

Processes4Planet

Research and Innovation for climate neutral industry

*Transforming the European Process Industry
for a sustainable planet & a prosperous society*



EU INDUSTRY WEEK

*Moving towards a competitive European bioeconomy:
Emerging biorefinery technologies & pathways to deployment*

17 February 2021



WHO ARE WE

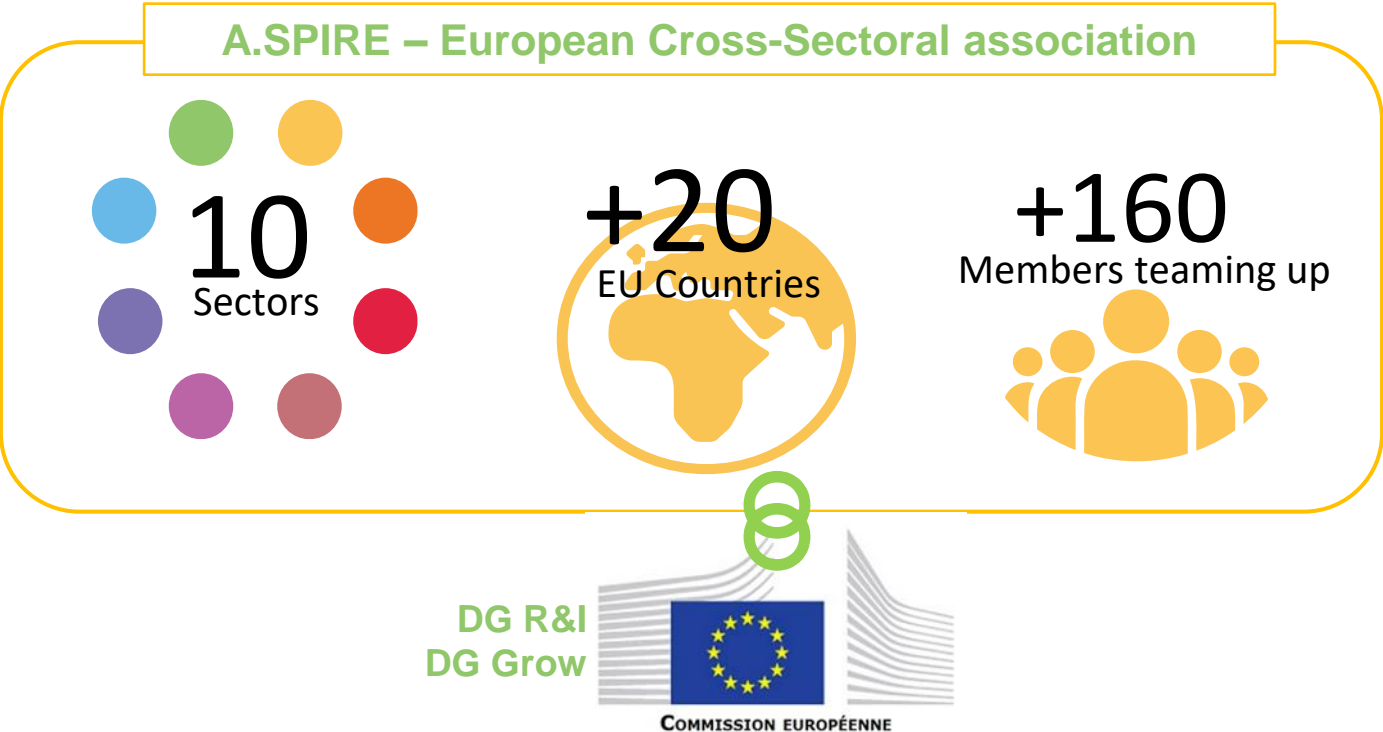
A vibrant community ...

