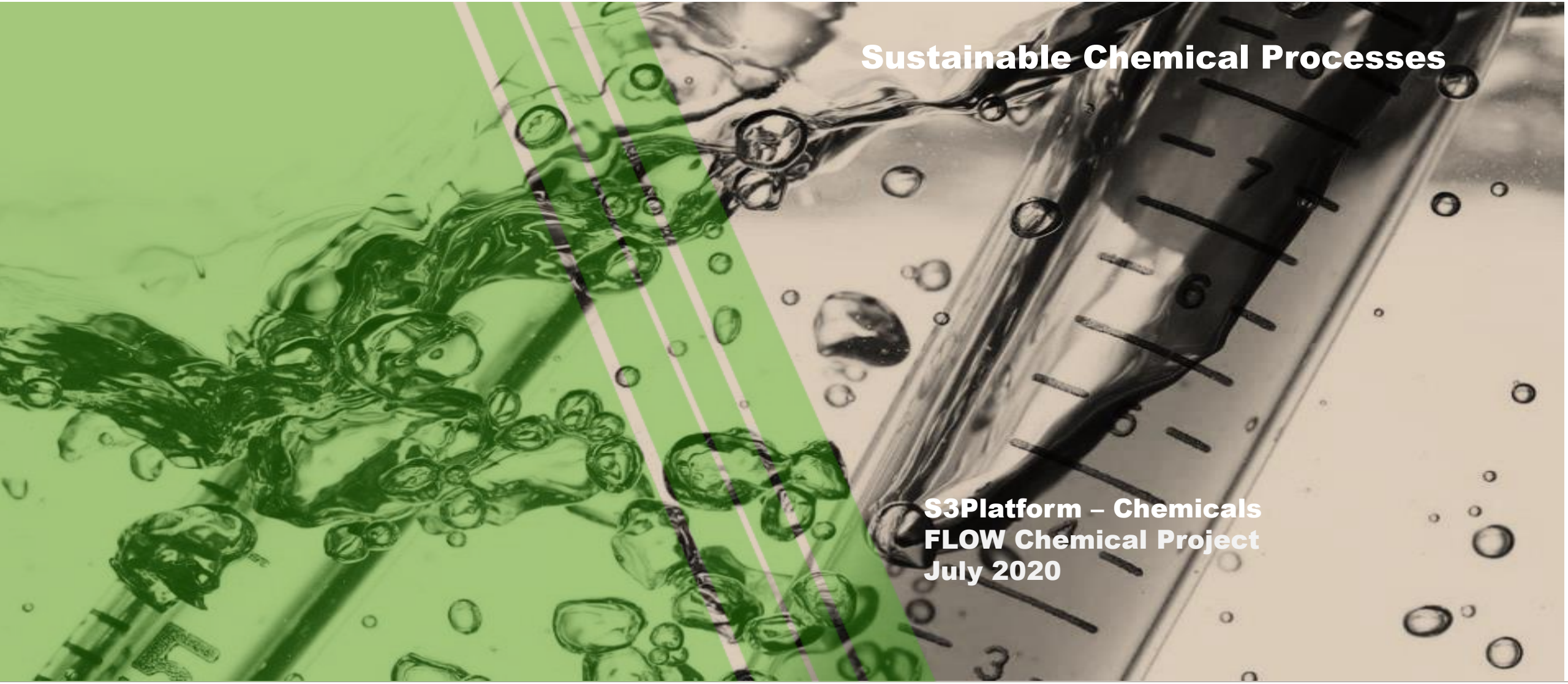


Sustainable Chemical Processes

S3Platform – Chemicals
FLOW Chemical Project
July 2020

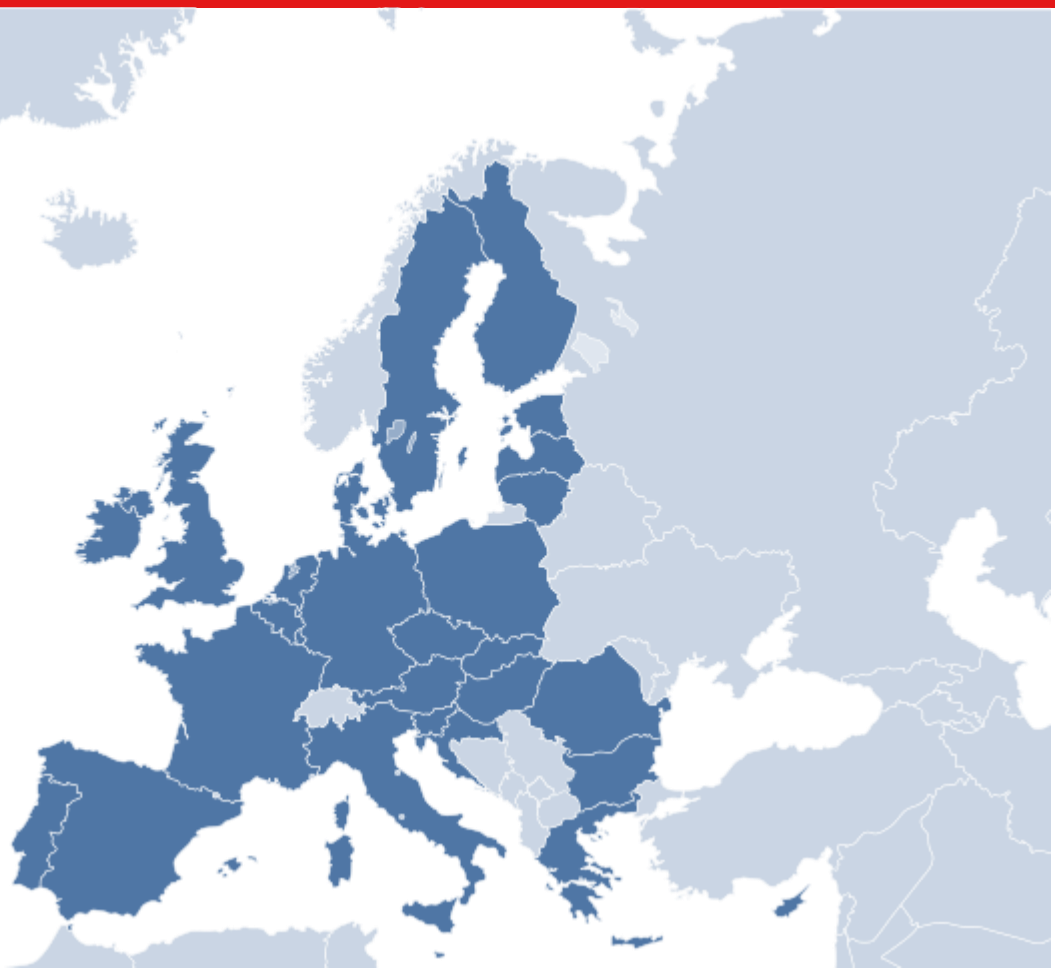
Generalitat de Catalunya

