



3rd meeting of the Board of Funders

Brussels, 30 June 2016

Preparing the H2020 work programme 2018-2020

Emilie Klecha and Thomas Skordas

Flagships Unit, DG Connect

European Commission

H2020 WP 2018-20

Preparing new initiatives



What is a FET Flagship?

- Science-driven, large-scale, multidisciplinary research initiative built around an ambitious unifying vision
- Address a **grand S&T challenge** requiring **cooperation among a range of disciplines, communities and programmes**, including both academia and industry
- Designed to **convert scientific advances into technologies and into concrete innovations** that benefit Europe's **society and economy**
- Realised through a **federated and sustained effort** (~10 years duration)

Some Key Questions

- **Is it good for Europe?**
- **Is it feasible?** Does Europe have the S&T excellence and capabilities (e.g. infrastructures)?
- **Will industry be interested & involved?**
- **What is the European added value and can Europe make the difference wrt competition?**

Prerequisites for new Flagships

- Build on (some) existing S&T communities, having reached critical mass → existing national or transnational activities
- Emerging technologies-oriented attracting industry interest
- Requiring large investments through large-scale (multi-disciplinary) partnerships

H2020 WP 2018-20

Open consultation



open for
commenting
submitted
contributions

Open Consultation: 10 February to 30 April 2016

<https://ec.europa.eu/futurium/en/content/fet-flagships>

Questions of the consultation:

- 1. What is the grand S&T Challenge?** What is the underlying vision, and main objectives? Which main technologies, including *digital technologies* (DSM strategy), will be advanced?
- 2. Why is it good for Europe?** What relevance for EU industry, which innovation potential, what socio-economic benefits? How would it position Europe to other regions in the world?
- 3. What would it take to do it?** What scale of efforts & which duration? What are Europe's assets (skills, capabilities) & which communities to be involved? Are there other relevant national or European research initiatives and why doing at European level?



■ **Other FET consultations (FET Proactive + Mathematics)**

<https://ec.europa.eu/futurium/en/digital4science>

Open Consultation Overview of Contributions



- **24 contributions** + 1 support to Quantum Technologies Flagship
- Many address **emerging grand S&T challenges** at the forefront of 21st century scientific endeavours and comparable to cross-cutting science funded in other parts of the world:
 - Novel, disruptive ICT-centric technologies incl. quantum-related ones
 - Major S&T advances in health and in life-sciences: restoring senses; printing human organs; advancing regenerative medicine; building synthetic cells; understanding genome functions, ...
 - Radical breakthroughs in energy
- **Direct links to ICT and to the European Cloud initiative** (extreme computing) for addressing S&T challenges in areas such as: health (biosensors; future healthcare; etc.); earth sciences and climate change; computational sociology; digital humanities and cultural heritage
- **2/3 express views of large interdisciplinary research communities** and scientific societies, networks of Universities, research institutions and industry
- Proposed **efforts range from 200 M€ to 1.5 B€** over periods of 5 to 15 years

Overview of Contributions (1)



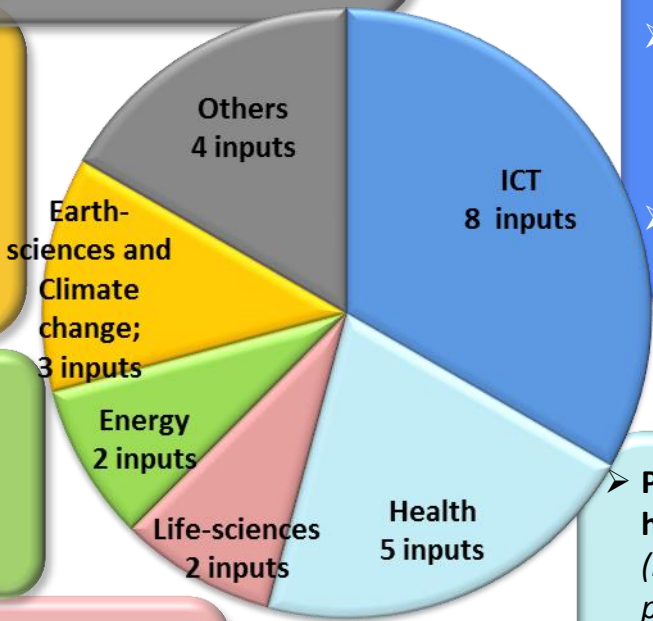
- **Social Sciences and humanities:** *A multidimensional model of Venice and its evolution; Computational sociology capturing the complexity of society and human behaviour*
- **Economy and finance:** *Moving European finance onto standardised pan-European virtual platforms; building a new global governance infrastructure based on interdisciplinary education*

This thematic clustering of the contributions is indicative only.