A.SPIRE – European Cross-Sectoral association

10 Sectors

+20 EU Countries

+160 Members teaming up



DG R&I
DG Grow

COMMISSION EUROPÉENNE

- Industrial Associations & Clusters
Industries, incl SME's, New Sectors ...
- RTO's & Higher Education Institutions
- Consultancies, NGO's,
KIC's, Innovation Agencies, ...
- MS & Regional Representatives
Financial Partners

OPEN APPROACH: inclusive of different stakeholders and welcoming Newcomers



Transformation levers and tools to enable P4Planet to achieve its ambitions





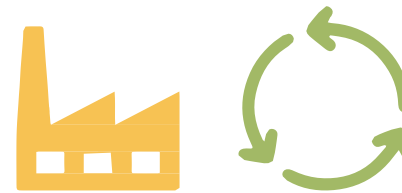
Unique cross-sectoral community

Innovation area	Progress up until milestone year ¹			
	2024	2030	2040	2050
Renewable energy integration	○	◐	◑	●
Heat reuse	○	◐	◑	●
Electrification of thermal processes	○	◐	◑	●
Electrically-driven processes	○	◐	◑	●
Hydrogen integration	○	◐	◑	●
CO ₂ capture for utilisation	○	◐	◑	●
CO ₂ utilisation in minerals	○	◐	◑	●
CO ₂ & CO utilisation in chemicals and fuels	○	◐	◑	●
Energy and resource efficiency	○	◐	◑	●
Circularity of materials	○	◐	◑	●
Industrial-Urban symbiosis	○	◐	◑	●
Circular regions	○	◐	◑	●
Digitalisation	○	◐	◑	●
Non-technological aspects	○	◐	◑	●

¹ Progress is depicted here as % of total TRL9 projects programmed in each area, and for circular regions, digitalisation, and non-technological aspects % of total investment needs until 2050

36 innovation programmes to FILL the GAP

+ Skills, Jobs, Competitive gap analysis, Framework/Standards



First-of-a-kind plants

Hubs for Circularity



Ambitions to enable Prosperity for all



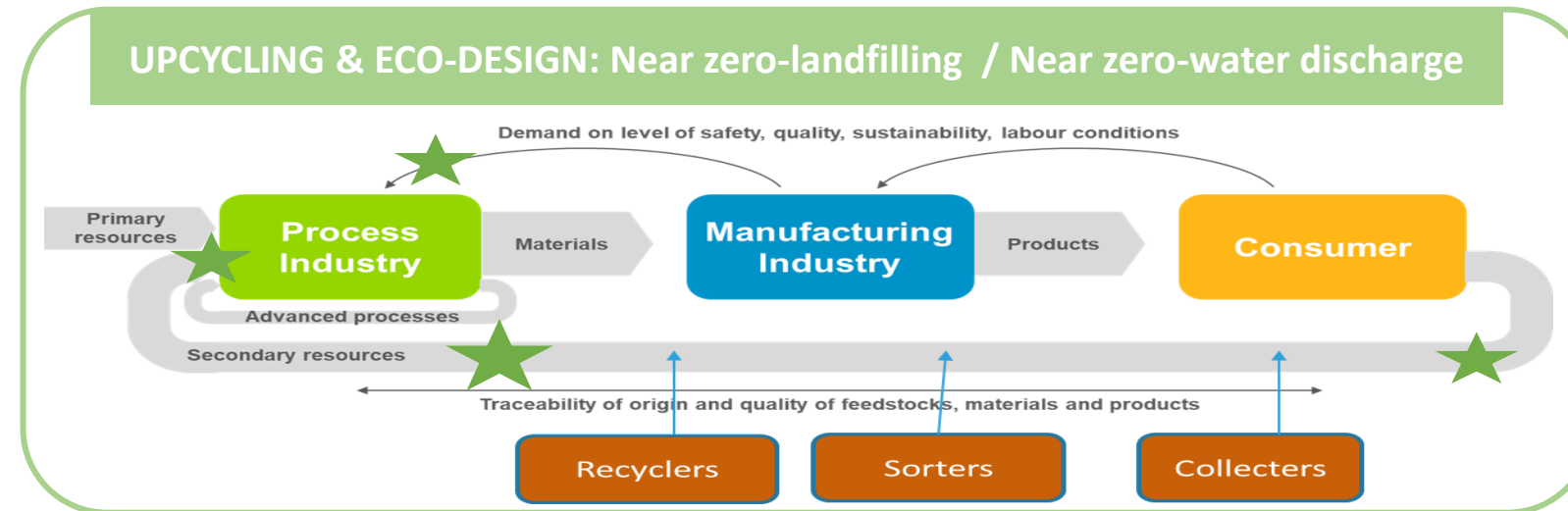
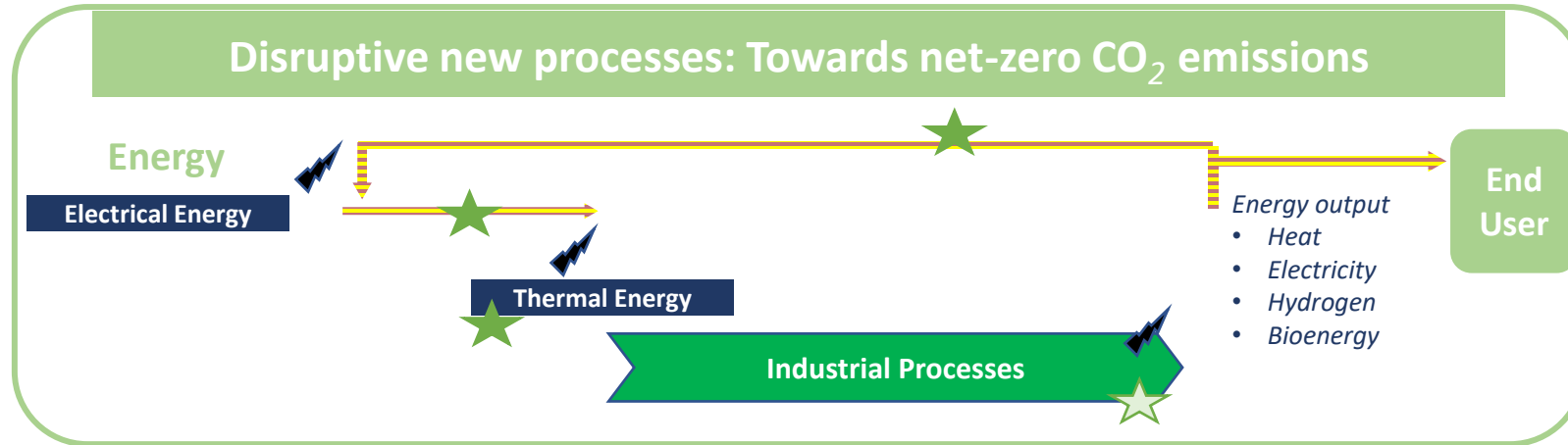
Climate neutrality