EU Chemical sector

€565 bilions

30,000

€10.0 billion



1.1% GDP

1,171,000

20.5%

ACCIÓ Generalitat de Catalunya Government of Catalonia

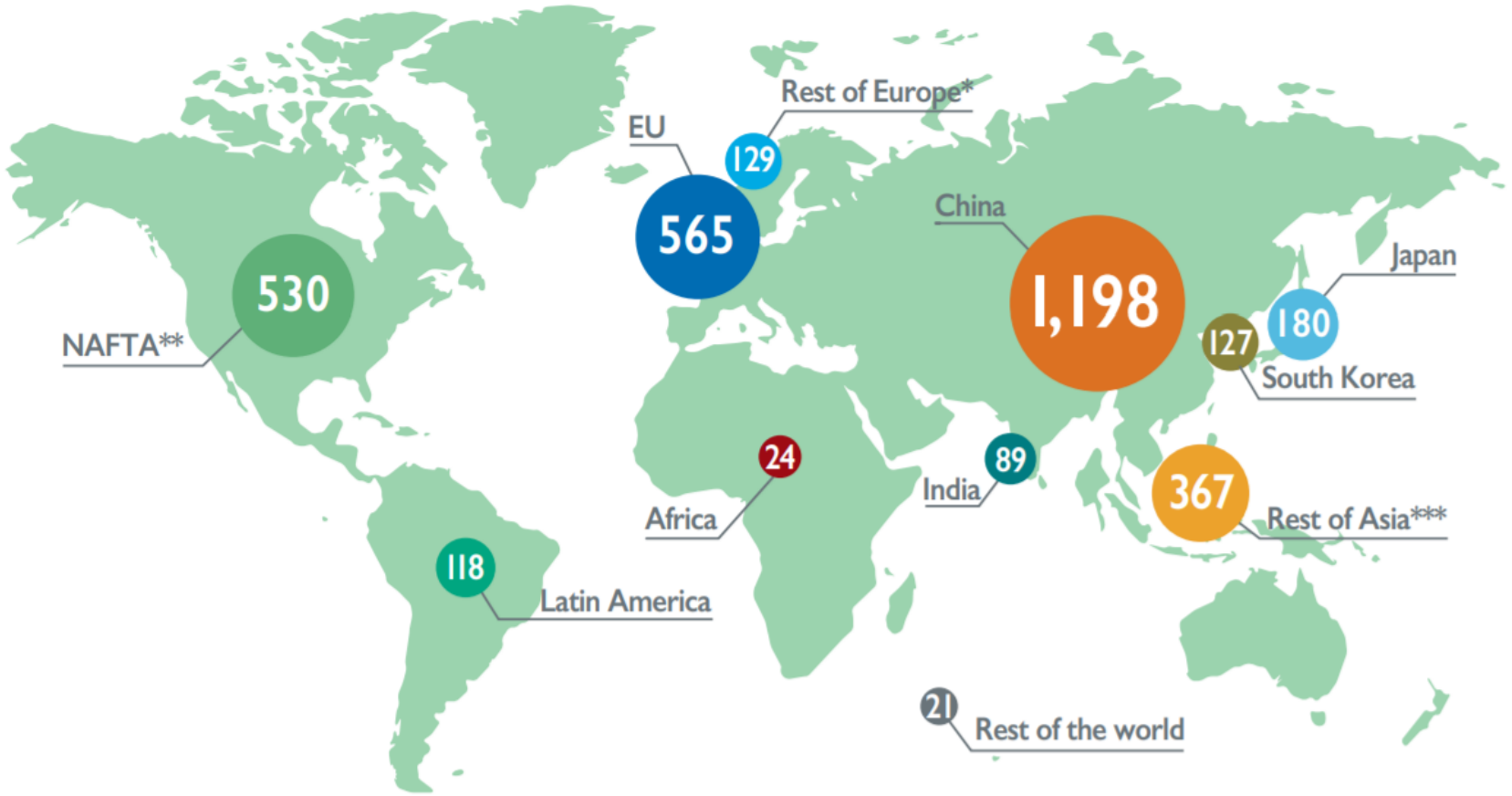
*Source: Own based on **Landscape of the European Chemical Industry 2020***

CataloniaConnects
catalonia.com

EU Chemical sector

Europe is the second largest chemicals producer in the world

World chemical sales (2018, €3,347 billion)