- **Climate simulation and modelling:** *HPC platform for developing very high resolution models of the climate; Mitigating climate change impacts along the agro-food chain*
- **Computing, modelling & simulation for understanding the earth system**

- **Technologies for Energy:** *Direct conversion of Solar Energy*
- **Computing and modelling:** *Forecasting the energy demand, consumptions and price*

- **Synthetic biology:** *Building a synthetic cell*
- **Cell biology:** *The 4D Nucleome (understanding how the full human genome functions)*



- **Materials, nanocomponents, and systems:** *nanoarchitectronics, superconductors, Quantum Engineering for Silicon Technology*
- **Robotics, interfaces, computational linguistics:** *Robot companions, representing meaning & content, interface technologies*
- **Big data, computing and health:** *Digital health, sensory restoration*

- **Personalized medicine and S&T for health:** *The future of health care (individualised healthcare and disease prevention system), A 4D human atlas, Biosensors for point of care applications*
- **Stem cell biology, bioprinting and regenerative medicine:** *Regenerative medicine, HOPE (printing human organs)*

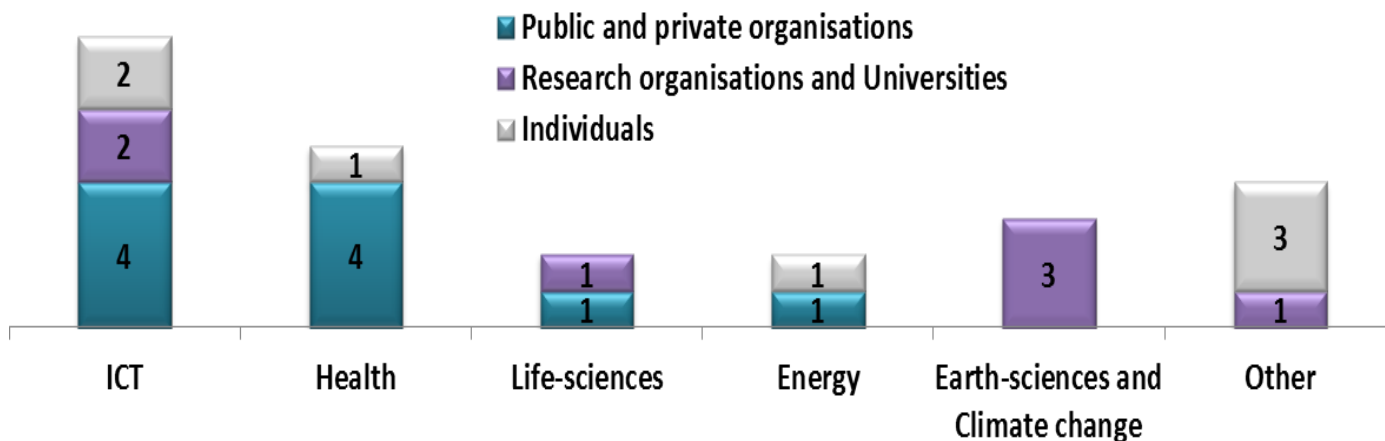
Overview of Contributions (2)



➤ The responses came from:

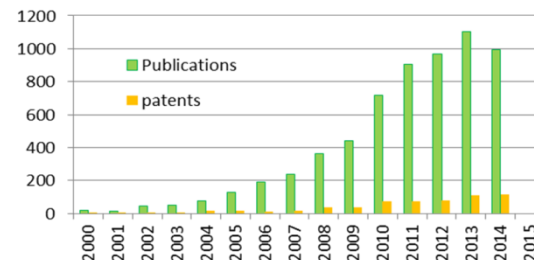
Country	N
IT	7
UK	5
NL	3
BE	2
DE	2
FR	2
CH	1
ES	1
IL	1

On behalf of public or private-public consortia, or individuals

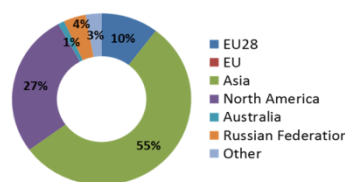


➤ Preliminary bibliographic/patent analysis ongoing:

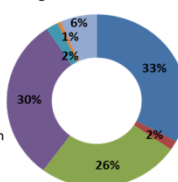
- Maturity of the field: trends over the 10 past years, size of the community
- Patent activity => Industry/market potential
- Position of Europe compared to the other regions



Regenerative medicine - Patents



Regenerative medicine - Publications



Contributions to Flagships ICT related (1)



Materials, nano components and systems

- ***Nanoarchitectronics technologies*** (merging nano, architecture and electronics) that resolve the problem of smart/cognitive interfaces between humans, systems and the environment by covering the whole electromagnetic spectrum. It was submitted by a Prof. of U. of Siena, Italy, and represents a Consortium comprising 36 institutions (universities, research centres and industries) from 9 EU countries.
- ***Superconductors*** A new generation of superconductor technology combining proper electrical, mechanical and thermal management of nano-engineered materials. It was submitted by CEA Saclay (FR) on behalf of the European Society of Applied Superconductivity, The Cryogenics Society of Europe and a Consortium of European companies interested in superconductivity and is supported by a large number of European institutes, laboratories and companies involved in the field.
- ***Quantum Engineering For Silicon Technology***: developing an engineering approach for the exploitation of quantum phenomena for the atomic scale fabrication of electronic devices targeting many industrial applications. It was submitted by CNR (Italy) on behalf of the QuEST Consortium (ten leading academic and industrial organisations covering the supply chain bridging the silicon industry with the quantum technology community).

Contributions to Flagships ICT related (2)



Robotics, computational linguistics, interfaces

- ***Robot Companions For Citizens ++*** Cooperative service robots (robot companions) for citizens. It was submitted by Scuola Superiore Sant'Anna (Italy) and is supported by a large network of universities, research institutes, and industries. It is based on a candidate Flagship funded as a 1-year pilot phase in 2012.
- ***Representing meaning & content***: Universal Multisensorial Meaning Representation Stimulating Tailored Information Exchange: Technologies for universal representation and understanding of content and meaning for stimulating tailored information exchange, irrespective of the language and culture of origin, the topic of information, or the humanness of the underlying agents. The idea was submitted by a team of researchers at the Centre for Computational Linguistics (CCL) on behalf of the Faculty of Arts of the University of Leuven (KU Leuven).
- ***ACE - Accessible Europe (interface technologies)***: Interface technologies and education tools for an all-inclusive and accessible Europe addressing mainly persons with disabilities and the elderly. It was submitted by an individual (a senior researcher of the Istituto Italiano di Tecnologia - Robotics, Brain and Cognitive Sciences, Italy).

Contributions to Flagships ICT related (3)



Big data, computing and health

- **"Digital Health"**: Developing pervasive and ubiquitous computing systems that span across computer science for resolving specific societal challenges such as health. It was submitted by an individual (a Professor of Manchester U., UK, and Director in ARM Ltd).
- **Sensory Restoration**: Technologies for sensory restoration and/or substitution for patients affected by aging, vascular or genetic conditions, etc. This is submitted by The Vision Institute (FR) and a core group of 11 partners representing a broad community of research institutes and scientists in Europe.

Contributions Health – related (1)



Personalized medicine and S&T for health

- ***The Future Of Health Care***: Deep Data, Smart Sensors, Virtual Patients And The Internet-Of-Humans: developing an individualised healthcare and disease prevention system based on imaging and sensor-based technologies for monitoring the clinical and molecular state of a patient from individual cells up to the entire organism. It was submitted by two Professors (from Max Planck Institute for Molecular Genetics, Berlin (DE) and the Swiss Federal Institute of Technology) on behalf of a large network of universities, research institutes, industries.
- ***A 4D Human Atlas***: Charting Human Development And Ageing In Health And In Disease: Constructing a 4D Human Atlas that charts human development and ageing in time and in space at up to cellular and even molecular resolution. It was submitted by a Prof. of the Weizmann Institute of Science (Israel) based on an unsuccessful Flagship proposal submitted to the first FET Flagship call (2012) to uncover the human cell lineage tree.
- ***Biosensors For Point-Of-Care Applications***: Development of a new biosensor device performing multiple tests on a small sample volume in a variety of clinical settings. Its aim is to give out the diagnosis of some diseases in one single test and the information on the therapy to follow. The idea was submitted by the CNR Institute of Neurological Sciences (IT).

