

BUILDING A SUSTAINABLE FUTURE:

FIND OUT MORE ABOUT
ENERGY TRANSITION
INITIATIVES IN MINAS GERAIS



DESENVOLVIMENTO
ECONÔMICO



**MINAS
GERAIS**

GOVERNO
DIFERENTE.
ESTADO
EFICIENTE.





“ On signing up as Latin-American pioneers in the Race to Zero campaign, we in Minas Gerais opted to assume a serious commitment to decarbonization and the energy transition, along with our pledge to support and facilitate life for those investing and working.

This is what the state government has done: by creating an environment that shields investment from political interference we are working to inspire trust among investors that, in Minas Gerais, the rules are followed and business is rewarded. ”

Romeu Zema

Minas Gerais State Governor



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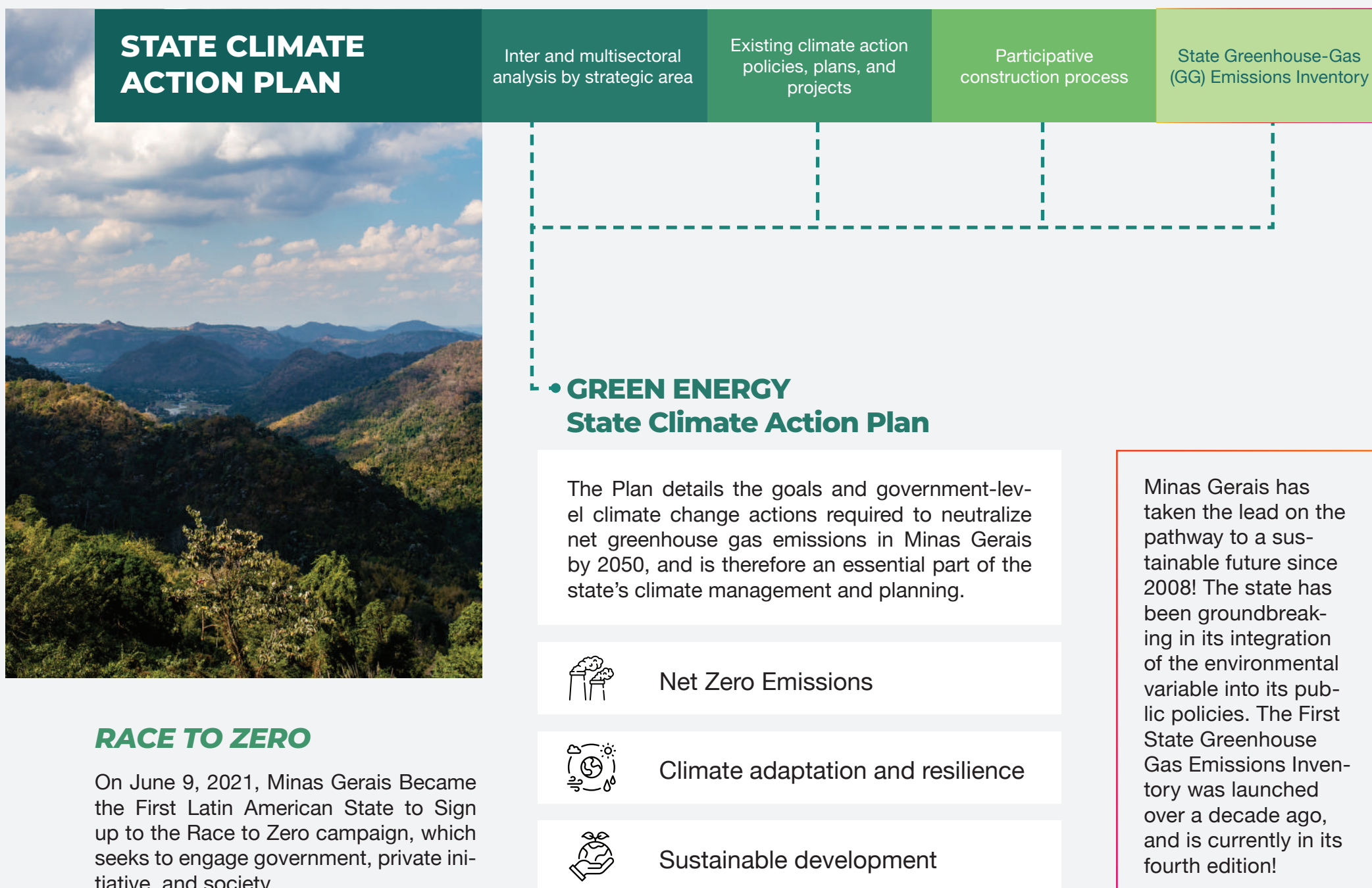