Source: Cefic Facts & Figures 2020

EU Chemical sector

World market share of EU chemical sales drops by half

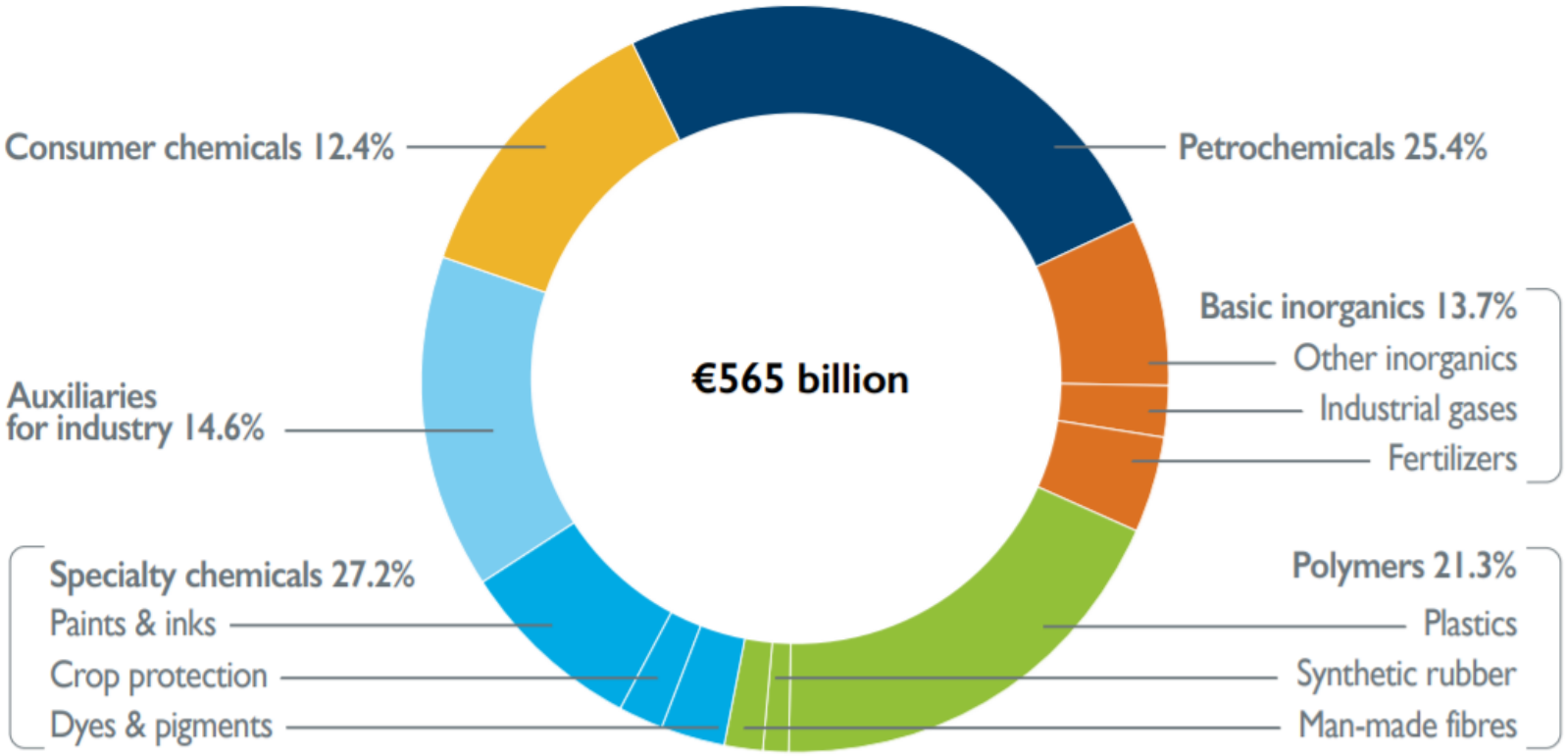
EU share of global chemicals market

Source: Cefic Facts & Figures 2020

EU Chemical sector

Base chemicals represented 60.4% of total EU chemical sales in 2018.

EU chemical sales 2018 (€565 billion)



