary (virgin) sources, not lifecycle CO_2 emissions of different materials.
Source: ArcelorMittal corporate strategy

GHG intensity per tonne of material

(many variable – recycled content, raw materials, source of electricity



Note: All steel and aluminum grades included in ranges.

Current communication based on WAS 2010

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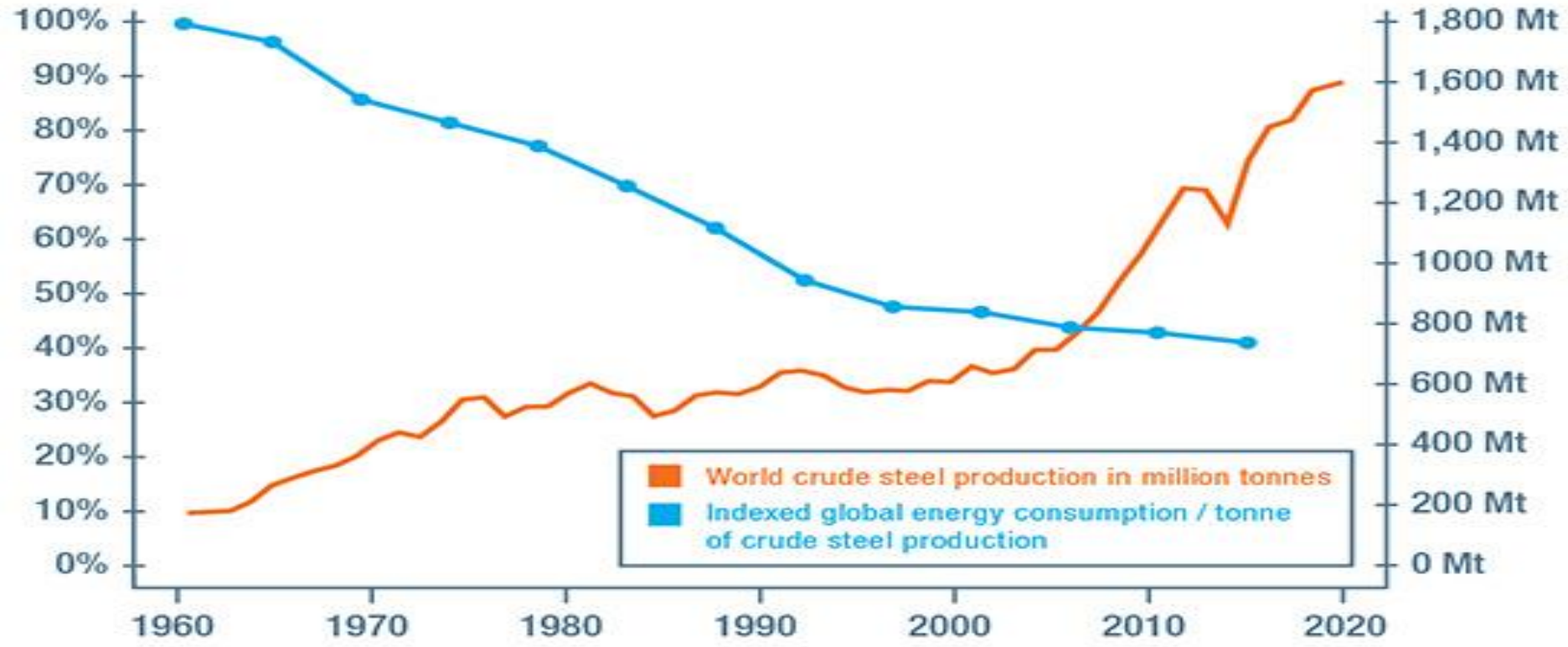
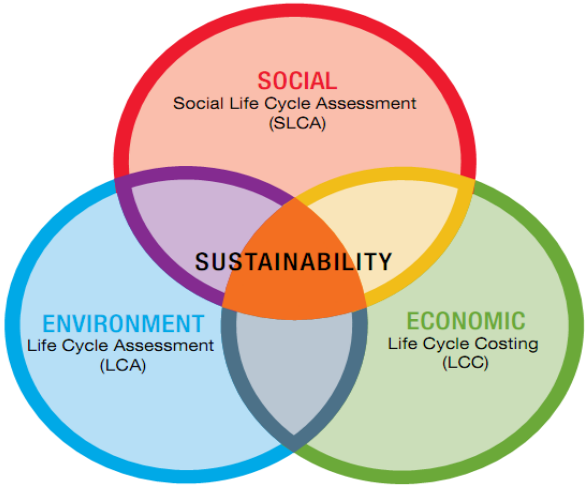


