



# ICGEB

International Centre for Genetic  
Engineering and Biotechnology

The background of the cover is a vibrant green. It features a large, semi-transparent DNA double helix structure that winds across the page. Overlaid on this are various white chemical structures, including hexagons, pentagons, and complex organic molecules, some with labels like 'Ca', 'GH', 'Lk', 'Tr', and 'Q'.

## ICGEB STRATEGIC PLAN 2020-2030

Science for Development

## International Centre for Genetic Engineering and Biotechnology

### VISION

To be the world's leading intergovernmental organisation for research, training and technology transfer in the field of Life Sciences and Biotechnology

### MISSION

To combine scientific research with capacity enhancement, thereby promoting sustainable global development

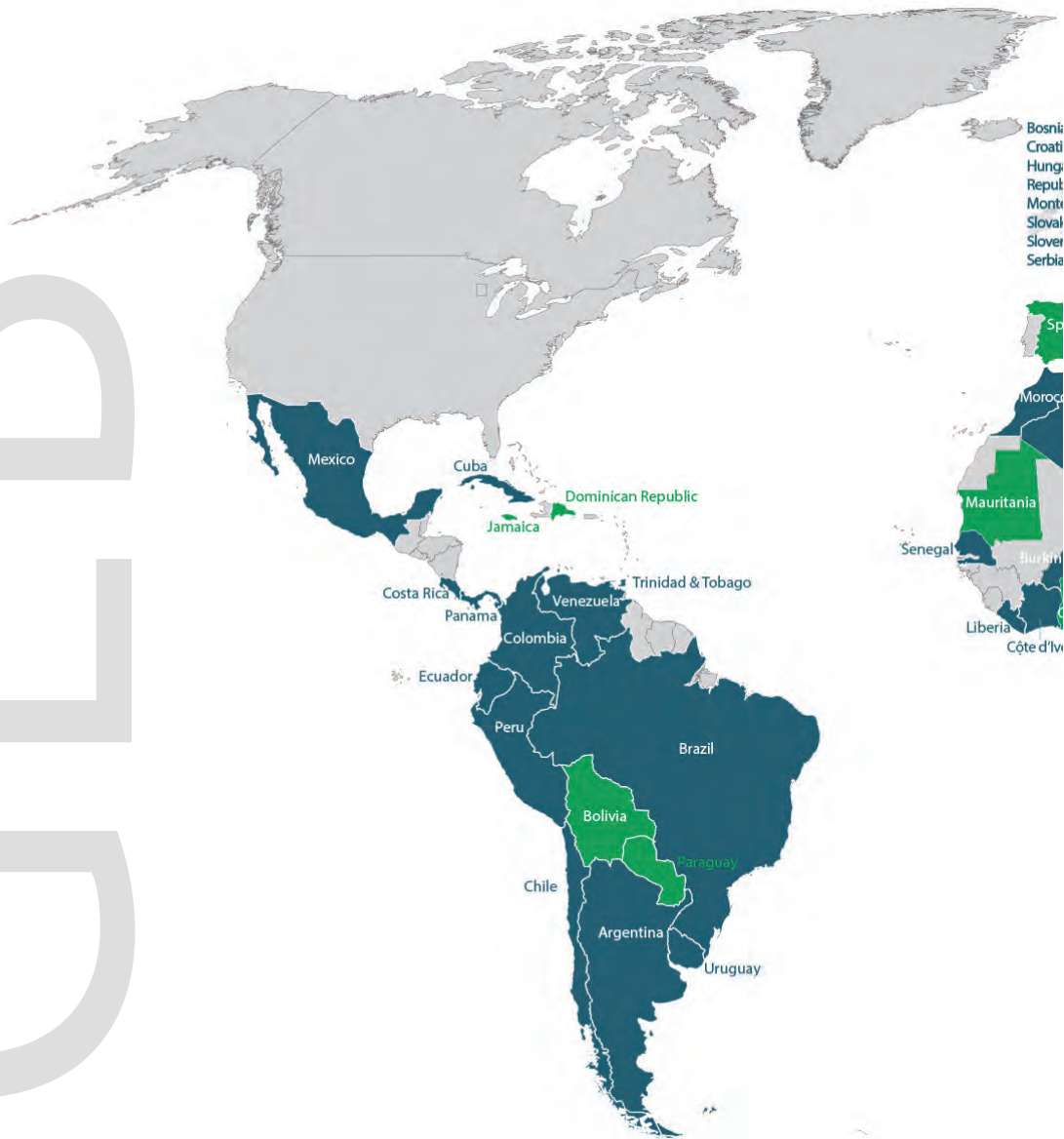


# Science for Development

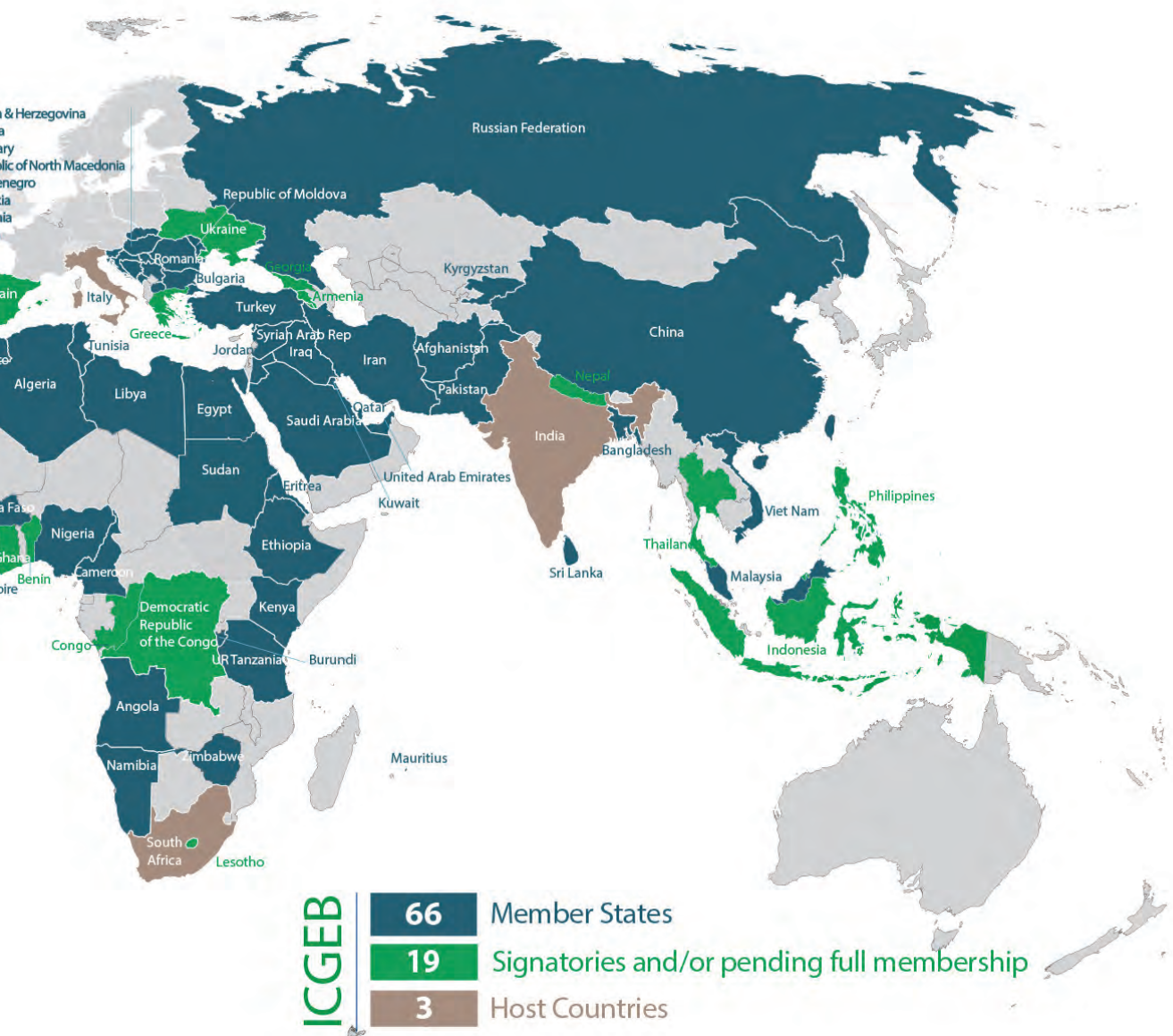
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# ICGEB



The International Centre for Genetic Engineering and Biotechnology (ICGEB) is an Intergovernmental Organisation and its operations are aligned with those of the United Nations Common System. It operates as a Centre of Excellence for Research, Training and Technology Transfer to industry to promote sustainable global development.



*The ICGEB is supported by over 60 Member States (shown in blue on the map)*

# EXECUTIVE SUMMARY

The ICGEB Strategic Plan 2020-2030 builds on the activities approved by the **Board of Governors**, and presents them in the context of the United Nations **2030 Agenda** and the **Sustainable Development Goals (SDGs)**. The Agenda envisages “*a world of universal respect for human rights and human dignity, the rule of law, justice, equality and non-discrimination*”, with a strong emphasis on the empowerment of women and of vulnerable groups.