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1. BUILDING A SUSTAINABLE FUTURE: FIND OUT MORE ABOUT ENERGY TRANSITION INITIATIVES IN MINAS GERAIS

The state is at the forefront in Latin America for embracing the Race to Zero campaign, with a serious commitment to decarbonization and the energy transition. A vibrant landscape of initiatives supports this commitment, from constant updating of the State Greenhouse Gas Emissions Inventory to formulation of the visionary State Climate Action Plan, and the inspirational Decarbonization Route project.

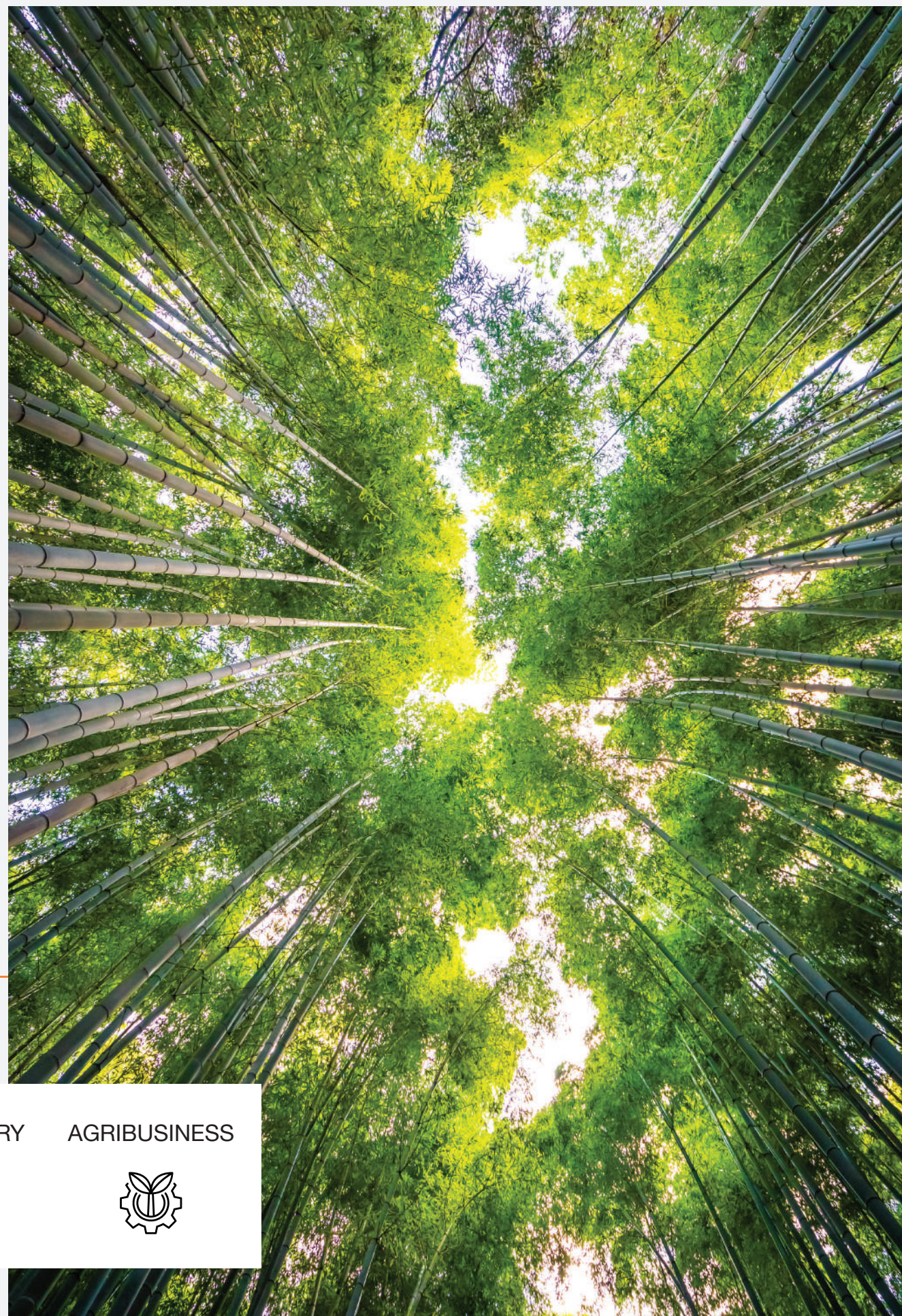


RACE TO ZERO

On June 9, 2021, Minas Gerais Became the First Latin American State to Sign up to the Race to Zero campaign, which seeks to engage government, private initiative, and society.