Source: Cefic Facts & Figures 2020

Challenges for Chemical Industry

Global Competitiveness. Multipolar world

New and disrruptive technologies

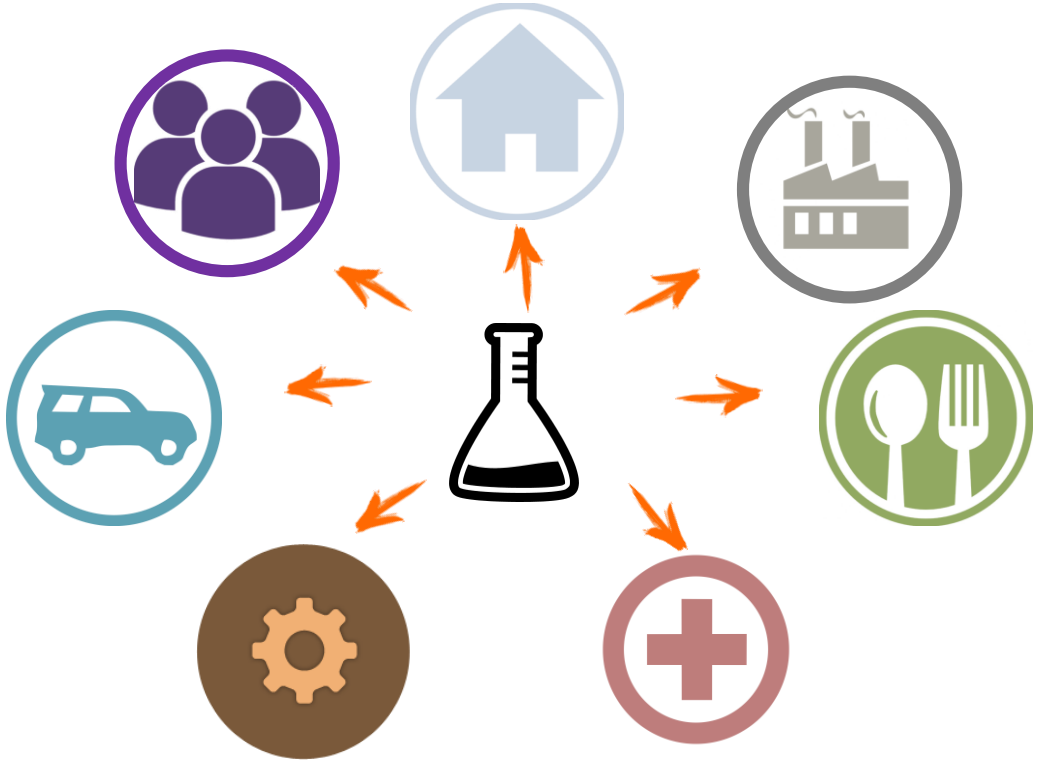
Circular Economy

Going Digital

Talent

#EUGreenDeal

Chemicals strategy for sustainability 9/05/2020



Encourage innovation.
Help better protect citizens and the environment against dangerous chemicals.

Simplify and strengthen the **legal framework.**

Greater **transparency.** Quickly reflect scientific evidence on the risk posed by endocrine disruptors, hazardous chemicals, and highly persistent chemicals in products.

EU strategic autonomy in the **production of essential chemicals** in key sectors and promoting research and development.

Sustainable transformation of the chemical industry.

Chemicals and the SUSTAINABLE DEVELOPMENT GOALS

Life on Land

The chemical sector measures and manages its environmental impacts and dependencies. This includes efforts to mitigate negative impacts that some products can have on ecosystems and biodiversity by improving product formulations and design as well as managing such products further downstream.

Zero hunger

The chemical sector has a key role in supporting a more sustainable food supply that meets the basic nutritional needs of a growing global population. Advances in chemistry help protect plants from pest infestations, improve food distribution channels, extend lifetimes of food and food packaging and maintain food quality and safety.

Life Below Water

The chemical sector works with others in the value chain to reduce marine pollution of all kinds, including nutrient pollution and prevention and reduction of ocean plastic waste.

Good Health and Well-Being

Chemistry is key to achieving the Good Health and Well-Being goal. Medical breakthroughs and technologies made possible through advances in chemistry provide a deeper understanding of how human health is impacted by disease and hazardous chemicals in our food, water and the environment. Chemistry plays a critical role in medical diagnosis and drug development, enabling people to live longer and healthier lives. Chemistry also offers new solutions for reducing pollution and its impacts on human health. The application of green and sustainable chemistry can help eliminate or reduce hazardous chemical pollution.

Climate Action

Advances in atmospheric chemistry are critical to our understanding of the causes of global climate change and to our ability to predict the extent and impacts of climate change. Chemical research will be essential to mitigate and adapt to climate change. Advanced materials for renewable energy, improved disease and seed treatments, and high-yield fertilizers to increase food production will help combat climate change.
The chemical industry is moving towards a low-carbon economy working to shift to low-carbon chemical .Research and innovation are essential to help the industry move towards circular, low-carbon raw materials by offering materials and energy solutions to our downstream customers using carbon from waste, biomass, and CO2 and CO from combustion gases.
The sector also plays a key role in developing solutions that will allow other sectors to strengthen their resistance to climate-related risks.

Clean Water and Sanitation

Access to clean water and sanitation is a global issue that must be managed at a local level and chemistry has an essential role. Developments in chemistry include disinfectants that kill germs and prevent disease; polymer membrane filters that remove impurities; materials for desalination; and materials for pipes that protect water from its source to the tap. New methods of water purification and lower cost desalination processes will contribute to achieving universal access to safe and affordable drinking water. Advances in chemical sector water management improve water quality by reducing pollution, reducing the proportion of untreated wastewater and increasing recycling and safe reuse. Water quality will improve through the deployment of greener technologies and pollution prevention strategies. Research is also needed to find high-efficiency separation methods for removal of metals and micro pollutants.

Responsible Consumption and Production

Chemical products help improve the quality and efficiency of production processes across industries. The chemical processing industry can go further by contributing to a transition to a circular economy by enabling the circular economy in downstream industries, and by recycling and reusing molecules to close the loop in chemical manufacturing.

Affordable and Clean Energy

Chemistry will help meet the goal 7 through the development of new materials for renewable energy, by being more energy efficient in the chemical processing industries, and by advancing cleaner fuel technologies.
The chemical processing industries can improve manufacturing efficiency through new catalysts, optimized process design, and new separations processes.
The chemical sector helps enable production and storage of renewable energy and renewable energy infrastructure through the supply of key materials for wind turbines and solar PV panels. Chemistry is also a key component of innovations in carbon capture and storage/utilization Technology and also collaborating on efforts to validate and scale hydrogen cell technologies as a new chemical carrier for energy and battery technology, which will help to improve access to new sustainable energy sources.

