EUROPEAN COMMISSION – JOINT RESEARCH CENTRE

Maddalena Querci
Deputy Head of Unit "Knowledge for Health and Consumer Safety"

Scientific aspects of modern biotechnologies – some reflections

CEE Round Table, September 18-20, Minsk

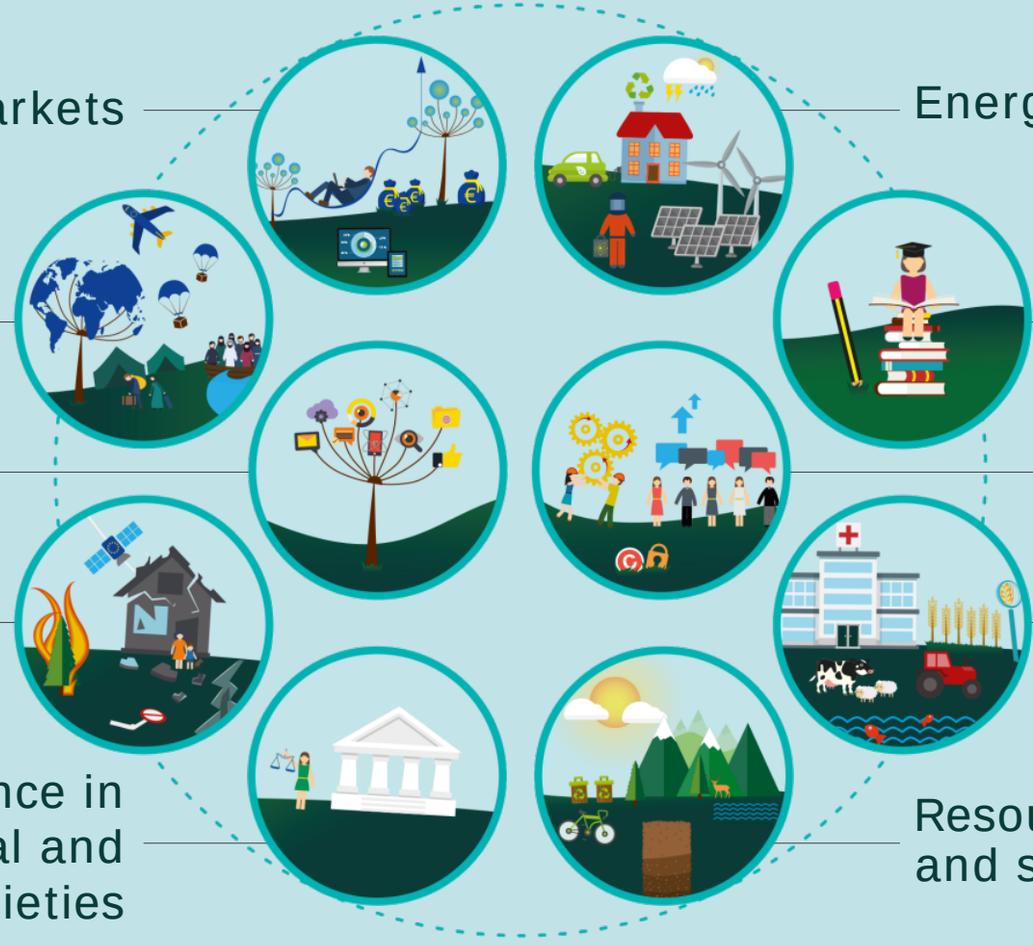
European Commission

JRC Mission

The Joint Research Centre (JRC) is the European Commission's science and knowledge service.

" Our mission is to support EU policies with independent evidence throughout the whole policy cycle "

JRC 10 Priority Nexus



Economy, finance and markets

Energy and transport

Migration and territorial development

Education, skills and employment

Data and digital transformations

Innovation systems and processes

Civil security

Food, nutrition and health

People, governance in multicultural and networked societies

Resource scarcity, climate change and sustainability

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JRC sites

Headquarters in Brussels
and research facilities located
in 6 locations **5 Member States:**

- Belgium (Geel)
- Germany (Karlsruhe)
- Italy (Ispra)
- The Netherlands (Petten)
- Spain (Seville)

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JRC Role: facts & figures

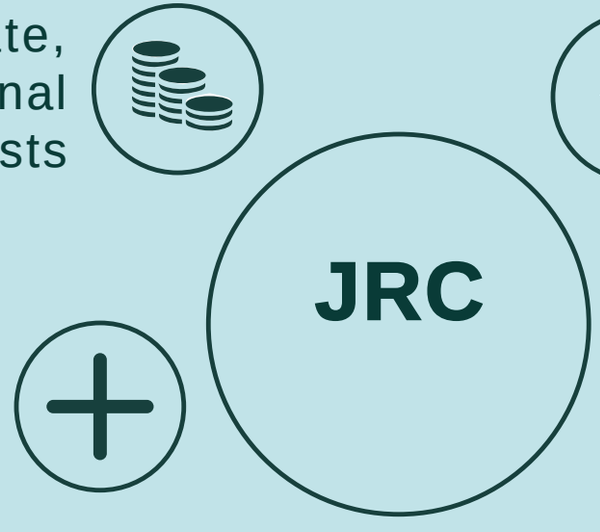
€ 386 million Budget annually, plus **€ 62** million earned income