Contributions Health – related (2)



Stem cell biology and 3D bio printing

- ***Hope (Human Organ Printing Era)***: New technologies for printing human organs. The aim is to exploit the potential of biofabrication and 3D bio-printing by developing new 3D tissue models and eliminating organ shortages. It is submitted by the president of the International Society for Biofabrication (ISBF) and Prof. of the U. Medical Centre Utrecht, on behalf of the ISBF multidisciplinary community of academic and private research teams in the field of bioprinting, biofabrication and biomanufacturing, as well as robotics, engineering and information technologies.

Regenerative medicine

- ***European Initiative For Regenerative Medicine*** aims at replacing or regenerating human cells, tissues or organs to restore or establish normal function. It was submitted by the Italian Regenerative Medicine Infrastructure (IRMI) including 9 Italian Universities, 5 Research Organisations and 7 private societies.

Contributions

Life sciences – related



- ***Building a Synthetic Cell*** for understanding how molecular building blocks collectively operate to define life in a cell. It was submitted by a Professor of the University of Delft on behalf of a large multi-disciplinary Dutch initiative to Build a Synthetic Cell (the BaSyC consortium).
- ***The 4D nucleome*** Initiative In Europe is about developing technologies that empower the human genome and biomedical community to move beyond the genome sequencing: decipher the spatio-temporal organization of the cellular nucleus and understand how the full human genome functions. It was submitted by CNAG-CRG (ES) on behalf of the 4DNucleome Community in Europe (more than 400 scientists supporting the initiative – see <http://www.4dnucleome.eu/>).

Contributions Energy – related



- ***Direct Conversion of Solar Energy***: Renewables and More Technologies is an initiative that aims to develop direct conversion technologies addressing the development of new catalysts, semiconductors, and nanostructures for solar energy production based on (artificial) photosynthesis. The idea was submitted by Leiden University (NL) and CNR (IT) on behalf of leading research institutes in the field and emerges from two ESF-funded Eurocores programmes.
- ***Forecast Of The Energy Price*** is about forecasting energy demand, consumptions and price in order to predict possible scenarios for the economy in Europe. The idea was submitted by an individual.

Climate simulation and modelling

- ***Extreme Computing and Climate***: Using extreme computing platforms for developing very high resolution models (one kilometre scale) of the earth's climate and quantitative estimates of the changing character of climate extremes. This idea is submitted by a Prof. of the U. of Oxford (UK) and 21 leading climate scientists representing Europe's leading climate modelling and climate computing centres and the European Network for Earth System Modelling.
- ***Climate Change Impacts Along The Agro-Food Chain***: End-User Relevant Research For Food Security. Mitigating the impact of climate change along the agro-food chain and in particular on primary production for increasing food security. The initiative was submitted on behalf of the FACCE JPI knowledge hub MACSUR (<http://macsur.eu>), comprising 70 European institutions in 18 countries.

Computing, modelling & simulation for understanding the earth system

- ***The Ultimate Earth Project***: Technologies for developing an understanding of the earth system (in terms of natural hazards, to anthropogenic effects on climate change and sustainable management of natural resources) in order to define realistic models of the Earth's climate, resources, health, etc. The initiative was submitted by the British Geological Survey (UK) and EPFL (CH) and represents a consortium of leading earth and environmental scientists and informatics experts.

Computing, Social sciences and humanities

- ***The Venice Time Machine***: This idea is about digital humanities and cultural heritage and aims at building a multidimensional model of Venice and its evolution covering a period of more than 1000 years (The Venice Time Machine, VTM project). It was submitted by EPFL (CH) on behalf of the VTM Italian and Suisse project Consortium.
- ***Computational Socio-Geonomics/Metaloger***, The Peoples' Toolkit: Analysing, understanding and developing models capturing the complexity of society and human behaviour and experimentally validating them. It was submitted by an individual from the UK.

Economy and finance

- ***Universal Digital European Finance*** is addressing the financial sector and aims to move all European finance onto standardised pan-European virtual platforms. It was submitted by an individual (Prof. of Financial Economics at Loughborough U., UK).
- ***The New Capacity Building Programme***: Developing a new global governance and Education: moving to a world-coordinated holistic multicultural, interactive, integrated and interdisciplinary collaboration/strategy (i.e., a new global governance infrastructure) that requires multicultural, interdisciplinary education based on cognitive neuroscience principles. It was submitted by an individual (a Professor who is the Founding Director and CEO of IMNRC – Belgium).