DECARBONIZATION ROUTE

In a collaboration led by the Minas Gerais State Government and coordinated by Invest Minas and the State Department for Economic Development (SEDE-MG), in liaison with the Environment and Sustainable Development Department, the Decarbonization Route project was conceived. Its mission is to bring together a range of public- and private-sector actors in a joint effort to chart the course toward decarbonization of the MG economy.



PRIORITY SECTORS

TRANSPORT



ENERGY



INDUSTRY



AGRIBUSINESS



SECTOR DIAGNOSES

- Mapping and engagement of key players
- Ongoing initiatives (public & private sectors)
- Emissions profile
- Technologies and their mitigation potentials
- Technical, economic, political, and social barriers

SCENARIO EVALUATION

- Technological alternatives
- Financial cost
- Economic return
- Environmental impact/noise-reduction

INVESTMENTS REQUIRED

- Charting of funding sources and products
- Subsidies for a green investment attraction strategy

RESULTS



GOVERNMENT

Public policies and regulation



INVEST MINAS

Green investment attraction strategy



PRIVATE SECTOR

Investments in decarbonization and green projects



2. ENERGY TRANSITION: OPPORTUNITIES AND INITIATIVES

GLOBAL CONTEXT

The current consensus is clear: concrete and urgent actions are necessary to achieve the goal of net-zero greenhouse gas emissions by 2050 and to limit global warming to 1.5°C.

The cost of inaction can be described not only in environmental and social aspects but also economically. It is estimated that by 2070, the global economy could suffer losses of \$178 trillion, in terms of net present value, in a scenario where the average global temperature increase of 3°C cannot be prevented. On the other hand, compared to this scenario, limiting global warming to the mentioned level could represent a gain, also in terms of net present value, of \$43 trillion.

In summary, the status quo is the most expensive option, not only environmentally and socially but also economically.

Sources: Deloitte. The Turning Point - 2022



LOSS OF \$178 TRILLION BY 2070 WITH A 3°C INCREASE IN GLOBAL TEMPERATURE

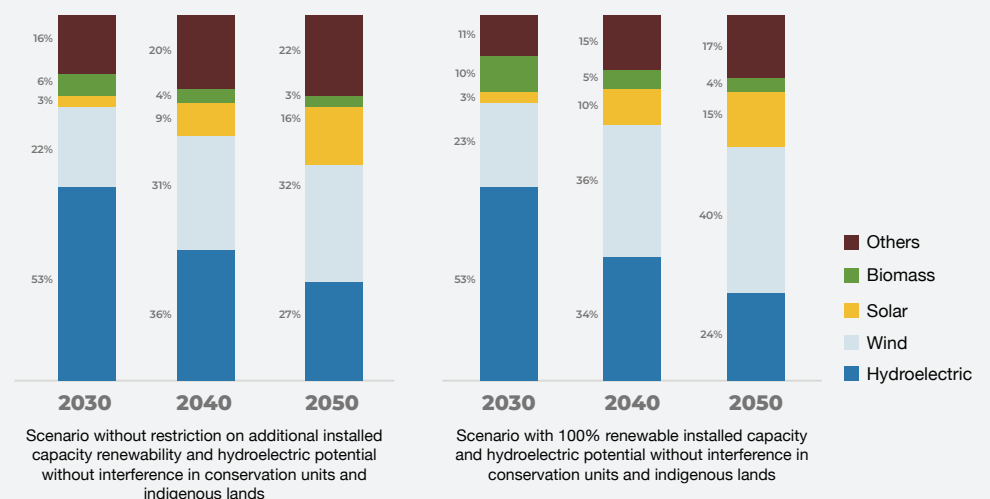


GAIN OF \$43 TRILLION BY 2070 WITH THE LIMITATION OF GLOBAL WARMING

BRAZIL: LEADER IN THE ENERGY TRANSITION

Brazil is a key player in the global energy transition, and is in a privileged position to lead the shift toward a low-carbon economy. Almost 50% of the country's energy, and more than 80% of its electrical energy, come from renewable sources—much higher levels than those observed globally. Solar and wind energy, increasingly economically attractive due to reduced costs, are set to significantly increase their participation in installed electricity generation capacity. This puts Brazil front and center as one of the most competitive places in the world for the production of green hydrogen—paramount for decarbonization globally—particularly in sectors where it is difficult to achieve emissions targets.