Sustainable Cities and Communities

As the population growth rate increases in urban areas, there is enormous pressure for cities to scale up the implementation of sustainable solutions that meet the needs of local communities. The chemical sector is working to increase its participation in multi-stakeholder collaboration to make cities more sustainable and inclusive.

Industry, Innovation and Infrastructure

The chemical processing industries can upgrade infrastructure and retrofit production facilities to become more sustainable. Chemical products play an important role in enabling and building resilient infrastructure solutions and by engaging with other sectors, chemical companies can further enable open-innovation and manufacturing advancements to encourage development of integrated and end-to-end models. Frameworks that promote industrial symbiosis for chemical sector companies and their value chains help address environmental and resource concerns, reduce raw material and waste disposal costs, earn new revenue from residues and by- products, support circular business models, and develop new business opportunities. Promote chemical research that will serve as the basis for innovation in many other sectors.

Decent Work and Economic Growth

The safe production and management of chemicals is crucial to economic growth and enhancing quality of life for people globally. Innovation provides business opportunities and a sustainable basis for global growth.

Source: EIC (DGI-ACCIÓ), based on data from ACS and WBCSD.

ReConfirm

The Regional Co-operation Networks
for Industrial Modernisation

Project idea:

FLOW CHEMISTRY Interregional Hub

Chemicals Partnership

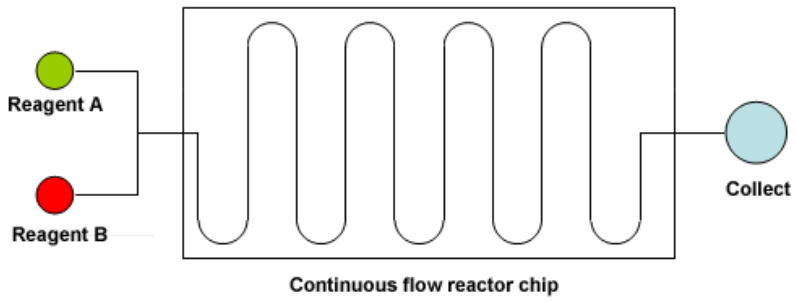
SUSTAINABLE CHEMICAL PROCESSES WORKING GROUP

Flow Chemistry

Flow chemistry is the development and study of chemical reactions whereby reactants are combined by pumping fluids, including solutions of reagents, though tubes at known rates and a controlled temperature.

The **benefits** of flow chemistry are: faster reactions, **cleaner products**, **safer reactions**, rapid reaction optimization, automation, **easy scale-up**.

Flow chemistry/process intensification can potentially reduce the number of steps in a synthesis, thereby resulting in a **greener** process.



Why this project?

- Innovative technology
- Paradigm change in production
- Increased safety and flexibility in production
- Faster and more efficient
- Less waste, higher rates and purity
- Energy savings
- Currently flow production combined with batch steps in existing plants
- For new plants: smaller equipment and plant footprint
- Faster introduction to market. Easy scale-up
- Business access to new technologies
- Application in emerging fields, such as personalized medicine.
- Regulatory agencies adapting quickly.
- This technology can facilitate the reindustrailization and relocation of companies and chemical processes in Europe.

Proposal

The creation of a **hub of laboratories and demonstration plants** to be able to scale up processes and reactions in continuous flow can allow access not only new process and production conditions, but also more stable and reproducible manufacturing conditions.

The proposal for the Flow Chemical Interregional Hub (FCIH) is based on 4 axes distributed in several geographical nodes.

- Axis 1: Pilot plant for process developments (not GMP)
- Axis 2: GMP plant as a demonstrator of processes and to carry out clinical batches.
- Axis 3: Resource center, management, financial aspects, promotion, legal and regulatory framework, accreditation of qualified technology providers in flow chemistry and complementary technologies, training, contact with investors, etc.
- Axis 4: Business Accelerator.