Open consultation Links to the proposals



Nanoarchitectronics – University of Sienna (IT)

<https://ec.europa.eu/futurium/en/content/nanoarchitectronics>

Superconductors – CEA Saclay (FR)

<https://ec.europa.eu/futurium/en/content/superconductors>

Quantum Engineering for Silicon Technology – Consiglio Nazionale delle Ricerche (IT)

<https://ec.europa.eu/futurium/en/content/quantum-engineering-silicon-technology-0>

Robot Companions for Citizens ++ – Scuola Superiore Sant'Anna, The BioRobotics Institute (IT)

<https://ec.europa.eu/futurium/en/content/robot-companions-citizens>

Fet Flagship Initiative in Sensory Restoration – The Vision Institute, Paris (FR)

<https://ec.europa.eu/futurium/en/content/fet-flagship-initiative-sensory-restoration>

Meaning: universal multisensorial meaning representation stimulating tailored information exchange – KU-Leuven (BE)

<https://ec.europa.eu/futurium/en/content/meaning-universal-multisensorial-meaning-representation-stimulating-tailored-information>

ACE: ACcessible Europe – Istituto Italiano di Tecnologia - Robotics, Brain and Cognitive Sciences (IT)

<https://ec.europa.eu/futurium/en/content/ace-accessible-europe>

Proposal for "Digital Health" Flagship – School of Computer Science, University of Manchester (UK)

<https://ec.europa.eu/futurium/en/content/proposal-digital-health-flagship>

HOPE (Human Organ Printing Era) – University Medical Center Utrecht (NL)

<https://ec.europa.eu/futurium/en/content/hope-human-organ-printing-era>

Biosensors for Point-of-Care Applications – Institute of Neurological Sciences - Italian National Research Council (IT)

<https://ec.europa.eu/futurium/en/content/biosensors-point-care-applications-0>

European Initiative for Regenerative Medicine – Italian Regenerative Medicine Infrastructure (IT)

<https://ec.europa.eu/futurium/en/content/european-initiative-regenerative-medicine>

The Future of Health Care – Max Planck Institute for Molecular Genetics Berlin (DE)

<https://ec.europa.eu/futurium/en/content/future-health-care-deep-data-smart-sensors-virtual-patients-and-internet-humans>

Open consultation Links to the proposals



A 4D Human Atlas: Charting Human Development and Ageing in Health and in Disease - Department of Computer Science and Applied Math and Department of Biological Chemistry, Weizmann Institute of Science, Rehovot , Israel

<https://ec.europa.eu/futurium/en/content/4d-human-atlas-charting-human-development-and-ageing-health-and-disease>

Building a Synthetic Cell - Technical University Delft (NL)

<https://ec.europa.eu/futurium/en/content/building-synthetic-cell>

The 4DNucleome Initiative in Europe – CNAG-CRG (ES) on behalf of The 4DNucleome Community in Europe

<https://ec.europa.eu/futurium/en/content/4dnucleome-initiative-europe>

Direct Conversion of Solar Energy: Renewables and More - University of Leiden (NL)

<https://ec.europa.eu/futurium/en/content/direct-conversion-solar-energy-renewables-and-more>

Forecast of the Energy Price – University of Rome "Tor Vergata" (IT)

<https://ec.europa.eu/futurium/en/content/forecast-energy-price-0>

Climate change impacts along the agro-food chain: End-user relevant research for food security - Thünen Institute of Market Analysis (DE)

<https://ec.europa.eu/futurium/en/content/climate-change-impacts-along-agro-food-chain-end-user-relevant-research-food-security>

The Ultimate Earth Project as an FET Flagship - British Geological Survey (UK) and EPFL (CH)

<https://ec.europa.eu/futurium/en/content/ultimate-earth-project-fet-flagship>

A Flagship European Programme on Extreme Computing and Climate - University of Oxford (UK)

<https://ec.europa.eu/futurium/en/content/flagship-european-programme-extreme-computing-and-climate>

The New Capacity Building Programme Flagship Project – IMNRC-NewPOL Network (BE)

<https://ec.europa.eu/futurium/en/content/new-capacity-building-programme-flagship-project>

Universal Digital European Finance EDUF – Loughborough University (UK)

<https://ec.europa.eu/futurium/en/content/universal-digital-european-finance-eduf>

Venice Time Machine Flagship – EPFL (CH)

<https://ec.europa.eu/futurium/en/content/venice-time-machine-flagship>

Computational Socio-Geonomics/Metaloger, The Peoples' Toolkit – Independent Professional Services Ltd (UK)