PROJECTED PARTICIPATION OF SOURCES IN CENTRALIZED INSTALLED ELECTRICAL ENERGY GENERATION IN BRAZIL - DIFFERENT SCENARIOS



Home to the planet’s most extensive tropical forest—and greatest diversity—and as the fifth-largest agricultural producer globally (with enormous sustainable agriculture potential), Brazil is the world’s most well-placed country with potential to sequester carbon from the atmosphere through preservation of its biomes, restoration of degraded areas, and development of low-carbon farming. McKinsey & Company provided a 2040 market projection of decarbonization opportunities for Brazil on different fronts.



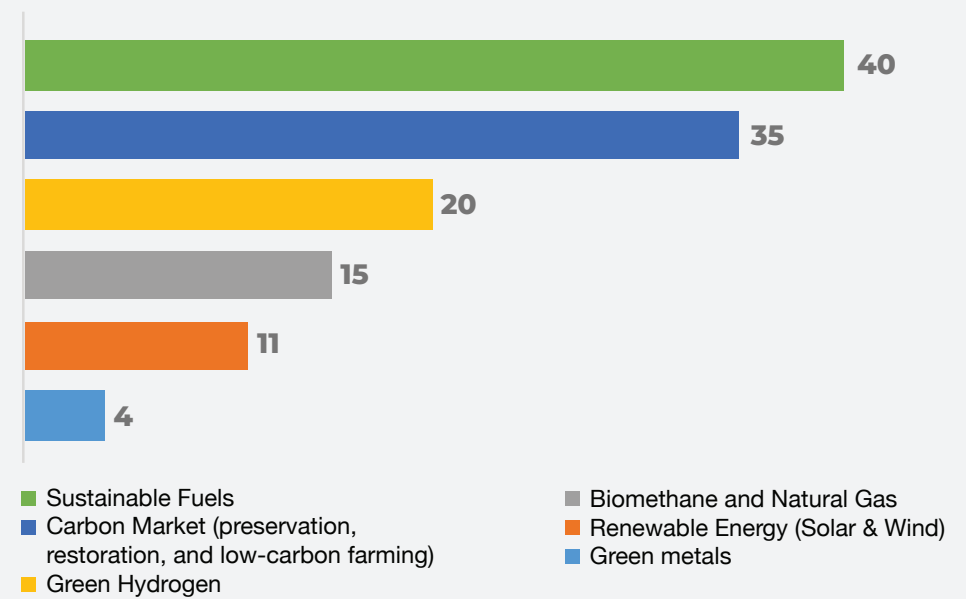
SOLAR ENERGY

Minas Gerais is Brazil’s leading state for solar energy generation, with 7.9 GW of total installed capacity in operation. In terms of centralized generation, installed operational capacity is 4.2 GW, accounting for 33% of the national total.

Some 96% of centralized installed electricity generation capacity in Minas Gerais comes from renewable sources (against 84% for Brazil), of which 21.5% originates from solar energy (against 6.3 % nationally). According to the McKinsey & Company projections, the levelized cost of energy (LCOE) for solar generation should see a 46% reduction in Brazil by 2040, a prospect that favors new enterprises and further gains in solar energy’s share of the electrical grid. Businesses under construction in Minas Gerais represent an additional installed capacity of over 3 GW in centralized generation. As the uptake of solar power has expanded, photovoltaic modules have become MG’s most widely imported product; at the same time, the state is one of the world’s foremost silicon metal producers in the world, factors that signal opportunities for consolidation in this productive chain.