The aim is to reconcile global economic progress with social justice and the conservation of natural resources. Developing countries, emerging economies and industrialised nations must all do their part to ensure the success of the Agenda. The ICGEB Strategic Plan seeks to leverage the Centre’s strengths to maximize the Organisation’s contribution to the **achievement of SDGs**, in the spirit of openness and collaboration, as called for by the Economic

and Social Council of the United Nations (ECOSOC), the General Assembly and the Secretary-General of the UN. The ultimate goal is to empower **ICGEB Member States** in the use of the latest scientific developments and help them apply modern biotechnology solutions to end disease and achieve food and energy security, while fostering the development of human capital through education, training and provision of equal opportunities for all.

The African Union’s Science, Technology and Innovation Strategy for Africa 2024 (**STISA-2024**) defines four mutually reinforcing pillars that are supported by the present strategy: building and/or upgrading research infrastructures; enhancing professional and technical competences; promoting entrepreneurship and innovation; and providing an enabling environment for STI development.

## UN GOALS INCLUDED IN THE ICGEB STRATEGIC PLAN FOR 2020-2030



**Zero hunger** - ICGEB focuses on plant biology and biotechnology, and aims to improve crop production and resistance to environmental stresses



**Promote access to affordable and sustainable energy** - guides the work of scientists at the ICGEB in New Delhi



**Promote health and wellbeing for all** - is underpinned by ICGEB’s research on parasitic and viral infectious diseases, and by research on non-communicable diseases, such as neurodegeneration, cancer and cardiovascular disorders



**Promote innovation** - ICGEB aims to do this at the country level, through the empowerment of individual scientists and local pharmaceutical companies



**Quality education for all** - ICGEB programmes aim to develop skills and make higher education possible for individual scientists, their institutions and the scientific communities



**Promote Global Partnership for the Goals** - ICGEB shares knowledge, expertise and technology through projects, and strategic partnerships that support countries’ efforts to achieve the SDGs and their own development priorities

# EXECUTIVE SUMMARY

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Further, throughout the Strategic Plan, attention is given to three cross-cutting themes: **Gender and Youth**, essential to nurture a brighter and more equitable future; **Least Developing Countries**, a major benchmark in measuring the success of the 2030 Agenda; **South-South Cooperation**, which is making increasingly significant contributions to global and regional development.

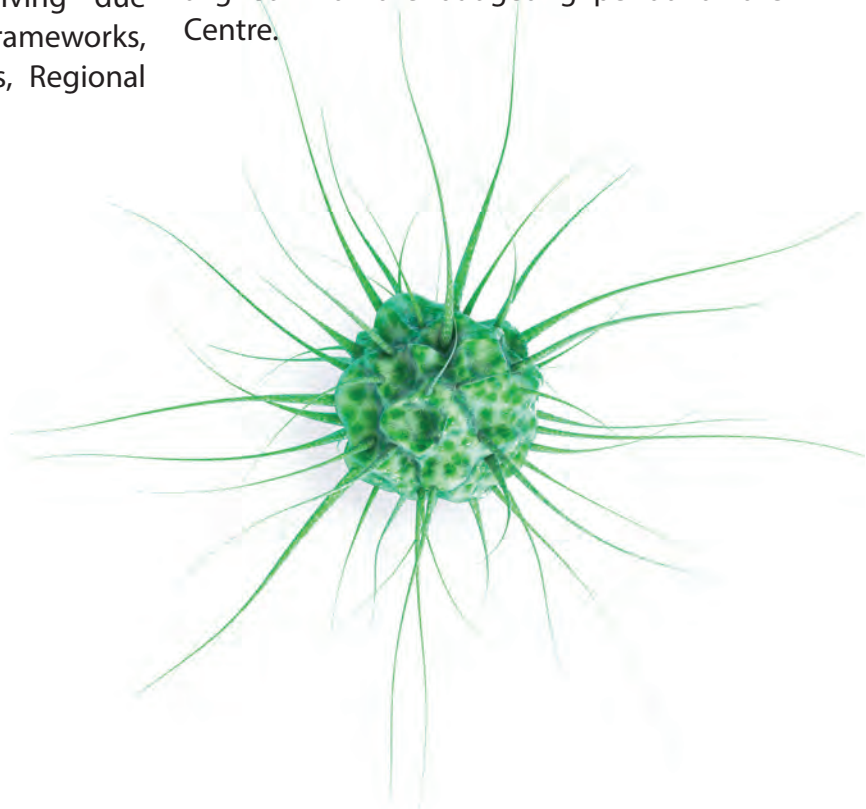
The implementation of this Strategic Framework will be based on the assessment of joint needs, in **partnership** with **ICGEB Member States**, combining data analysis, planning, and programming processes to deliver better outcomes to the scientific communities in our Member States and, ultimately, to the whole society, moving beyond meeting needs, to reducing them over time.

In underpinning such changes, ICGEB will pay special attention to strengthening capacities in its **Constituency**, from local research communities to national industrial partners, focussing particularly on **disadvantaged regions** and groups, while giving due consideration to the institutional frameworks, represented by ICGEB Governors, Regional

Research Centres, Affiliated Centres and Liaison Officers.

While being aware that all SDGs are deeply interconnected, ICGEB prioritises **SDGs 2, 3, 4, 7, 9 and 17**, which translate into 6 Pillars. Based on ICGEB's mandate and capacities, the ICGEB will specifically assess its performance with reference to the results, as further outlined in the **Strategic Matrix** (page 10).

Implementation of the programme will be adapted to regional contexts, capacities and needs: not all Outcomes will apply to all **ICGEB Member States**, therefore, ICGEB activities will reflect the context and the needs of specific countries or regions. The Organisation will work in **synergy** with partners to implement research programmes that respond to bottom-up requests, and programmes that strengthen the capacities of individual people, research communities, and countries. The present **Strategic Plan** does not articulate ICGEB's resourcing projections, funding and shortfalls, which will be expounded in a subsequent **5-Year Operational Programme**, aligned with the budgeting period of the Centre.





# Strategic Framework Matrix



International Centre for Genetic Engineering and Biotechnology





## ICGEB - STRATEGIC FR

<b>VISION</b>	To be the world's leading intergovernmental organisation for re			
<b>MISSION</b>	To combine scientific research with capacity			
<b>UN SDGs</b>				
<b>ICGEB OBJECTIVES</b> Statutes Art.2	To develop and promote the application of genetic engineering and biotechnology for solving problems of development, particularly in developing countries (2.d.)			
<b>ICGEB PILLARS</b>	<b>1. HEALTH: INFECTIOUS DISEASES and NON-COMMUNICABLE DISEASES</b>	<b>2. SUSTAINABLE AND EFFECTIVE AGRICULTURE</b>	<b>3. INDUS R</b>	
<b>OUTCOME</b>	<ul style="list-style-type: none"> <li>→ Increased knowledge through scientific research in the field of vaccines, diagnostics and medicines for communicable and non communicable diseases that primarily affect developing countries</li> <li>→ Increased access to high quality and affordable Essential Medicines, diagnostic tools, and medicines for NCDs developed by the ICGEB (SDG Target 3.8/3.b)</li> </ul>	<ul style="list-style-type: none"> <li>→ Increased number of crops with improved yield and nutrition, developed through scientific research and made available to Member States (SDG Target 2.3)</li> <li>→ Increased number of crops resistant to biotic and abiotic stresses developed (SDG Target 2.3)</li> <li>→ Increased number of biofertilisers and biopesticides developed (SDG Target 2.4)</li> </ul>	<ul style="list-style-type: none"> <li>→ Increased clean energy identified th made availabl 7.a)</li> </ul>	
<b>PERFORMANCE INDICATORS</b>	<ul style="list-style-type: none"> <li>N. of publications in the field;</li> <li>N. of External Grants/Collaborative Projects in the field;</li> <li>N. of patented technologies/new developed technologies in the field;</li> <li>N. of licenses and R&amp;D agreements with companies</li> </ul>			
<b>OUTPUTS</b>	Laboratories, publications, conferences, technologies, new plant types and agreements with industry, international collabora			
<b>MAIN LINES OF ACTION</b>	<b>INFECTIOUS DISEASE</b> <ul style="list-style-type: none"> <li>• VIROLOGY</li> <li>• PARASITIC DISEASES</li> <li>• MEDICAL BIOTECHNOLOGY (Recombinant diagnostics and vaccines)</li> </ul>	<b>NON-COMMUNICABLE DISEASE</b> <ul style="list-style-type: none"> <li>• CARDIOVASCULAR DISORDERS</li> <li>• IMMUNOLOGY</li> <li>• MOLECULAR GENETICS</li> <li>• NEUROBIOLOGY</li> <li>• CANCER</li> <li>• MEDICAL BIOTECHNOLOGY (Biosimilars, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• CROP IMPROVEMENT</li> <li>• BIOTIC AND ABIOTIC STRESS RESISTANCE</li> </ul>	<ul style="list-style-type: none"> <li>• BIOFUELS</li> <li>• INDUSTRIA</li> </ul>
<b>CROSS-CUTTING PRIORITIES</b>				