Near zero landfilling and near zero water discharge



Competitive EU process industries



36 innovation programmes



The block contains a grid of 36 small circular icons, each representing a different innovation programme. The icons are arranged in a 6x6 grid. The central icon, located in the 3rd row and 3rd column, is highlighted with a larger size and the text 'P4PLANET' below it. Other icons include symbols for energy, recycling, and various industrial processes.

UNLOCKING PRIVATE INVESTMENTS & BARRIERS TO MARKET FOR CLIMATE NEUTRAL & CIRCULAR SOLUTIONS



De-risk investments

Financial Flow up to TRL9

Define framework conditions for market uptake

Available & affordable green energy as enabler

Holistic digital process innovation 4.0 as accelerator

Hubs for Circularity to accelerate innovation



P4PLANET



Competitive Process Industry



Jobs

Skilled workforce

Sustainable Processes

Sustainable Materials

Shift to a real circular economy

Circular Regions

Export innovations worldwide

(CO2 has no borders)

36 innovation programmes





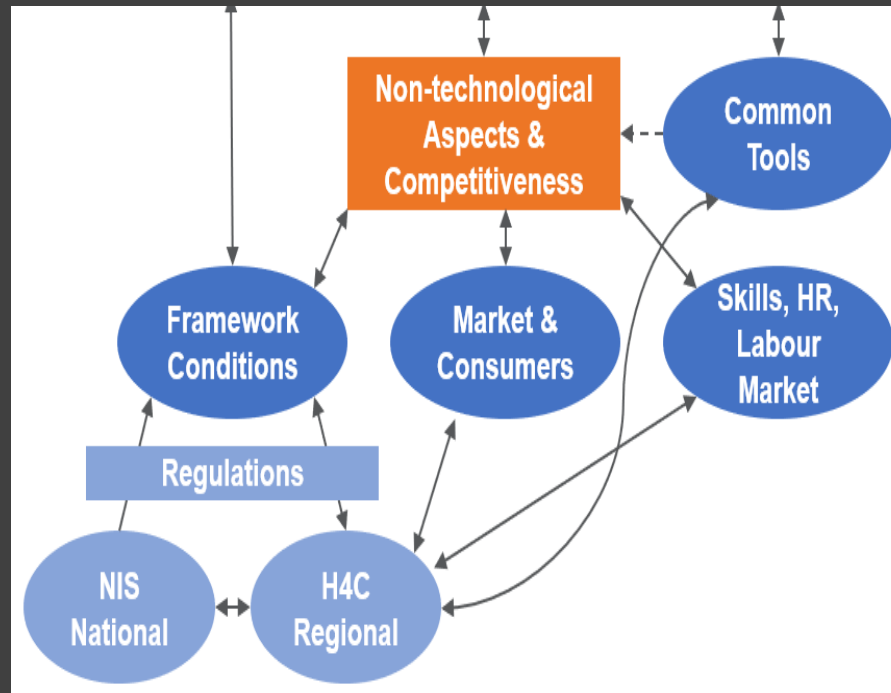
“European Energy Intensive Industry Skills Agenda and Strategy”
Erasmus+ Project



SPIRE/P4PLANET sectors and innovation eco-system working together for the skills of the future on Industrial-Urban Symbiosis and the Process Industry 4.0

Processes4Planet

NON-TECH & SOCIAL INNOVATION Delivering more societal, economic and market impact.



- EU, national & regional framework conditions
- Management of market & consumer demands & changes
- Effective common tools: LCA, business models, digital methodologies...
- Gender balance
- Human Resources, skills and labour market

14 IAs	Innovation area	36 IPs	Innovation programme
1	Renewable energy integration	1a	Integration of renewable heat and electricity
		1b	Integration of bioenergy, waste and other new fuels
		1c	Hybrid fuel transition technologies
		1d	Flexibility and demand response
2	Heat reuse	2a	Advanced heat reuse
2	Electrification of thermal processes	3a	Heat pumps
		3b	Electricity-based heating technologies
4	Electrically-driven processes	4a	Electrochemical conversion
		4b	Electrically driven separation
4	Hydrogen integration	5a	Alternative hydrogen production routes
		5b	Using hydrogen in industrial processes
		5c	Hydrogen storage
6	CO2 capture for utilisation	6a	Flexible CO2 capture and purification technologies
7	CO2 utilisation in minerals	7a	CO2 utilisation in concrete production
		7b	CO2 utilisation in building materials mineralisation
8	CO2 & CO utilisation in chemicals and fuels	8a	Artificial photosynthesis
		8b	Catalytic conversion of CO2 to chemicals or fuels
		8c	Utilisation of CO2 and CO as building block in polymers
		8d	Utilisation of CO to chemicals or fuels
9	Energy and resource efficiency	9a	Next-gen catalysis
		9b	Breakthrough efficiency improvement
10	Circularity of materials	10a	Innovative materials of the process industries
		10b	Inherent recyclability of materials
		10c	Upgrading secondary resources
		10d	Wastewater valorisation
11	Industrial-Urban symbiosis	11a	Demonstration of Industrial-Urban Symbiosis
12	Circular regions	12a	European Community of Practice
		12b	Development of Hubs for Circularity
13	Digitalisation	13a	Digital materials design
		13b	Digital process development and engineering
		13c	Digital plant operation
		13d	Intelligent material and equipment monitoring
		13e	Autonomous integrated supply chain management
		13f	Digitalisation of industrial-urban symbiosis
14	Non-technological aspects	14a	Integration of non-technological aspects in calls
		14b	Human resources, skills and labour market

CLIMATE AMBITION: towards the net-zero emissions scenario

Focus on electrification, energy mix, renewables, process flexibility, process CO2 emissions and indirect emissions

Specific Objectives

1.- Integrating Renewable energy

2.- Reduce emissions through CO/CO2 capture and use.