2040 MARKET VALUE OF PRIMARY DECARBONIZATION OPPORTUNITIES FOR BRAZIL (US\$ BILLION)



8 GW of total installed capacity	1/3 of national centralized generation capacity (4 GW)	3 GW in additional centralized generation capacity under construction
96% of the electricity mix is renewable (21% solar)	46% reduction in generation costs by 2040	35 GW in additional authorized capacity with construction to commence

SOL DE MINAS (MINAS SUN) PROJECT

Since the project's inception in 2019, installed solar energy generation capacity has seen considerable growth in Minas. Key aspects of the project include:

- Simplified environmental licensing
- Tax incentives
- Training for municipal administrators in investment attraction and formulation of public policies
- Development of the Network Availability Map, a real-time tool informing connection availability for new distributed mini-generation enterprises



With support from Invest Minas, renewable energy company Elera Renováveis have installed the biggest and third-biggest solar farms in Brazil. Full operating capacity totals around 2 GW, with R\$6 billion in investments.



WIND ENERGY

Although installed wind energy generation capacity is primarily concentrated in northeastern Brazil, the potential of Minas Gerais to use this method is also worthy of note. Based on information collated under the 2050 National Energy Plan, the installable potential identified in the Minas Gerais Wind Atlas takes on a relevant position compared to other states, which have also mapped their potential using their own wind atlases. For example, considering areas with wind speeds exceeding 7m/s and 70-meter (m) heights, the installable potential of 64 GW mapped in Minas in 2010 exceeds the potential identified by the states of Paraíba and Pernambuco in 2017. MG currently has an operating power plant with installed capacity of 156

KW. Another eight projects authorized by the Brazilian Electrical Energy Agency (ANEEL) for the company Voltalia, with construction yet to begin, total 384 MW. Invest Minas is supporting wind and hybrid projects (wind + solar), forecast for operational start-up in 2025 and 2030, totaling R\$13 billion in investments, and 3.8 GW in wind generation capacity.

INSTALLABLE POTENTIAL (MW) ACCORDING TO STATE WIND ATLASES

Date	State	Height (m)			TOTAL
		70/75/80	100	140/150	
2014	Rio Grande do Sul	-	102,800	245,300	348,100
2013	Bahia	38,600	70,100	195,200	303,900
2019	Ceará	23,144	41,770	94,274	159,188
2010	Minas Gerais	24,742	39,043	-	63,785
2017	Paraíba	6,000	14,700	42,100	62,800
2003	Rio Grande do Norte	19,431	27,080	-	46,511
2017	Pernambuco	6,600	10,725	20,830	38,155
2007	Paraná	1,363	3,375	-	4,738
2002	Rio de Janeiro	1,524	2,813	-	4,337
2009	Espírito Santo	448	1,143	-	1,591
2008	Alagoas	336	649	-	985
2012	São Paulo	15	564	-	579

German Corporation Sowitec plans to invest almost R\$10 billion in hybrid solar and wind energy-generation complexes. In terms of the latter, the company's projects represent a total installed capacity of 3.3 GW.





THE MARKET IN PRACTICE

“More than 90% of our energy mix comes from renewable sources; we have industries that produce and consume fuel, we have companies that manufacture the equipment to produce hydrogen, companies that fabricate green products using hydrogen, and the capacity for exports. Minas could have the whole hydrogen chain within its state lines. This is an exponential impact.”

Marcelo Veneroso
CEO of Neuman & Esser in Brazil

GREEN HYDROGEN

Given its competitive edge in renewable energy production, with a considerably higher level of participation in its electrical and energy networks than the global average, Brazil is well placed to become one of the world’s foremost green hydrogen producers, and Minas Gerais has a prominent position in this scenario. Considering all enterprises authorized by the Brazilian Electrical Energy Agency (ANEEL) to generate electricity from renewable sources, the state has the highest installable capacity in the country, with a total of almost 60 GW.¹ Minas is also of great relevance across sectors whose decarbonization will probably depend on the use of green hydrogen, and is a national leader in steelmaking industries (27% of output value), mining (31% of production), cement (23% of production value), and fertilizers² (62% of output). McKinsey & Company project a national green hydrogen market worth US\$20 billion in 2040, with predominance of the domestic market (US\$12 billion) on exports (US\$6 billion). Investments required for the development of this market in Brazil are estimated at US\$200 billion.

¹ Includes enterprises in operation, under construction, and yet to commence construction.

² In March 2024, Eurochem inaugurated a fertilizer factory in Minas Gerais, with capacity to fulfil 15% of national demand, which is certain to enhance the state’s leadership in this sector.



NEUMAN & ESSER

Neuman & Esser is investing R\$70 million in the construction of a green hydrogen generator factory (ethanol, biomethane, or natural-gas electrolysis and reforming cells) in MG state capital Belo Horizonte.