## Research, training and technology transfer in the field of Life Sciences and Biotechnology

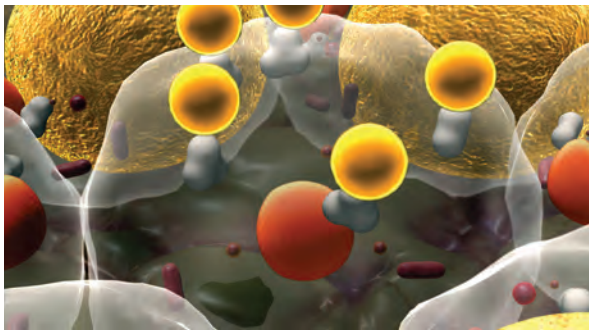
### Enhancement, thereby promoting sustainable global development

			
	<p>To assist developing countries in strengthening their scientific and technological capabilities in the field of genetic engineering and biotechnology (2.b)</p>	<p>To stimulate and assist activities at regional and national levels in the field of genetic engineering and biotechnology (2.c.)</p>	<p>To promote international co-operation in developing and applying peaceful uses of genetic engineering and biotechnology, in particular for developing countries (2.a.);</p> <p>To serve as a forum for exchange of information, experience and expertise among scientists and technologists of Member States (2.e.)</p>
<p><b>AGRICULTURAL BIOTECHNOLOGY AND RENEWABLE ENERGY</b></p>	<p><b>4. ENHANCEMENT OF HUMAN CAPITAL</b></p>	<p><b>5. ENHANCEMENT OF EXPERTISE AND TECHNOLOGICAL SKILLS IN MEMBER STATES</b></p>	<p><b>6. SCIENTIFIC HUB FOR R&amp;D AND INTERNATIONAL COOPERATION</b></p>
<p>Access to technologies to develop products from biological sources through scientific research and transferable to Member States (SDG Target 9.5)</p>	<p>→ Expanded number of fellowships available for Member States, particularly developing countries, for enrolment in scientific programmes (SDG Target 4.b)</p> <p>→ Expanded number of women scientists from Member States involved in ICGEB training (SDG Target 4.5)</p>	<p>→ Increased access to technologies for the production and quality control of several life saving recombinant proteins in Member States (SDG Target 9.5)</p> <p>→ Improved domestic technology for development, research and innovation in Member States (SDG Target 9.b)</p>	<p>→ Enhanced North-South, South-South, triangular regional and international cooperation in science, technology and innovation (SDG Target 17.6)</p> <p>→ Enhanced number of initiatives to support and promote scientific, multi-stakeholder partnerships, to mobilise and share knowledge, expertise, technology and resources (SDG Target 17.16)</p>
	<p>N. of i. PhDs - ii. Postdocs, iii. Short-term fellowships awarded/completed in total and disaggregated by gender and region; N. of participants at ICGEB Meetings and Courses from Member States, total and disaggregated by gender and region.</p>	<p>N. of TT agreements with companies/agencies in Member States; N. of personnel from Member States visiting/trained at the BDU, total and disaggregated by gender and region; N. of CRPs and ECRGs awarded and implemented, total and disaggregated by gender and region</p>	<p>N. of international collaborative projects performed in partnership with (laboratories in) MS; N. of newly developed partnerships to support the implementation of the Strategic Framework and the SDGs; N. of MOUs with new partners N. of RRCs established and operational</p>
<p>Activities</p>	<p>Implementation of fellowship programmes, implementation of M&amp;C</p>	<p>Novel vaccine and drug candidates, biosimilar and other technologies developed at the ICGEB, implementation of CRPs</p>	<p>Implementation of Meetings and Courses, Scientific International Cooperation Projects, Established partnerships</p>
<p>AGRICULTURAL BIOTECHNOLOGY</p>	<ul style="list-style-type: none"> <li>• PHD COURSE IN MOLECULAR BIOLOGY &amp; BIOTECHNOLOGY</li> <li>• POST DOCTORAL FELLOWSHIPS</li> <li>• PODCAST of SEMINARS / E-LEARNING PLATFORMS</li> <li>• TARGETED FELLOWSHIP SCHEMES (IFP)</li> <li>• M&amp;C including THEORETICAL AND PRACTICAL COURSES</li> </ul>	<ul style="list-style-type: none"> <li>• TECHNOLOGY TRANSFER AND TECHNICAL ASSISTANCE TO COMPANIES IN MEMBER STATES</li> <li>• COLLABORATIVE RESEARCH PROGRAMME GRANTS</li> <li>• EARLY-CAREER RETURN GRANTS</li> <li>• ADVOCACY AND REGULATORY SCIENCE</li> </ul>	<ul style="list-style-type: none"> <li>• PARTNERSHIP DEVELOPMENT AND IMPLEMENTATION</li> <li>• ESTABLISHMENT OF REGIONAL RESEARCH CENTRES</li> <li>• TARGETED INTERNATIONAL COOPERATION PROJECTS IN MEMBER STATES TO SUPPORT NATIONAL DEVELOPMENT PLANS</li> </ul>

Gender and Youth
South - South Cooperation
Least Developed Countries

# FOREWORD

**Biotechnology** is an invaluable means of achieving the SDGs. Mankind is confronted with unprecedented challenges: food security, security of energy supply, a growing burden of disease, and climate change, to name a few. Modern biotechnology provides breakthrough products and methodologies to address those challenges: to combat NCDs and neurodegeneration, to stop the outbreak of infectious diseases, to reduce pollution, to relieve poverty, to feed the hungry, to use less and cleaner energy, to protect biological diversity, and to develop safer, cleaner and more efficient industrial manufacturing processes.



Everyday the ICGEB performs biotechnology-related research, building capacities and transferring expertise and technologies to scientists in its **Member States** to enable them to meet those challenges. As the only intergovernmental organisation whose remit is to combine biotechnology research with international cooperation, the Organisation, which has three major laboratories located in **Italy, India and South Africa**, forms an interactive network of internationally-renowned scientists and state-of-the-art facilities for molecular and cellular biology. This provides a scientific research hub and educational environment of the highest

international standard.

**International cooperation** in biotechnology remains a crucial node for global development<sup>1</sup>. The ICGEB is addressing the challenges through its renewed Strategic Framework, which builds on its Statutory objectives. Focused on **6 strategic Pillars**, including the advancement of scientific knowledge (Pillars 1-3), enhancement of human capital (Pillar 4), strengthening of technological capacities at the local level (Pillar 5) and, promotion of international, north-south, south-south and south-north partnerships (Pillar 6), the Strategic Framework substantially contributes to the achievement of the UN SDGs.

Infectious Diseases
<b>Cause of death by 2030</b> HIV-TB- Malaria
<b>Regions</b> LMiCs <sup>2</sup>
<b>Population</b> 5 million

Research areas include Infectious Diseases, Non-Communicable Diseases (NCDs) - from basic research to applied Medical and Industrial biotechnology, and Plant Biology and Biotechnology.

The emergence of novel pandemic **viral infections**, such as Covid-19, Dengue, Zika, Malaria, and Chikungunya, remains a constant threat across the ICGEB constituency.

The burden of NCDs, including diabetes, cardiovascular disorders, cancer and neurodegeneration, takes an increasing toll across all regions of the world, representing

<sup>1</sup> Global R&D collaboration more vital than ever, survey finds, 26 November 2019, Science Business

<sup>2</sup> Holmes KK, Bertozzi S, Bloom BR, et al., editors. Major Infectious Diseases. 3rd edition. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017 Nov 3. doi: 10.1596/978-1-4648-0524-0/, Chapter 1 Major Infectious Diseases: Key Messages from Disease Control Priorities, Third Edition

# FOREWORD

the leading cause of death worldwide, killing 41 million people each year-equivalent to 71% of all deaths globally. NCDs are set to overtake communicable diseases as a leading cause of disability and mortality across LMICs within the next decade and, as such, need to be recognised as major barriers to attaining **SDGs 2 and 3**.

Access to affordable and **clean energy** is an area that has gained increasing attention at all levels, with global companies and institutions committed to increasing the production and use of cleaner and more affordable energy sources. Employing biotechnological tools to recover biogenic waste has enormous development potential in the context of sustainability and the circular bioeconomy.

This Strategic Framework provides a firm

foundation for the research that ICGEB intends to perform, in collaboration with its Member countries and with other partners, in the coming ten years to meet the targets of **SDGs 2, 3, and 7**. It also provides a firm foundation for promoting other related activities: human capital development, technology transfer, partnership development, and scientific dissemination and communication, in line with **SDGs 4, 9, and 17**, all playing key roles in delivering the benefits of modern biotechnology.

ICGEB shares the responsibility for contributing to the achievement of the Sustainable Development Goals and calls upon all its stakeholders **to support our Strategic Plan** and to help in its implementation.