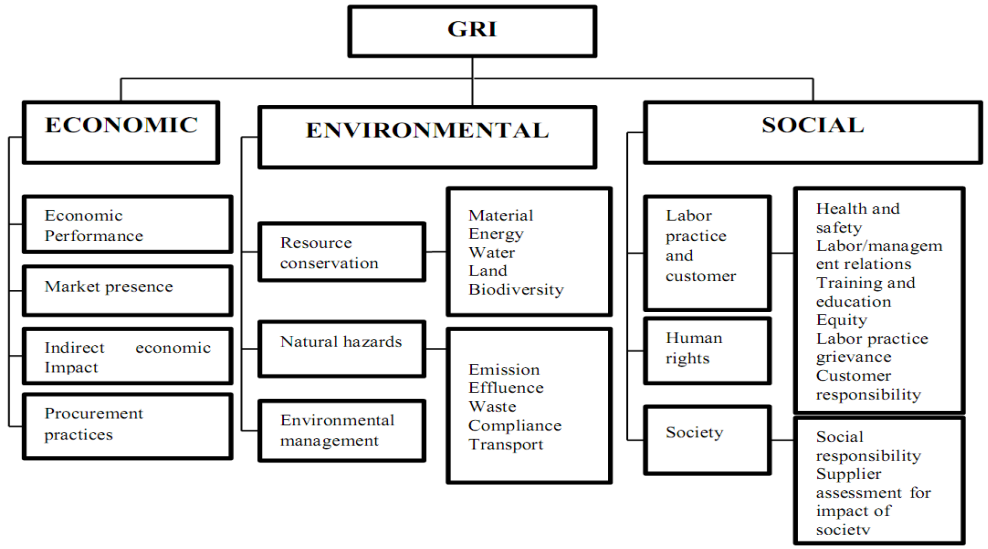
- Global steel production has increased almost fivefold since 1960
- Energy consumption has been reduced by 60% per tonne of steel in the same period

For every tonne of steel produced today, we save almost 24 GJ per tonne compared to 1960. That's enough energy to drive an average passenger vehicle 17,380 km, which is equivalent to driving across the USA and back more than twice.

Life cycle thinking:
Key to every aspect of sustainability



Global Reporting Initiative (GRI)



GRI Suggestive Indexes

INDICATOR	RELEVANCE	BENCHMARKING TRENDS	UN SDGs
Environmental sustainability			
1 Greenhouse Gas (GHG) Emissions	Reducing GHG emissions in steelmaking must be tackled on a global level. Making the substantial CO_2 reductions required will need technology transfer, collaboration and breakthrough technologies. Steel products also play an important role in a low carbon economy due to their long life cycle, 100% recyclability, and innovative qualities.	World GHG emissions 2014* 50 bnt Steel industry 6.6% Rest of total activities 93.4% On average, 1.9 tonnes of CO_2 are emitted for every tonne of steel produced. *Source: CO_2 Emissions From Fuel Combustion Highlights 2014 and 2015, IEA	UN SDG 13 – Take action to combat climate change and its impacts
2 Energy intensity	Steel production is energy-intensive. The steel industry has made significant reductions in energy consumption in the past decades resulting in benefits to the environment while ensuring economic competitiveness.	On average, 20 GJ/t crude steel cast The most energy efficient steel companies have reduced their energy consumption per tonne of steel produced by 60% since 1960.	
3 Material efficiency	The recovery and use of by-products within and outside the steel industry combined with the responsible management of natural resources contribute to material efficiency and help to prevent waste.	Steel production output 2015 based on materials used Crude steel production and by-products 97.3% Waste 2.7% Our goal is zero waste.	UN SDG 12 – Responsible consumption and production
4 Environmental Management Systems (EMS)	Registered environmental management systems are an effective way to manage environmental performance and to ensure legal compliance.	84.0% (2005), 87.6% (2010), 93.6% (2015) +11.5% 11.5% increase of employees and contractors working in EMS-registered production facilities since 2005.	
Social sustainability			
5 Lost time injury frequency rate	Our industry employs millions of people. Nothing is more important than the safety and health of the people who work in the steel industry.	4.2 (2005), 2.3 (2010), 1.2 (2015) -72% Lost time injury frequency rate has improved by 72% since 2005.	UN SDG 8 – Decent work and economic growth
6 Employee training	Human capital is a key asset for all organisations and a main driver for the creation of value. Training programmes aim to expand the knowledge and skills of employees and help them to make the best use of their talents.	6.4 (2014), 6.8 (2015) +5% 5% increase in training days per employee compared to 2014.	
Economic sustainability			
7 Investment in new processes and products	Investments in new processes and R&D contribute to a sustainable steel industry.	Percentage of revenue invested in new processes and R&D 7.4% (2014), 12.6% (2015) +71% 71% increase in investment since 2014 (excluding developing countries, the increase is 4%).	UN SDG 9 – Industry, innovation and infrastructure
8 Economic Value Distributed (EVD)	Steel is critical to economic growth. It is important to quantify the value companies create and to establish how much of this wealth is distributed to society.	Economic value distributed to society in 2015 US$ 1,068 bn	UN SDG 8 – Decent work and economic growth

با تشکر از توجه شما