CH2V
CENTRO DE HIDROGÊNIO VERDE

Another groundbreaking initiative in the state is the Green Hydrogen Center of the Federal University of Itajubá, which will undertake research to support green hydrogen market expansion in Brazil, with the planned pilot electrolyzing plant with cells supplied by Neuman & Esser.



ATLAS
AGRO

In agribusiness, the company Atlas Agro is set to invest R\$4 billion in the production of green fertilizers and hydrogen in Minas Gerais.

BIOMASS

Forest Biomass

Minas Gerais has Brazil’s most extensive area of planted forests, concentrating almost 90% of charcoal production; this input’s application in steel and ironworks in the state is highly relevant and sustainable.

Urban Waste Biomass

Minas Gerais has Brazil’s second-highest concentration of urbanized areas, accounting for 10.5% of the total mapped across the country.

Farming Biomass

As one of Brazil's leading agribusiness states, Minas is also among key producers of important sources of biomass such as sugarcane, soy, and corn. In terms of sugarcane, the state is in expansion: increasing record harvests in 2023–2024 will place it as Brazil's second-highest producer. Minas Gerais is also home to Brazil's most numerous total milk herd, with the fourth-biggest beef and pork livestock headcount, and high potential for energy generation using animal waste.

BIOFUELS

Ethanol

Minas is the fourth-biggest ethanol producer nationally, with the country's second most significant hydrous ethanol market. To encourage its use, the state has the country's biggest difference between the State VAT rate on gasoline, and the rate inciding upon this biofuel. In September 2023, the Minas Gerais Sugar Energy Industry Association (SIAMIG) announced sizeable investments in the state sugarcane chain, from crops to production of ethanol and development of new technologies related to the fuel, electric mobility, and green hydrogen.



The pig-iron sector and steelmakers such as Aço Verde Brasil, Gerdau, Vallourec, and ArcelorMittal operate to high sustainability standards in Minas Gerais

State Policy for Stimulation of Ethanol Consumption

This policy, created in early 2024, lists actions to encourage the consumption of ethanol, support its productive chain, and promote low carbon emissions in farming.



With inputs of R\$11.3 billion and creation of 1,600 jobs, companies associated to SIAMIG invest in various stages of the productive ethanol chain in Minas.

Biogas and Biomethane

The use of biomass (especially sugarcane and animal waste) for the production of biogas and biomethane also presents a great opportunity to be more widely explored in Minas Gerais. The potential for decarbonization of biogas in the state is calculated at 7.4 million tCO₂e/year for its use as a fuel (biomethane), and 6.6 million tCO₂e/year for its application in electricity generation. The state houses the highest number of biogas plants in Brazil: total output across the 274 facilities was 313 Nm³/year in 2022—the country’s third-highest volume, a 50% increase on the previous year.



Invest Minas is supporting the project involving investment of R\$152 million by Italian company Asja, with planned biomethane output capacity of 80,000 m³ per day.

Sustainable Aviation Fuels

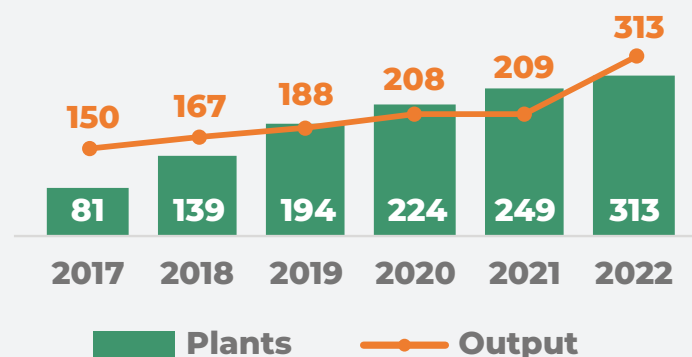
McKinsey foresees a rapid increase in global demand for sustainable aviation fuels (SAFs) over the coming years due to regulatory advances. By 2050, almost 40% of the total energy demand in aviation is set to be supplied by SAFs. For Brazil, this market, with focus on exports, may turn over US\$40 billion by 2040. The type of raw material used and greenhouse gas emissions are central elements, and production using oils cultivated from species grown after reforestation of degraded pastures is shaping to meet the most demanding requirements—those of the European market. A survey of degraded pastures with good agricultural conversion potential, carried out by the Brazilian Agricultural Research Corporation (EMBRAPA), puts Minas Gerais, with 4 million hectares, among the states with most areas in these conditions.