Challenges

Challenge 1:
Facilitate the access of companies to chemistry equipment in flow

→ **Pilot plant**

Challenge 2:
Promote the creation of companies in this field:

- Development of new products through flow chemistry
- Reactor Design
- Catalysis and biocatalysis
- Service providers

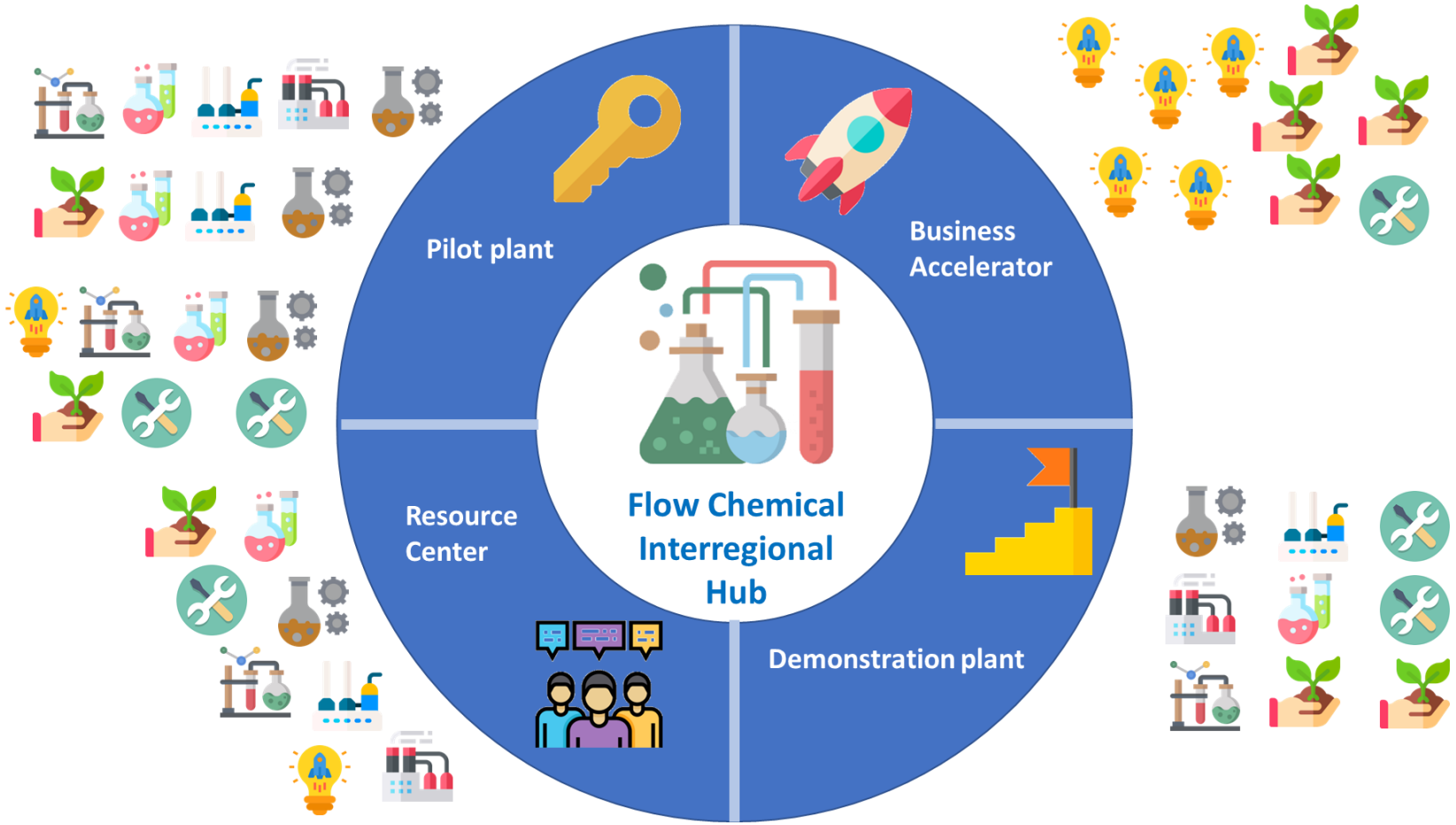
→ **Business Accelerator**

Challenge 3:
Scale up

→ **Demonstration plant**

Challenge 4:
Technological advice
Legal and regulatory framework
Training

→ **Resource Center**



Pharma and fine chemical companies, research centres

Start-ups in flow or biotech with intensive flow use, reactor designer, catalysis and bio-catalysis

Private investors /Corporate investor

Accredited technology providers

Main potential costumers

- pharmaceutical,
- agrochemical,
- fragances and flavours
- other fine chemical companies,
- biotech companies focusing on drug discovery,
- nano-material companies.