**Food Security**

**Undernourished**  
821 million people

**Regions**  
Sub-Saharan Africa and Southern Asia

**Children**  
22% stunted  
7.3% wasting <sup>3</sup>



<sup>3</sup> The Sustainable Development Goals Report 2019, UN Statistics Division, 2019

# PRINCIPLES FOR IMPLEMENTATION

## Scientific excellence and competencies

This is the driving force of ICGEB’s research activities and the foundation of its **scientific reputation**, as exemplified by the number of internationally **peer-reviewed publications**, international collaborations, and recognition within the international scientific community.

## Leave no-one behind

This is essential to achieve the Sustainable Development Goals by 2030 and entails focusing on **disadvantaged, marginalised people and geographical areas**. Existing, and potential, inequalities are identified and analysed in every project. For example, gender parity in participation, and the availability of particular medical treatments.

## Accountability

This entails periodical reporting on **efforts** made and progress achieved. Impact is considered **successful** where it is verifiable and transparent.

## Shared responsibility

Global challenges require global solutions. Stakeholders at all levels are encouraged to pull together to ensure a sustainable future. ICGEB will promote **scientific diplomacy** through multi-stakeholder partnerships with Governments, businesses, civil society groups, citizens and researchers, enabling all to cooperate as equals, in line with the 2030 Agenda.

## Integrated approach

Characteristic of the 17 SDGs, ICGEB operations promote a connected number of activities in the field of biotechnology, ranging from **research to teaching, training and technology transfer**, each impacting on several of the Goals.



# LEGAL BASIS

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## ICGEB Statute Article 2 Objectives

### The objectives of the Centre shall be:

- To **promote** international co-operation in developing and applying peaceful uses of genetic engineering and biotechnology in particular for developing countries;
- To **assist** developing countries in strengthening their scientific and technological capabilities in the field of genetic engineering and biotechnology;
- To **stimulate** and assist activities at regional and national levels in the field of genetic engineering and biotechnology;
- To **develop and promote** the application of genetic engineering and biotechnology for solving problems of development, particularly in developing countries;
- To **serve** as a forum for exchange of information, experience and know-how among scientists and technologists of [Member States](#).

## METHODOLOGY

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- Research in the laboratories
- Training of scientists
- Research collaboration and funding
- Scientific events
- Technology transfer
- Technical assistance
- International partnerships and networking

## GOVERNING BODIES/SUPPORT SERVICES

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- **Governing Bodies, Direction and Programme Services:** Office of the Director General, External Relations, Scientific Coordination with the Components, Board of Governors, Council of Scientific Advisors, Fundraising and Technology Transfer, Communication and Outreach
- **Direct Support Services:** Legal and Administration, Budget and Finance, Human Resources, Procurement, Internal Audit, Information Technology, Technical Services, Library, Premises

# STRATEGIC VISION AND FOCUS AREAS



## Pillar 1. Health: Infectious Diseases

**VISION:** to gain understanding of the mechanisms by which important human pathogens are transmitted, replicate and cause disease, thereby promoting the development of novel preventative, therapeutic and diagnostic strategies.

**Neglected Tropical Parasitic Diseases, Malaria, Tuberculosis (TB), Arboviruses (Flaviviruses, Dengue, Zika, Chikungunya), Schistosomiasis, Leishmaniasis, Listeriosis, Trypanosomiasis, Hookworm, COVID-19**

### FOCUS AREAS

Basic research in disease mechanisms is a priority. Outputs include top class scientific publications defining disease mechanisms and yielding pointers to novel forms of therapeutic intervention. Such 'blue sky' research has traditionally been the bedrock for the major advances in disease prevention and therapy.

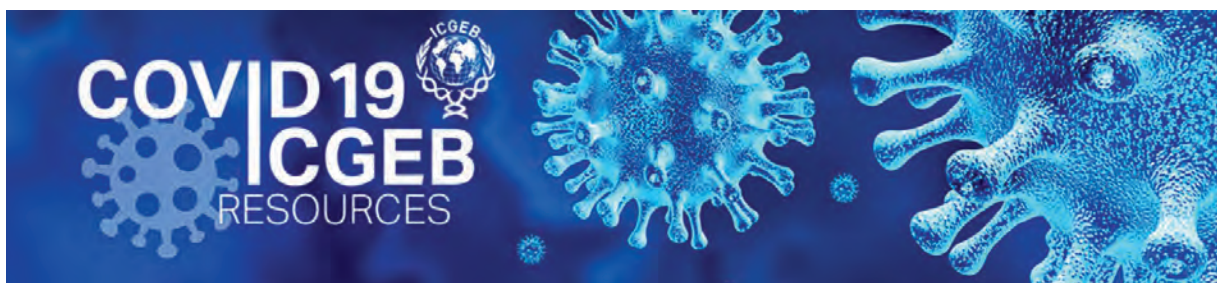
The current focus on **neglected tropical parasitic diseases, malaria, tuberculosis (TB) and arboviruses, including Dengue, Chikungunya and Zika**, supports a flexible approach to allow a rapid response to new challenges, such as **COVID-19**. In one month, between 1 March and 1 April 2020, ICGEB mobilised eight laboratories in Italy and India to deploy high-containment resources, and experimental validation of therapeutic possibilities against COVID-19. Studies conducted by Sun Pharmaceuticals in collaboration with the Molecular Virology Lab, were instrumental in initiating Phase II clinical trial on AQCH, a phytopharmaceutical drug, as potential treatment for COVID-19 patients in India (June 2020). Further, ICGEB, again in collaboration with Sun Pharmaceuticals, licensee of the technology, will begin Phase I clinical trials of vaccination against Dengue within the next 2-3 years, aiming to roll out the new vaccine

within 6 years. Clinical trials on a new botanical therapy are expected in less than 2 years.

Diagnosis of flavivirus infections remains a priority. It is envisaged that new diagnostic kits will be available within 2-3 years, allowing rapid and simple point-of-care diagnosis of different flavivirus infections.

Diagnosis of TB remains of paramount importance, novel assays to detect biomarkers of TB infection are under development at ICGEB labs, and are expected to be in clinical use within 4 years. Efforts are ongoing to identify and analyse super-spreading events of drug resistant TB cases in hotspots, by deep sequencing of clinical Mycobacteria strains. As part of a multinational collaboration (**FANTOM consortium**), studies are underway to understand how macrophages contribute towards the host defence against mycobacterium infection.

Discovery of drug candidates effective against tuberculosis and malaria is a major priority. It is proposed to employ novel strategies that would overcome drug resistance bottlenecks. Two drug candidates against malaria and one against tuberculosis have been identified, based on initial hits and are being further optimised. Using an approach based on re-purposing of medicines, the use of statins as a means of treatment for TB



# STRATEGIC VISION AND FOCUS AREAS

is entering pre-clinical trials. Antibody therapies against TB and malaria are also being explored. Studies in several Neglected Tropical Diseases will develop novel therapies for Leishmaniasis and Schistosomiasis.

The translational health division provides technologies for the development of locally-produced diagnostic kits for HIV, HCV, Dengue, Chikungunya and Zika, and will continue to develop novel viral diagnostics.

Throughout these activities, ICGEB continues to ensure that its constituency gains exposure

to the latest technologies, thereby promoting sustainable development and research in areas within countries most at need. Other translational programmes will be built in collaboration and in partnership with industrial partners, aimed at developing novel diagnostics, vaccines and therapies. In fact, only through collaboration, co-creation and sharing of knowledge with industry can ICGEB research results generate value for its Constituency. The ICGEB Fundraising Technology Transfer and Innovation Office (FTI) is dedicated to this purpose.



## Pillar 1.

### Health: Non-Communicable Diseases

**VISION:** to understand the underlying mechanisms of disease and develop novel therapies for major non-communicable diseases including neurodegeneration, myocardial infarction and cancer.

## Cardiovascular Disorders, Neurodegeneration, Genetic Diseases, Cancer, Rare Diseases

### FOCUS AREAS

**Myocardial infarction** remains a major cause of global incapacitation, and no new therapies have been discovered in the last 20 years. Using innovative genetic screening approaches, ICGEB is developing biotherapeutics which will significantly improve cardiac recovery from infarction. These molecules are being formulated for human delivery and phase I clinical trials are expected to begin within the next 3-4 years.

Cancer is a major global cause of death, and ICGEB's work on **cervical, prostate** and lung cancers, and on **leukaemias**, points the way to increased awareness and uptake of preventative and diagnostic measures, whilst identifying new pathways for therapeutic intervention. In prostate cancer, research aims to identify novel biomarkers within the African population that can be used as prognostic markers, thereby assisting in patient management and therapy. These assays are expected to enter trials within the next 3-4 years. The immune microenvironment of

solid tumours is a key determinant of cancer evolution and the target of most recent therapies. ICGEB developed tools to monitor changes in the microenvironment of **lung tumours** to identify novel targetable axes of resistance to immunotherapy. Personalized cancer medicine is another important research topic and the ICGEB is developing novel drug combinations for targeted therapy of leukaemia and lymphoma, and novel CRISPR/Cas9-based models for drug screening.