<https://ec.europa.eu/futurium/en/content/computational-socio-geonomicsmetaloger-peoples-toolkit>

■ High-level Roundtable Conference in November or early December 2016

- ❖ Under the patronage of Commissioner Oettinger

- ❖ ~60 High-Level participants:

- Member States (and Associated Countries)

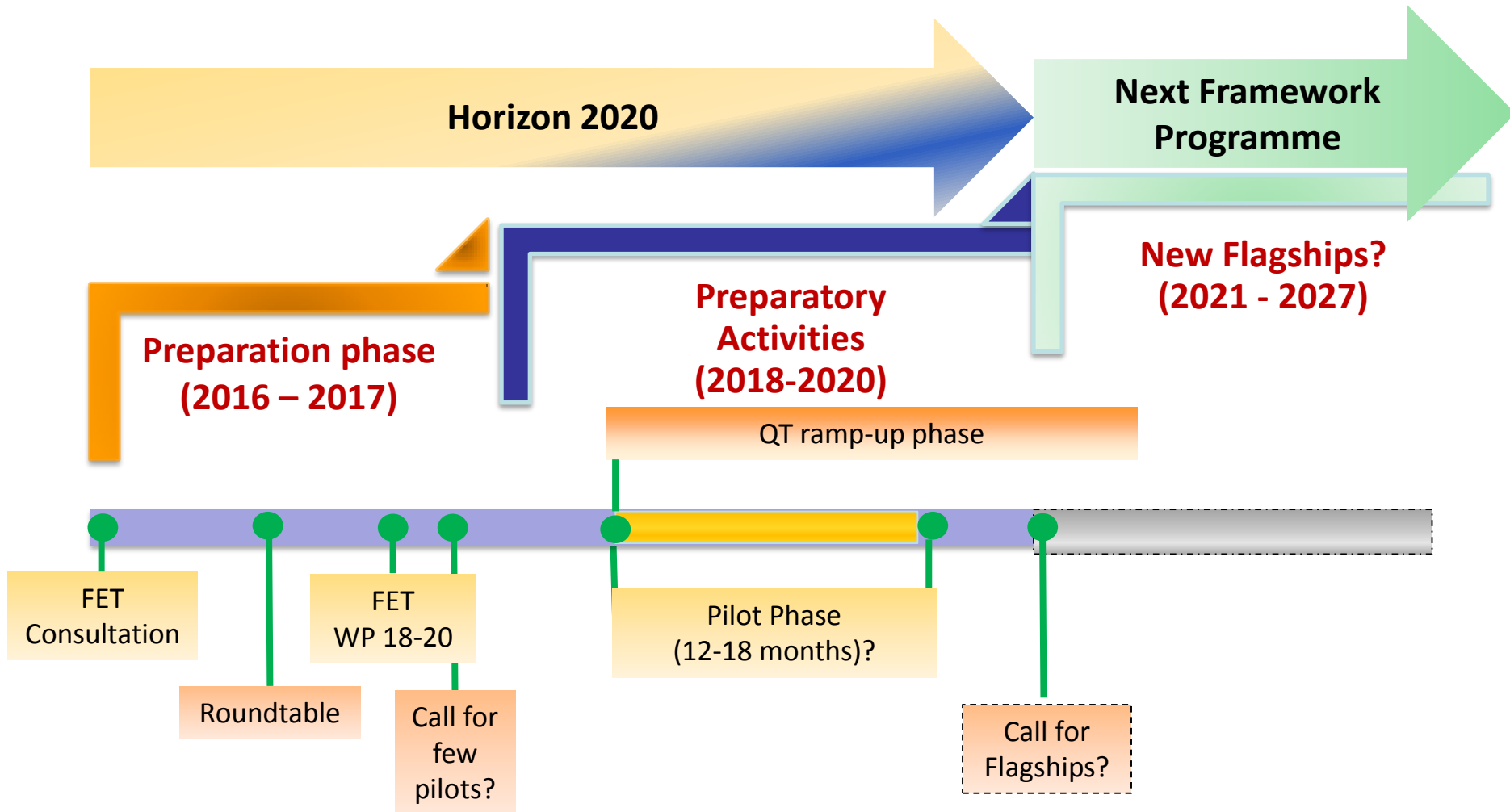
- Industry Representatives

- Representatives of large research performing organisations

➔ Aim: discuss options for the selection of Flagship preparatory actions

■ Use the outcomes of the Roundtable to prepare FET WP 2018-2020

Timeline



THANK YOU!