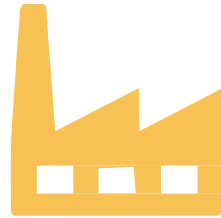
KPIs:

1.- CO2 eq. emission reduction by integration of renewable energy & energy efficiency, measured on a relevant number of demonstrators

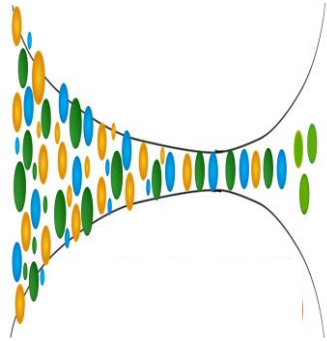
2.- CO2 eq. emissions reduction potential through CO2 Capture and Use measured through a relevant number of demonstrators.

(Target: 100% reduction trajectory at TRL7)

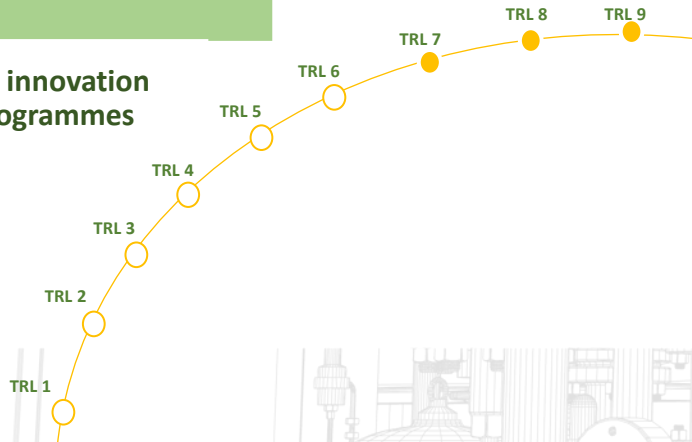
MARBLES (FOAKs): a showcase of the Process Industry transformation



FIRST OF A KIND
FOAK Plants
FOAK Units within a plant



36 innovation programmes



- **First-of-a-kind Large scale plants in operation**
- Combine one or several P4Planet Innovations towards the 2030/2050 ambitions to reach Climate neutrality and circularity
- Acting as Hubs of bulk amounts of resources from industry and the municipalities.
- Several marbles will likely connect to reach together the targets of the partnership's KPIs
- **50+ Marbles** identified of which ca. We aim to **launch 15 in the period 2021 – 2030**, responding to the green-deal plan, and enabled by the P4planet innovation portfolio

PRIVATE INVESTMENTS

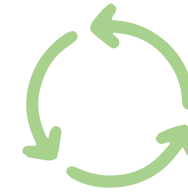
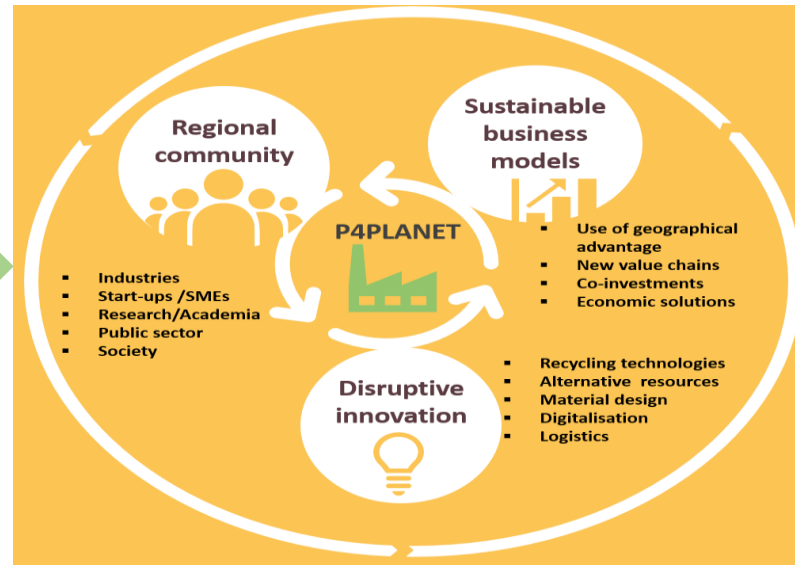
- Industry leader commitment
- when technical and economic feasibility is proved through Horizon Europe programs.
- Public support needed to de-risk and accelerate