Understanding the mechanisms underlying neurodegeneration, to identify novel therapeutic targets, is also a specific focus of ICGEB's research, with an emphasis on **Amyotrophic Lateral Sclerosis (ALS)**.

Using gene therapy approaches, the ICGEB is developing novel therapies against rare genetic diseases. A phase I clinical trial for the treatment of the **Crigler Najjar Syndrome** commenced in 2018, with broad clinical application expected within 5 years.

All our activities, from the identification of therapeutic targets to identification of novel

# STRATEGIC VISION AND FOCUS AREAS

therapeutic approaches and/or drug delivery, involve the implementation of state-of-the-art technology. This includes a world-leading group of experts in genome editing, high throughput screening for genes and chemical compounds, high content imaging, big data analysis, artificial intelligence applied to biology research and the latest techniques for gene delivery (page 31). Deliverables are top class publications in major, international, peer-reviewed journals, and the development of intellectual property to make knowledge

transfer and partnership with industry possible. This, in turn, provides a basis for ensuring that the ICgeb Constituency attains expertise in these different disciplines, becoming self-sustainable in its own endeavours to combat these diseases. The ICgeb FTI Office facilitates the relationship between industry and ICgeb Pls. It frames collaboration with industrial partners, identifies funding schemes and grants for proof-of-concept projects, and displays ICgeb technologies at B2B events, TT forums and fairs.



## Pillar 2. Sustainable Agriculture

**VISION:** to contribute to increasing food security and eliminating world hunger.

**Plant Biotechnology , Biofertilisers, Biopesticides, Microbiome Studies, Crop Improvement for biotic/ abiotic stress tolerance and improved nutritional quality**

### FOCUS AREAS

ICGEB's research uses a multi-faceted approach, including state-of-the-art **gene editing technologies** and **mutation breeding**, to develop **improved crops** with enhanced yield, capable of thriving in previously uncultivable areas, and increasing their resistance to various forms of biotic and abiotic stress. At the same time, ICgeb promotes the production of new food varieties in which **nutritional value** is greatly enhanced. Finally, the production of environmentally **friendly biofertilisers** and **biopesticides** greatly increases crop yield, making agriculture more sustainable by reducing reliance upon traditional organic fertilisers and toxic pesticides. Focus crops currently include staples, such as rice and sorghum, as well as coffee and grape.

Microbial inoculants are biofertilisers that offer a safe and easy means of improving

crop production. In a triangular collaboration between the three ICgeb Components in Italy, South Africa and India, ICgeb is developing a plant-microbiome programme to identify specific communities of **plant-beneficial microbes** for rice and sorghum across a range of Member countries. It is envisaged that, within a 5-year period, such products will be available for farmers in many low-resource settings.

Enhancing disease resistance and expanding cultivatable areas requires crop modification. ICgeb has become a world leader in the application of modern genome editing techniques for agricultural research. This technology is less likely to encounter some of the regulatory issues traditionally associated with **GMOs**, and is therefore likely to gain wider use and quicker implementation. Activities in ICgeb laboratories focus on increasing crop-plant resistance to salt and to various herbicides,





# STRATEGIC VISION AND FOCUS AREAS

and it is expected that these plants will be transferred to field production within 3-4 years.

**Biopesticides** not only present a safer solution for environmental, animal and human health, but can also be relied upon to reduce chemical residue levels in agriculture.

ICGEB works with key stakeholders to support the development of regulatory infrastructure facilitating biopesticide registration and promoting the use of biopesticides as part of

**Good Agricultural Practice** in pest management. As with all our activities, state-of-the-art research within these fields in ICGEB laboratories is intended to provide our constituency with direct access to these technologies, thereby directly providing institutes across the globe with the capability of developing their own biofertilisers for specific geographical locations and crops, as well as the ability to implement genome editing technologies.



## Pillar 3.

### Industrial Biotechnology and Renewable Energy

**VISION:** to devise cost-effective processes to produce second-generation biofuels, using agricultural residues together with novel enzymes and strains effective in converting cellulosic biomass into energy molecules, and using microalgae as a platform to produce advanced biofuels. The use of genetic engineering and other modern biological technologies has enormous potential for the production of clean and renewable energy from biological sources.

## 2<sup>nd</sup> and 3<sup>rd</sup> generation biofuels, Bioethanol, Biodiesel, Butanol, Alkanes, Long chain alcohols

### FOCUS AREAS

Development of second- and third-generation **biofuels**, essential for Sustainable Development, is pursued by an ICGEB team of scientists who use systems biology approaches for designing new biofuel production pathways, developing organisms that can utilise such pathways, and ultimately ensuring such products enter the production chain. Great advances have been made in the area of **biomass utilisation**, by developing a novel, engineered fungal platform for cellulytic enzyme production, and by engineering the metabolic pathways of a common laboratory bacterium to ferment C5/ C6 biomass sugars into bioethanol. Both of these key steps in the production of second-generation biofuels have been granted US Patents, and the process is currently being up-scaled. It is expected that this technology will be transferred and implemented by the ICGEB constituency within 2-3 years. Further research is focussed on microbial production of advanced fuels, such as

butanol, long chain alcohols, and alkanes, which have properties similar to gasoline and diesel in terms of energy density.

Genetic engineering of microalgae is being implemented to improve their capacity for carbon sequestration and lipid accumulation to allow higher biodiesel production. Research on cyanobacteria has led to the isolation of hydrocarbon-producing marine and fresh water strains, and genome engineering of a cyanobacterial isolate has led to higher glycogen accumulation. A great deal of emphasis is placed on connecting this production to bioremediation processes, thus linking the production of biofuels with the development of cleaner environments.

Enhancing the capacity of ICGEB constituents to develop and use these technologies within their local settings and environments is a key goal. Deliverables will be the establishment of labs using these technologies in many low resource settings.



## Pillar 4. Enhancement of Human Capital



**VISION:** to increase the numbers of trained and proficient scientists able to contribute to more inclusive growth, through the provision and encouragement of quality scientific education, skills acquisition and training. Development strategies, particularly those intended for low or lower-middle income countries, set out to achieve middle-income status through industrialisation and diversification of the economy<sup>4</sup>. However, value-added manufacturing and service industries depend on mathematical and scientific knowledge, advanced levels of proficiency in literacy, and cognitive skills such as abstract thinking, problem-solving and understanding of the scientific process. This vision is also expressed in the Agenda 2063 of the African Union. The ICGEB human capacity development programmes, conducted at the ICGEB Components and in Member countries, aim to achieve this vision.

## FOCUS AREAS

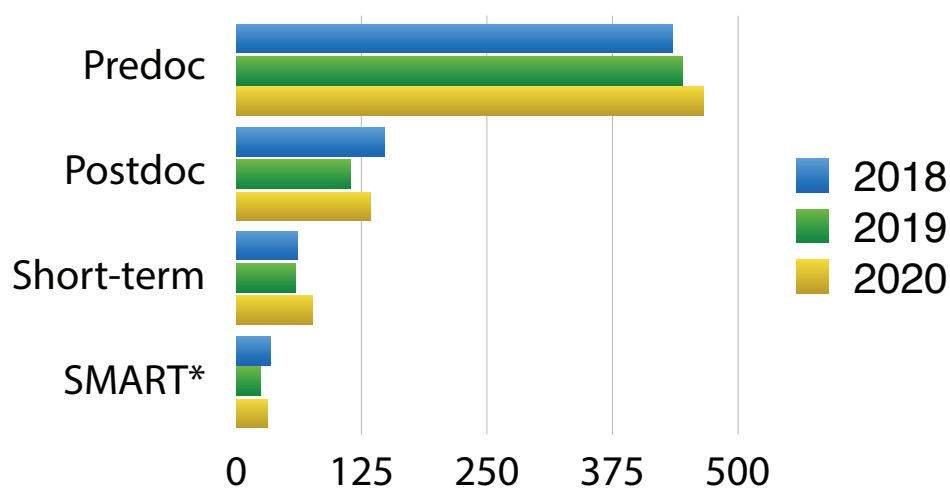
Developing relevant skills in Science, Technology and Innovation (STI) is critical for achieving Sustainable Development Goals (United Nations, 2016). Also, it seems highly probable that human capital development is one of the greatest catalysts for improvements in the living standard of the population. However, there is a serious skills shortage in STI areas that limits the capacity for country-led development and increases dependency on foreign expertise; this is particularly true for LDCs and low to middle income countries (LMICs). In this context, ICGEB's mandate to act as a Centre of Excellence for training in science and biotechnology is timelier than ever. **ICGEB offers a multifaceted skills development platform to scientists from Member States, comprising an International PhD Fellowship Programme, several mobility schemes and training opportunities.**

### 1. International PhD Fellowship Programme in Molecular Biology

This Programme aims to develop a strong knowledge base for **ICGEB's Member States**, offering **multidisciplinary training** that covers a wide range of topics within genetic engineering and biotechnology; addressing issues of human health and nutrition relevant to the needs of the **ICGEB Constituency**. A specific advantage of this Programme, compared with similar courses, is that during the 3-4 years of training, taking place within the state-of-the-art facilities located in Trieste, New Delhi and Cape Town, the fellows actively participate in the ongoing research projects of the ICGEB laboratories. In addition, they take part in the wide range of activities organised at each Component, such as international scientific seminars, courses on **grant writing** and grant application processes, **intellectual property**

<sup>4</sup>Supporting Secondary School STEM Education for Sustainable Development in Africa, Leon Tikly, Marie Joubert, Angeline M. Barrett, Dave Bainton, Leanne Cameron and Helen Doyle, Bristol Working Papers in Education Series #05/2018

# STRATEGIC VISION AND FOCUS AREAS



**protection** and management, and basic **entrepreneurship** skills: all elements that are essential for the future development of young scientists' careers.