Interregional dimension

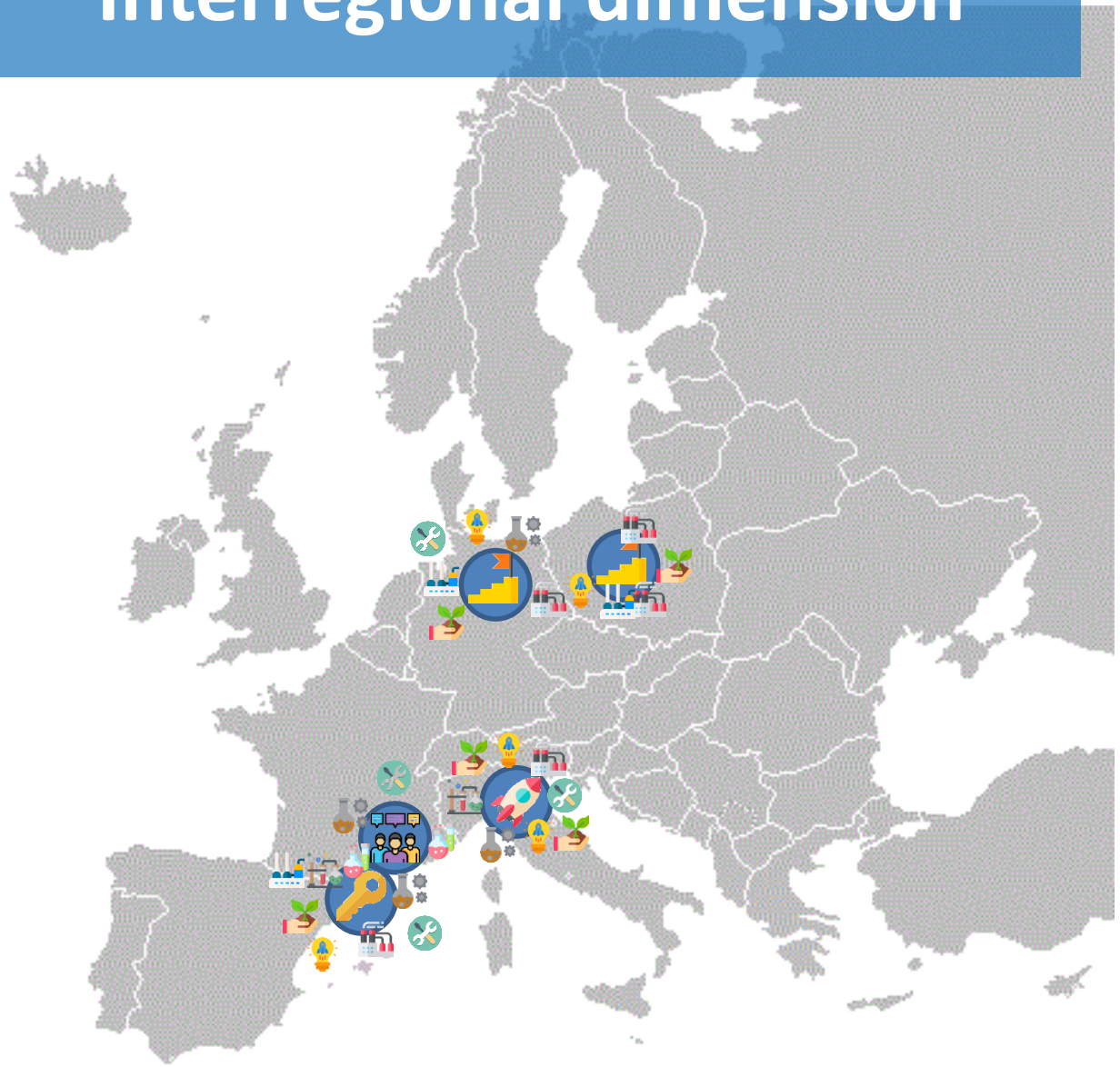
FCIH
Regional Nodes (TBC)

Technical Assessment
Knowledge providers

Chemical Industries
Farma Industry
Agrofood industries
Technical centers
Research Centers
Tech Suppliers
Equipment suppliers

Venture Capital
Business Angels
Corporate Investors

Startups



Working group

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Moltes gràcies
Thank you very much

MD. Núñez, PhD

Catalonia Trade & Investment Offices

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