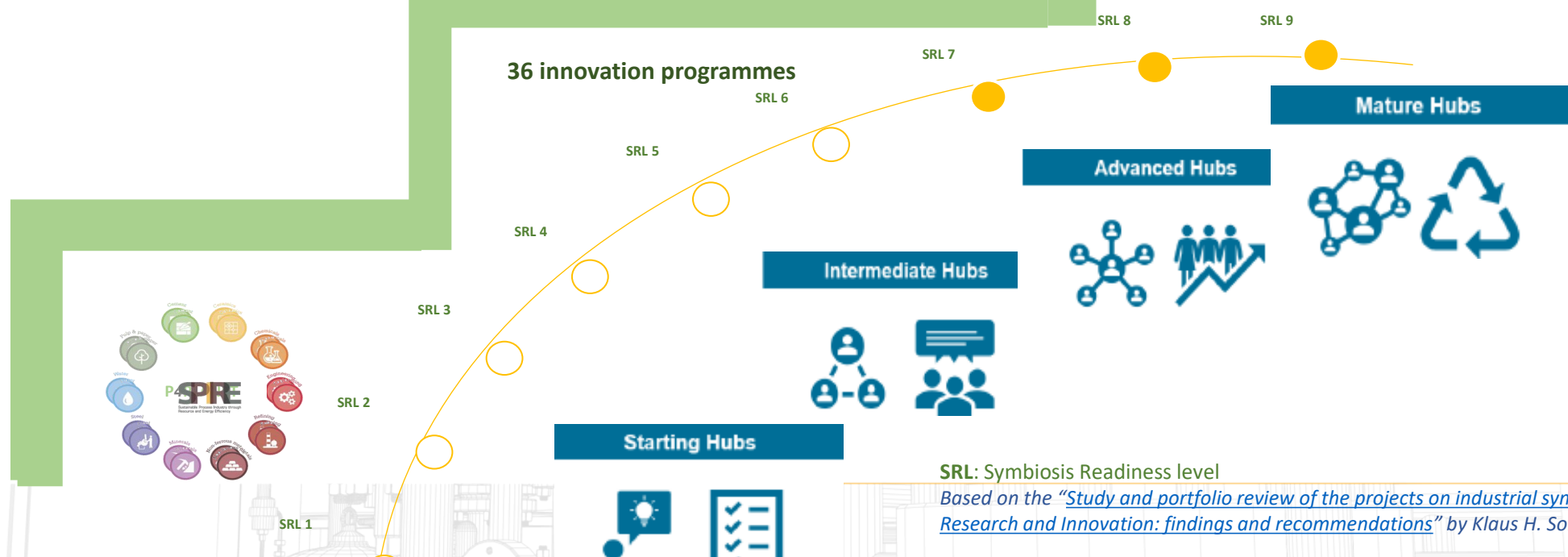
Processes4Planet Objective: territorial systemic solutions

THE H4Cs CONCEPT

Self-sustaining economic industrial ecosystems for **full-scale Industrial-Urban Symbiosis and Circular Economy, closing energy, resource and data loops** and bringing together all relevant stakeholders, technologies, infrastructures, tools and instruments necessary for their incubation, implementation, evolution and management.



Hubs for Circularity



SRL: Symbiosis Readiness level

Based on the "Study and portfolio review of the projects on industrial symbiosis in DG Research and Innovation: findings and recommendations" by Klaus H. Sommer

WHAT'S NEXT

- **February –March 2021:**
 - A.SPIRE members finalise topics and negotiations for P4Planet's MoU
 - Define new working structure within A.SPIRE
 - 8 to 17 Feb: **P4PLANET's ideation/brokerage event**
 - March (tbc): **follow up P4Planet's Brokerage event**
 - 19 March (A.SPIRE BoD) + 31st March (A.SPIRE General Assembly)
- **April 2021: Signature of Processes4Planet MoU with the European Commission**
- **May 2021: Processes4Planet launch event (Process Industry conference)**
- **April – June 2021:**
 - Kick-off of new working structure of A.SPIRE: engagement of our members
 - Kick-off of the new governance and advisory structures of Processes4Planet: Partnership Board, Feedback Panel and Impact Panel
 - 19 June: A.SPIRE BoD meeting
- **September - November 2021: Projects & H4Cs Forum** + Board meeting



Connected across borders and to citizens

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