The ICGEB PhD Fellowship Programme is expected to impact directly upon the knowledge base and research capacity of the source countries.

## 2. Postdoctoral Fellowships

Besides the completion of a specific scientific project, and the advancement of the scientific skillset of the scientists involved, this Programme directly supports **individual scientists**. It allows them to build a network of contacts at the international level, to **gain exposure** in an international scientific environment, with **teaching**, and **supervising** experience; all of which are crucial for the further development of their scientific careers in their home countries. Upon completion of their fellowships, scientists are expected to return to their country of origin and increase the pool of well-trained university lecturers and researchers, thereby improving standards and widening the scope of the education programme of the country (See also the ICGEB-CRP Early Career Return Grants, Pillar 5 below). This also aids [ICGEB Member States](#)

to increase intellectual autonomy, particularly relevant in addressing problems that are specific to their geographic locality and population.

In many LDCs, newly-graduated students rapidly become teachers and professors, without any additional higher education. This creates a chronic process where an expansion in the educational standards is impossible. Both the ICGEB PhD and Postdoctoral Fellowship schemes produce highly-trained scientists and educators who have progressed beyond a PhD and have established an international scientific network. This means that upon their return home they can have a major impact on the quality of the educational programmes in their respective institutes and further afield within their countries. One highly-trained PhD or post-doc, teaching classes of 100-200 students per year, has massive potential for capitalising upon a relatively small investment and ensuring sustainability of the education provided.

## 3. Scientific Mobility for Advanced Research Training (SMART)

This scheme promotes South-South Cooperation and the mobility of researchers between [ICGEB Member States](#). Through the short-term training programme, fellowships are

# STRATEGIC VISION AND FOCUS AREAS

awarded to promising young researchers from the ICGEB Constituency, holding at least an MSc or equivalent degree and working in any area of research that has a potential translational benefit for their home laboratory. The SMART Programme is a concrete tool for boosting direct collaboration between **ICGEB Member States**, and increasing South-South Cooperation in STI. The ICGEB also promotes targeted mobility schemes, run in cooperation with a Member State, such as the “**IN-China Fellowship Programme**”, promoting the mobility of international researchers to Chinese laboratories.

## 4. In-country training through the organisation of Meetings and Courses

Every year the ICGEB funds and organises over **30 scientific events** in its Member States on cutting-edge topics in the Life Sciences, with the aim of promoting education, scientific dissemination and interaction between internationally-renowned scientists and young researchers. Events range from **practical**

**workshops**, through **theoretical courses**, to major scientific **conferences**. Supported events are evaluated by a Scientific Selection Committee and include high-level international speakers.

An increase in the practical training component, through the development of new partnerships with manufacturers of state-of-the-art scientific equipment, is increasingly pursued, as well as support by co-sponsors and the development of collaborations with partner organisations for the co-organisation of events in fields of common interest. Participation in the ICGEB events constitutes, for many scientists worldwide, a valuable first approach to the Centre’s activities, leading to new collaborations, access to fellowships and other opportunities. The endorsement of the applications by the ICGEB Liaison Officers ensures the quality of the proposals and of the proposing institutions, which act on behalf of the ICGEB in organising the scientific event.

As the demand for training across the ICGEB Constituency is constantly increasing, the **ICGEB wishes to identify new partners willing to contribute to its Skills Development Programmes**, and to contribute to the **mission of promoting science for sustainable development**. Currently, the Programmes run at the Institute’s maximum capacity in terms of resource allocation and demand far exceeds the financial capacity of the Centre to effectively support the needs of its Members. A major strategic goal of the ICGEB is to double the funding capacity of such Programmes to reach 3-4M Euro per year, in order to expand the PhD and the Postdoctoral Fellowship programmes, increase the number of South-South exchanges and specifically targeting women scientists. Also, there is a strong need to conduct more practical training courses across the ICGEB Constituency.



# STRATEGIC VISION AND FOCUS AREAS

## 5. Development of free on-line educational resources

The ICGEB International Seminars and selected Meetings and Courses are also available for download on the ICGEB Website,

Apple Podcast and YouTube channels. ICGEB provides free, on-line resources, as a cost-effective approach for teachers, trainers and students across the ICGEB constituency.



### Pillar 5.

### Enhancement of Expertise and Technological Skills in Member States

**VISION:** to promote *in-house* innovation, new business models and partnerships to ignite change and deliver value to society. ICGEB's vision is to foster Knowledge Transfer in all its forms with a focus on innovative biotechnology solutions and highly-skilled and trained personnel, which, together with a fertile business environment, are the crucial drivers of inclusive economic growth and development, as formally recognized by Agenda 2063 of the African Union and the UN 2030 Agenda.

## FOCUS AREAS

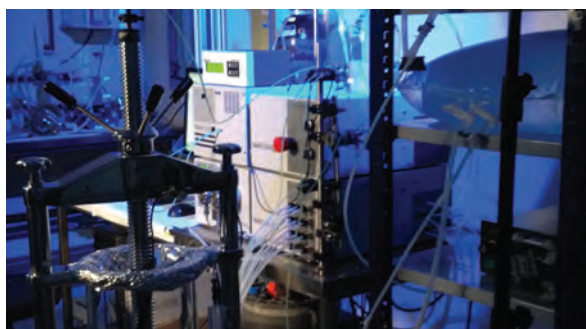
### 1. Development and transfer of second-generation biosimilar technologies

**Biosimilars** are follow-on biological medicines that have a high degree of similarity to a reference product already authorised for use, as supported by appropriate analytic testing and clinical trials. The first generation of biologics are off-patent and are produced as biosimilars, at a significantly reduced cost. The second generation of biologics, mainly monoclonal antibodies, are currently or imminently coming off patent and can be freely reproduced. The challenge of these products – all of which are lifesaving drugs – is that they are far more complex than small molecule drugs. ICGEB's strategy consists of training the employees of pharmaceutical companies based in Member States **in the technologies for the production, purification and quality control of specific biotherapeutic products, in order to make these technologies available on the largest possible scale.**

To date, the ICGEB has developed and transferred technologies and quality control testing in line with the European Pharmacopoeia for insulin, filgrastim, erythropoietin, growth hormones and their long-lasting counterparts,

obtained through genetic engineering. Some of the technologies are developed and scaled-up to the pilot scale in order to easily set up production facilities.

Such biotherapeutics have been invaluable in the treatment of serious illnesses such as diabetes, anemia, and renal diseases. Most of



the companies involved in ICGEB technology transfer activities are now producing biosimilars that are sold on domestic markets and successfully compete in the international pharmaceutical arena. Scientists attend training sessions at ICGEB to acquire the knowledge and expertise in the manipulation of recombinant cell banks, in upstream and downstream processes, and in quality control procedures in accordance with the guidelines of European and International Pharmacopoeia. Laboratory

procedures are then adapted to local conditions, requiring a financial investment to set up, or optimise, production facilities.

The ICGEB focuses on the technology and expertise required to obtain the Active Pharmaceutical Ingredient at the pre-industrial level; it does not support its partners in scaling up technologies in GMP conditions nor in fulfilling the regulatory process but could direct at partners having such expertise. **In this framework, the ICGEB is upgrading its technology transfer offer:** in order to be able to deliver training in a more “**pharma-compliant**” environment, with **enhanced quality control services** and **GMP recombinant cell lines**, the ICGEB is renovating the Biotechnology



Development facility in Trieste. This expansion will also allow a broadening of the scope of the types of molecules that can be produced, supporting, in particular, the development of similar antibody-based therapeutics. A key focus is the development of new technologies for the production of monoclonal antibodies for the treatment of major diseases, starting with breast cancer and arthritis.

Last, in order to meet the growing demand for distance learning, the ICGEB plans to design online training modules based on Standard Operating Procedures covering the entire production process, from the cell to the purified Active Pharmaceutical Ingredient. The plan is to develop a rich video based eLearning platform, which can deliver training effectively everywhere,

as an alternative to standard trainings conducted at the ICGEB laboratories.

## 2. Novel biotechnology solutions

Novel applications of biotechnology offer unique possibilities for innovative drug development and unprecedented options for economic exploitation<sup>5</sup>. Their business development follows a trajectory that is significantly different from that of standard small molecule drugs, because they are no longer driven by large pharmaceutical companies.