Two recently-announced projects in the state are a perfect fit for this: based on development of agroforestry systems and bioindustrial hubs, sustainable feedstock company S.Oleum intends to restore 175,000 hectares to produce advanced vegetable oils from the macaw palm (Macaúba) and other native trees.

Energy firm Acelen, created by the Mubadala Capital fund, will invest R\$125 million to install an Innovation & Technology Center for the industrial production of vegetable oils and other macaw palm byproducts.

BIOGAS PLANTS AND OUTPUT VOLUME (NM³/YEAR) IN MINAS GERAIS



S.Oleum, founded in Minas Gerais, and Acelen, belonging to Mubadala Capital, are investing in vegetable-oil production with advanced applications, including the sustainable aviation-fuel industry.



REGENERATIVE, LOW-CARBON FARMING

Beyond the production of vegetable oils and other sustainable inputs from restoration of degraded biomes, farming in Minas Gerais, supported by state-level public policies, has the potential to advance, based on a circular economy and low-carbon emission processes. The ABC+/MG Plan, formulated by the State Agriculture, Livestock, and Supply Department (SEAPA), lists a number of different actions and goals toward this end. Projects such as that of meat company Carapreta Carnes Nobres demonstrate the potential for success of sustainable enterprises in the sector.

ABC+/MG Plan

The State Sectorial Plan for Adapting to Climate Change and Low Carbon Emissions in Farming (ABC+/MG Plan) seeks to promote adaption to climate change in control of greenhouse gas emissions in farming across the state, based on practices and technologies such as:

- Remediation of Degraded Pasture lands
- Cropping Integration Systems – Livestock– Forest
- Agroforestry Systems
- Bioinputs
- Animal Waste Management



Solar energy, water reuse, repurposing of animal waste to generate biogas and industrial inputs, and implementation of circular economy processes, are relevant components of the Carapreta enterprise—a R\$1.2 billion project supported by Invest Minas.

STRATEGIC MINERALS

The lion's share of mineral production in Brazil is concentrated in Minas Gerais; indeed, the name derives from the historical importance of mining for the state. Opportunities in this sector go far beyond iron ore—the state is responsible for more than 50% of national production—and include several materials considered strategic for decarbonization and the energy transition, such as lithium, silicon, rare-earths, graphite, manganese, potassium, and phosphate.

It should be noted that the state is one of the world's foremost silicon metal producers, and that its output, due to the use of reforestation charcoal and renewable energy, enables classification of the silicon produced in Minas as green silicon. With the recent growth of proven reserves in the state—the biggest in Brazil—and the registration of mining rights with the National Mining Agency (ANM), Minas is enjoying a boom in lithium project investments—R\$5.5 billion in projects assisted by Invest Minas (announced, under implementation, or in operation) and an expected total of R\$30 billion by 2030.

A further R\$5 billion has been announced in rare-earth mining projects by companies Meteoric Resources, Terra Brasil Minerals, and Viridis Mining & Resources. Companies MTR Mineração Terras Raras and Aclara are also looking at implementing rare earth projects in the state.



Lithium Valley Brazil is a socioeconomic program created by the Minas Gerais state government, based on the lithium production chain. According to the Brazilian Geological Service, the area is home to Brazil's largest proven lithium reserve. The program seeks to promote investments, business, jobs, and income in the Jequitinhonha Valley (region with the state's lowest human development index), and to introduce Minas Gerais into the global



Investing companies:



3. COME TO MINAS SEE HOW INVEST MINAS CAN DRIVE YOUR PROJECT



INCENTIVES

Minas Gerais offers fiscal incentives that reduce costs and confer competitiveness upon your business. Invest Minas advises companies in their dealings with the Treasury.

STATE VAT (ICMS) INCENTIVES:

- **Output** (+60 sectoral tax treatments)
- **Importation and sale** (import corridor)
- **Distribution centers linked to the industry**

CORPORATE TAX (IRPJ) INCENTIVES:

- **IRPJ exemption** for up to 10 years under the Digital Inclusion Program
- **75% IRPJ reduction** for up to 10 years for new businesses
- **Reinvestment of 30% IRPJ**



HUMAN RESOURCES

We have education programs tailored to offer qualified professionals to companies and increase employability among the population. In partnership with the State Education and Social Development Departments, Invest Minas gauges business demands to define qualification courses.