Over the last 10–15 years the focus of many companies has increasingly shifted to external research as a resource for future products. Innovative drug research is now carried out by small biotech companies, initially with limited economic support, but possessing knowledge-intensive capacity. These are usually initiated as spin-offs of universities or research centres and endowed with specific intellectual property and expertise strictly related to the application under development. Their activities usually rely on investment by business angels and venture capitalists to reach the pre-clinical stage, or even the first phases of clinical studies, and show success, when they then attract the interest of the larger pharma companies.

While this represents a conceptual revolution in the common practice of large pharmaceutical industries in developed countries, it also offers **an unprecedented opportunity for developing countries:** a new class of biotech companies that are small and focused, that can rely on relatively limited economic support to achieve competitive success. This opportunity, however, relies on the creation of **capacities that extend beyond laboratory skills**, to include knowledge of intellectual property protection, the fostering of innovative applications, and nurturing of entrepreneurship skills. Knowledge Transfer is now a recognised activity and has been adopted as part of the “Third mission” alongside teaching

<sup>5</sup> *Biotechnology and the bio economy – Towards inclusive and sustainable industrial development*, Y. Lokko et al. *New Biotechnology* 40 (2018)

# STRATEGIC VISION AND FOCUS AREAS

and research; and industry is now an integral part of the triple helix innovation model. Students' entrepreneurship is becoming the next driver of technology transfer and this implies that specific training should be offered to young scientists active at ICGEB, at undergraduate levels, to help forge an entrepreneurial mindset.

### 3. Collaborative Research Programme (CRP) Grants

The CRP aims to finance projects addressing original scientific topics of particular relevance for the applicant's country. Support is available for research projects in many fields of science, human healthcare, industrial and agricultural biotechnology, and environmental bioremediation. Peer-reviewed evaluation of scientific projects ensures transparency and meritocracy.

Although efforts are being made in STI to boost **employment, competitiveness and growth**, and in addressing societal challenges such as **Infectious Disease and Non-Communicable Disease** and also **Food and Energy Security**, the world's research output from developing countries and the investment in research is still low. Research and innovation (R&I) capabilities and infrastructures in many developing and newly industrialised countries are yet to be fully optimized due to several impeding factors – from insufficient funding and poor governance to a shortage of women in science, poorly equipped laboratories, and little practical research training for science students, owing to the separation of research centres from universities.

Building upon the ICGEB's expertise in biomedical research and its longstanding experience in specialised training, the CRP Programme **enhances the R&I capabilities of Principal Investigators (PIs) across its constituency, empowering them through direct support for research activities *in loco***, feeding local expertise in biotechnology research. Selected candidates receive financial and technical support to carry out a project in collaboration with an ICGEB PI, intended to improve the capacity of existing research groups and/or to help in establishing

new ones, whilst also improving locally available equipment and infrastructure. The endorsement of the ICGEB Liaison Officer, as per the rules of the Programme, ensures **alignment** of the proposed project with **national priorities**.

The **direct beneficiaries** of the CRP Programme are **scientists** across the ICGEB Constituency, selected on scientific merit, geographical distribution and the relevance of the proposed research topic to the aims of the Programme. **Indirect beneficiaries** are their **home institutions**, through enhanced capacity of research staff, upgrade of the research facilities and scientific skills, and enlargement of **strategic research networks**. The country of origin of each CRP grantee benefits from having additional, highly skilled individuals, with greater connections to the international scientific research community, including the ICGEB, and, in the medium and longer term, an increase in the overall national innovation potential in a specific field of research. The Programme promotes international research cooperation attuned to national interests and ownership.

In addition, the **Early Career Return Grants Scheme** promotes the establishment of new laboratories in the ICGEB constituency, these grants are awarded to young scientists returning to a Member State after a research period abroad. The scheme is intended to reverse brain drain and to strengthen the research base of the Country involved.

**Budgetary constraints limit the potential impact of the CRP Programme and the number of investigators that the ICGEB can support. The Programme has become extremely competitive over the years. A major strategic goal of the ICGEB is to raise the funding threshold to at least 10%, which in net terms means raising approximately an extra 1M Euro per year. ICGEB wishes to identify partners and funding opportunities to support more projects, prioritising LDCs and the Global South, as well as gender parity.**

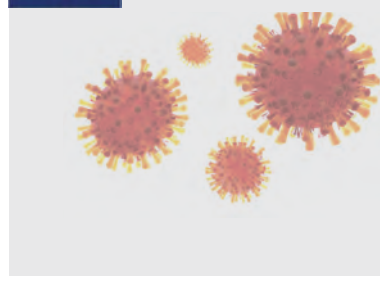
# STRATEGIC VISION AND FOCUS AREAS

## 4. Regulatory Science

Complementing the promotion of biotechnology internationally, ICGEB Regulatory Science activities focus on providing direct support for the establishment and enhancement of national biosafety regulatory frameworks and administrative and technical offices, through the **drafting of legislation, regulations and guidance documents**, and **providing in-country training** in the execution of essential procedures. In particular, the work of the ICGEB Regulatory Science Group in Burkina Faso, Ethiopia, Ghana, Nigeria and Uganda has led to these countries extending the use of GMO technology beyond the laboratory, and ultimately to having GM products made directly available to farmers and consumers.

Donors and collaborators have recognised that these activities continue to enhance the technical expertise of regulatory officers and experts in the developing world, supported by popular mentored training fora and an eLearning portfolio. The emergence of new biotechnologies, especially gene drives, genome editing and RNAi technologies, which result in a broader range of applications and which, by extension, help governments to attain a broader range of policy goals, has also resulted in increased requests for support. During the present Framework, the Group is expanding the assistance it provides to include, for example, the exploration and refinement of the regulatory arenas that will cover the derived products, and to develop specific risk assessment approaches<sup>6</sup>.

### Pillar 6. Scientific Hub for R&D and International Cooperation



**VISION:** to improve the capacity of ICGEB Member countries to connect and cooperate in the field of Life Sciences through competence sharing and improved coordination amongst existing bilateral, multilateral and other mechanisms; to become a privileged scientific forum for cutting-edge research and scientific debate among ICGEB's constituency; to channel resources and promote synergies in the STI sector between various national and international actors.

## FOCUS AREAS

### 1. Partnership development and implementation

As an Organisation, ICGEB is unique. This uniqueness creates a special and permanent opportunity when taking into account its broad mandate, the increasingly competitive landscape of international cooperation and its dual nature as both an International Organisation and a **Centre of Excellence for Research in Life Sciences**. During the timeframe of the present Strategic Framework,

the ICGEB will further promote its positioning in the international environment, with a view to enhancing decision-makers' perception that backing the Centre is a smart investment that is good for scientific research, for domestic scientific communities and, ultimately, for the economy, wellbeing and security of the Member Countries.

Strengthening ICGEB's relationships with bilateral partners and international cooperation departments is vital. The ICGEB benefits from a consolidated and strong cooperation

<sup>6</sup> Syed Shan-e-Ali Zaid et al., *New plant breeding technologies for food security*, Science 2019, <https://science.sciencemag.org/content/363/6434/1390>



# STRATEGIC VISION AND FOCUS AREAS

with the **Governments of Italy** (Ministry of Foreign Affairs), **South Africa** (Department of Science and Innovation, Ministry of Higher Education, Science and Innovation), and **India** (Department of Biotechnology, Ministry of Science and Technology). These Governments not only regularly provide their full Assessed Contributions to the Organisation, but also a

and the **European Union**. In this regard, ICGEB will actively participate in the next Research Framework Programme, Horizon Europe, contributing to the international cooperation objectives of the European Commission to the forging of the European Research Area, and will continue to foster its cooperation with the Joint Research Centre (JRC) of the EC in areas of



remarkable amount of Voluntary Contributions, which, for the most part, are not earmarked and allow the Organisation to implement its scientific programmes and extramural activities to the benefit of the entire constituency. During the timespan of this Strategic Framework, the ICGEB will focus on strengthening such relationships and forging new bilateral partnerships, and establishing synergies with the existing programmes in-country or at regional level, particularly with those supporting scientific research, technology transfer and ICGEB's cross-cutting priorities, in order to maximise impact in this sector. Country or Region-specific scientific cooperation projects will also be pursued, in order to increase the scientific capacity of targeted Member Countries. Other Members who are in a position to undertake more responsibility to support ICGEB's mandate through implementing the Strategic Framework, are also urged to strengthen cooperation with the ICGEB. This vision goes hand-in-hand with the increasing internationalization of ICGEB's personnel and management structure.

The ICGEB will work towards increasing its visibility and relations with multilateral partners

common interest. In addition, in order to increase funding and collaboration opportunities with the European Union, the ICGEB will undertake the Pillar Assessment procedure to be entrusted with implementation of EU budget under indirect management.

With regards to multilateral partnerships, ICGEB needs to strategically articulate its unique value-added role and build trust through ongoing engagement. Modalities of cooperation include direct funding, trust funds, developing an inter-sectoral agenda based on the SDGs, sharing good practices and results, and exchanging professionals.