PATHWAYS OF THE FUTURE:

Pathways of the Future (Trilhas de Futuro) is an MG State Government program to provide technical courses free of charge to students and those graduating from high school.



EDITIONS 1, 2, and 3

- 81 courses
- 277 educational institutions



2024

- 50,000 new vacancies



FUNDING

Invest Minas puts companies in contact with financing solutions, especially the Minas Gerais Development Bank (BDMG), our key partner.

BDMG

The Minas Gerais Development Bank offers a range of credit solutions for:

- Investments (installation, expansion, and modernization)
- Sustainability (renewable energy and energy efficiency)
- Working capital
- Innovation
- Agribusiness

BNB

The Bank of the Northeast draws on resources from the Northeast MG Constitutional Financing Fund (FNE) to finance long-term investments, working capital, and defrayal across a number of areas:

- Agribusiness
- Industry
- Trade & Services
- Tourism
- Infrastructure
- Health
- Innovation
- Sustainability
- Distributed Micro and Mini Generation
- Startups

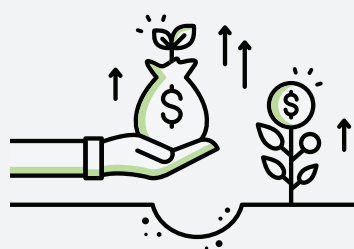


LOCATION

Invest Minas advises companies in identifying the most suitable site for installation of their enterprise, in partnership with municipalities across the state.

GEO MG

A publicly-accessible GIS system developed by Invest Minas, GEO MG cross-references information from a database of public and private real-estate properties available to receive projects (land lots, hangars, logistics parks, and industrial estates) with a variety of other relevant information on MG (infrastructure, economy, education, etc.), enabling identification of the best site for a project in accordance with its specific needs.



INNOVATION

Minas Gerais supports companies in innovation projects. Invest Minas puts you in touch with the best tools.

COMPETE MINAS (MG RESEARCH FOUNDATION – FAPEMIG)

- Economic subsidies for innovative processes in companies or Science & Technology Institutions (STIs)
- First call: R\$100 million in available funds
- Counterpart funding: 10%

EMBRAPII

- Brazilian Industrial Research & Innovation Corporation – Partial funding of innovation projects between companies and universities
- Possible funding of up to 50% of projects with non-reimbursable resources

BDMG Pro-Innovation: + R\$ 50 million

Inovacred (partnership with Federal Government Project & Research Funding – FINEP): + R\$ 500 million

INFRASTRUCTURE

Investments in public infrastructure to increase the competitiveness of companies, which may be reimbursed with State VAT (ICMS) credit. Invest Minas will guide you through the process.

ICMS CREDIT GRANT

Companies from across all sectors in Minas Gerais may use up to 60% of incremental ICMS—the difference between the tax due in the calculation period, and the tax due in the same period of the financial year prior to concession of the benefit—for roadworks in the public interest.



Invest Minas is the Minas Gerais State Government's Investment Promotion Agency—the first of its kind in Brazil—and for over 50 years has assisted entrepreneurs, promoting attraction and facilitation of investments, and contributing to job and income generation in Minas Gerais.

We are a state-level agency, linked to the Economic Development Department, maintained by the Minas Gerais Development Corporation (CODEMGE) and the MG Development Bank (BDMG).

ONE-STOP SHOP

Unified service for investors, in liaison with public agencies and private entities to ensure the success of projects through all their phases.

SUPPORT IN NEW BUSINESS DEVELOPMENT AND IMPLEMENTATION

Connection of partners and support to accelerate investments and business

PROJECT SITING

Support and identification of suitable municipalities and properties for the project, in line with the criteria set by the investor, and in liaison with municipal authorities.

PUBLIC POLICIES

Proposal of public policies favoring the business environment and improving the competitiveness of Minas Gerais.

INTERNATIONAL PROMOTION AND PROSPECTING

Promoting Minas Gerais as an investment and business destination for international companies and investors.

SKILLS-ENABLING AND STRENGTHENING OF MUNICIPALITIES

Contributing to investment attraction and economic development expertise in towns and cities.

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Analysis of the Biofuels Scenario.

International Renewable Energy Center – CIBIOGÁS

National Mining Agency (ANM)






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