ICGEB is already cooperating with the United Nations within the auspices of the **Technology Facilitation Mechanism**, which is based on a multi-stakeholder collaboration between Member States, civil society, the private sector, the scientific community, United Nations entities, and other stakeholders of the United Nations Interagency Task Team on Science, Technology and Innovation (STI), which ICGEB joined in 2018. Engagement with the **United Nations Office for South-South Cooperation (UNOSSC)** will be instrumental in advancing the promotion of knowledge sharing and creation

# STRATEGIC VISION AND FOCUS AREAS

amongst countries in the ICGEB Constituency, the vast majority of which belong to the Global South. Partnership with the UN for the promotion of peaceful use of biotechnology will be further consolidated in the framework of the Biological Weapons Convention. Research on infectious diseases and capacity building in Member Countries, in diagnostics and surveillance, such as the development of point-of-care devices for the detection of pathogens, which are considered as a first-line containment for epidemic threats, are of particular interest to the States that are party to the Convention.

The ICGEB will also continue to contribute to the UN Inter Agency Committee on Bioethics and to partner with UNIDO, WHO, FAO, WIPO and other relevant UN Agencies. ICGEB will continue to align its operations to those of the UN System, including seeking observer status within ECOSOC.

Deeply rooted in its Host Countries, the ICGEB will continue to foster long-lasting relationships with top **Italian, Indian and South African scientific organisations and universities**. With respect to its headquarters Region, **Friuli Venezia Giulia**, and the city of Trieste, the ICGEB will pursue its active engagement with the “**Trieste Science System**”, by participating in its public events aimed at the promotion and dissemination of scientific topics among the citizenship at local, regional and cross-border level. The ICGEB will also support the Region in the achievement of its Smart Specialization Strategy and its international cooperation priorities, through implementation of the existing Bilateral Collaboration Agreement, and active participation in calls and mutually agreed initiatives.



## 2. Regional Research Centres

The ICGEB continues to implement the Regional Research Centres (RRCs) agenda, to provide cost-effective assistance and support to science-based priorities identified at a national or regional level in Member States. RRCs are expected to promote capacity enhancement programmes and technology transfer at a regional level. The main objectives of a newly-created RRC are: (i) to conduct scientific research at the highest international standards according to the needs of the Hosting Country and other countries in the same geographical area; (ii) to provide an international centre for short- and long-term research training activities, and (iii) to enhance the capacity of the scientific community in the geographical region in the field of biotechnology. All activities will be performed under the scientific leadership of the ICGEB.

## 3. Scientific Hub for Member States

The ICGEB continues to act as a scientific reference point for its Constituency, involving, as far as possible, scientists from Member States in its scientific events and activities. It also organises specific dissemination and information activities for its Members on burning scientific issues and the latest scientific discoveries. In the next few years, the ICGEB will promote activities directed at its Members in the field of genome editing. Such activities will be mainly conducted through various forms of training. Another field of interest will focus on biosimilars and issues related to quality control. Additional topics will be identified during the timespan of this Framework, based on the needs of ICGEB's Member States.



# CROSS-CUTTING PRIORITIES

Cross-cutting priorities are thematic or geographical areas considered of crucial importance for realising the present Strategic Framework and the goals it is set to achieve. These priorities affect all ICGEB Pillars and will be integrated in all phases of ICGEB activity, from planning to policy and impact evaluation. Such priorities are not intended as new focus areas, but rather as a tool which will help in the monitoring of the implemented activities, allowing the ICGEB - and its Member States - to ensure that adequate financial and human resources are allocated to make an impact in the identified priorities.

During this Framework, the ICGEB will focus on three cross-cutting priorities: Gender Equality and Youth, South-South Cooperation, and Least Developed Countries (LDCs). We believe that such priorities are interdependent, when considered in the wider context of the ICGEB mandate and the overall contribution to the UN Sustainable Development Goals.

## Gender Equality and Youth

According to recently published data from 500 scientific institutions worldwide, women



make up 50% of all undergraduates in the Life Sciences, but less than 30% of scientific researchers and only 25% of professors are women<sup>7</sup>. On the International Day for Woman and Girls in Science, the UN Secretary General said that “dismantling gender stereotypes”

is an essential step towards ending the gender imbalance in science. ICGEB’s thirty-year experience in international scientific cooperation and collaboration with Member States confirms the above data and the need to advocate for change through the promotion of gender equality. To this end, the ICGEB will further enhance its efforts, both externally with partners and internally through awareness



discussions and dedicated undertakings, to encourage the integration of gender equality requirements in its projects, while also trying to increase participation of women scientists in its research programmes. Internally, the objective is to reach gender equality in all ICGEB-funded programmes by 2030, guided by the positive example of the individual skills development programmes, where equality of gender representation is already achieved. The ICGEB will continue to collaborate with partners active on this priority, such as the Organization for Women in Science for the Developing World (OWSD), and will promote skill development projects particularly dedicated to women, such as the new flagship programme “WE-STAR”, Women in Science Fellowship Programme, supporting women scientists in Africa and Asia to pursue postdoctoral research activities at the ICGEB Components.

According to the United Nations<sup>8</sup>, **85% of the world’s young people live in developing countries**. Investing in young people’s future

<sup>7</sup> UNESCO, *Women in Science*, available at [www.uis.unesco.org](http://www.uis.unesco.org)

<sup>8</sup> [https://www.unfpa.org/sites/default/files/pub-pdf/EN-SWOP14-Report\\_FINAL-web.pdf](https://www.unfpa.org/sites/default/files/pub-pdf/EN-SWOP14-Report_FINAL-web.pdf)

# CROSSCUTTING PRIORITIES

health and education is the best way for a country to unlock productivity and innovation, cut poverty, create opportunities, and generate prosperity.

Human capital has played a pivotal role in the success of emerging economies around the world. Projections show that human-capital investments can do the same for the poorest countries in LDCs. Young people also face challenges in their job prospects. These challenges are well recognized in the 2030 Agenda, with SDGs aiming to broaden employment and education opportunities for youth to reduce the mismatch between skills and market needs. The ICGEB acknowledges that young people constitute the main driving force for the future of science and of their countries and will continue to invest in young scientists throughout its programmes.

## South-South Cooperation

As an Intergovernmental Organisation in which the great majority of Member States are countries of the Global South, the ICGEB implements South-South Cooperation in all of its actions, to promote scientific cooperation, capacity building and technology transfer. ICGEB operations are aligned with the **General Assembly Resolution A/73/L.80** dated 8 April 2019 on the Buenos Aires outcome document of the second High-level United Nations Conference on South-South Cooperation, and **offer punctual solutions** to its calls with regards to scientific cooperation. In this context, ICGEB's objective is to forge a **strong partnership** with the UNOSSC to foster its South-South and **Triangular cooperation activities** in support of scientific and economic development of Member States.

During the present Framework, ICGEB South-South Cooperation will also focus on the

following strategic actions: i) promoting dialogue, exchange and internationalisation of science in low resource settings; ii) provision of fellowships to increase human capital development in the South; iii) providing research grants and early career return grants to reverse the negative effects of brain drain; iv) convening meetings promoting visibility and capacity of institutions in the South, through presentation of their science to a wider, international audience; v) providing platforms for scientific exchange; vi) exchanging good practices and lessons learnt in the development and implementation of biosafety regulatory systems; vii) advocacy and global outreach actions; viii) engaging in and promoting scientific diplomacy at all levels.

## LDCs

LDCs represent about 12% of the global population but account for less than 2% of the world's GDP, and about 1% of global trade in goods. **Eradicating poverty, reducing malnutrition, increasing health quality, achieving internationally-agreed development goals, and enabling the transition from the LDC category** are the main challenges faced by these countries<sup>9</sup>. Many LDCs have been ICGEB Members since the foundation of the Centre and, therefore, their inclusion as a geographical focus is fundamental. The ICGEB will promote - also in partnership with other agencies - the funding of specific, tailor-made projects, targeting LDCs in particular, as a group, as a region, or as individual countries. As an example, in the next three years, the ICGEB will implement a specific action aimed at strengthening the research base in **Ethiopia and Djibouti**.



<sup>9</sup> Programme of Action for the Least Developed Countries for the Decade 2011-2020: <http://unohrlls.org/UserFiles/File/IPoA.pdf>

# RESEARCH MACRO AREAS



## ICGEB RESOURCES

**Facilities:** High-Throughput Screening (HTS), Bioexperimentation and Animal Models, Cell culture, Pathogenic Virus Manipulation (BSL3), Crystallography, NMR, Imaging, Flow Cytometry, Viral vectors for gene delivery

**Expertise:** Artificial Intelligence, Big Data, Bioinformatics, Proteomics, Genomics, Computational and Systems Biology, Gene Editing, Genetic engineering, Biomass conversion, Fermentation, Regulatory Science, Peptide synthesis, Diagnostics, Biomarkers



Printed in July 2021

by Gramaglia & C. srl  
Trieste, Italy

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*Graphic Project and Design by Marella Prata, ICGEB Trieste*



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