Independent of private, commercial or national interests

30% of activities in policy preparation, **70%** in implementation

125 instances of support to the EU policy-maker annually

More than **100** economic, bio-physical and nuclear models



Staff: **1500** core research staff (**83%** with PhD's), **3000** total staff

Policy neutral: has no policy agenda of its own

42 large scale research facilities, more than 110 online databases

83% of core research staff with PhD's

Over 1,400 scientific publications per year

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Directorate for Health, Consumers and Reference Materials

Director: E. Anklam

~ 300 Staff Members

~ 50 % female

Located in Geel, Belgium & Ispra, Italy

F.1
Health in Society

C. Nicholl

Ispra Site

F.2
Consumer Products Safety

A.Hoeveler

Ispra Site

F.3
Chemical Safety and Alternative Methods

M. Whelan

Ispra Site

F.4
Food Fraud Detection

F. Ulberth

Geel Site

Ispra Site

F.5
Food and Feed Compliance

H. Emons

Geel Site

Ispra Site

F.6
Reference Materials

D. Florian

Geel Site

F.7
Knowledge for Health and Consumers

G. Van den Eede

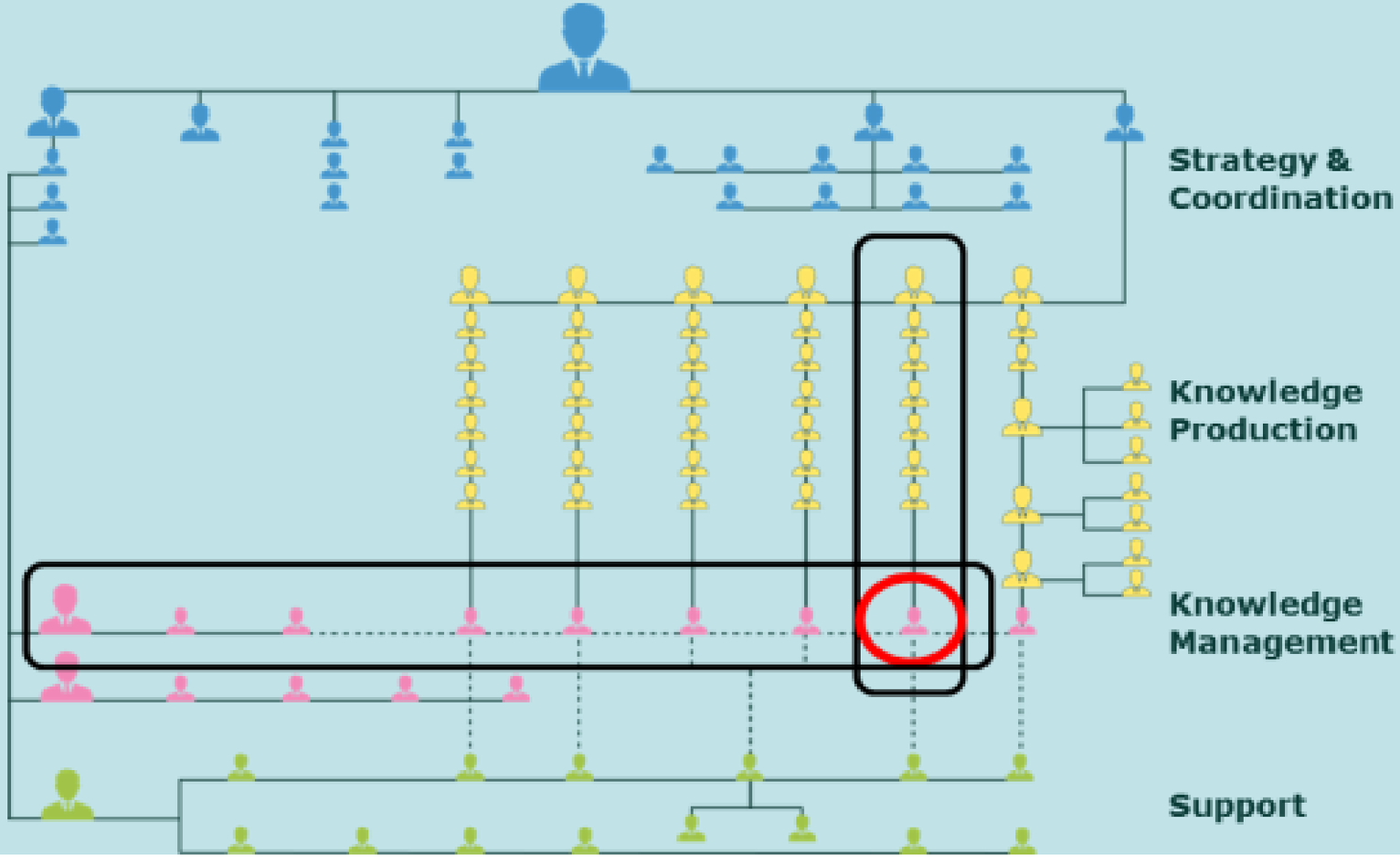
Geel Site

Ispra Site

European Commission

JRC.F.7 - Knowledge for Health & Consumer Safety Unit

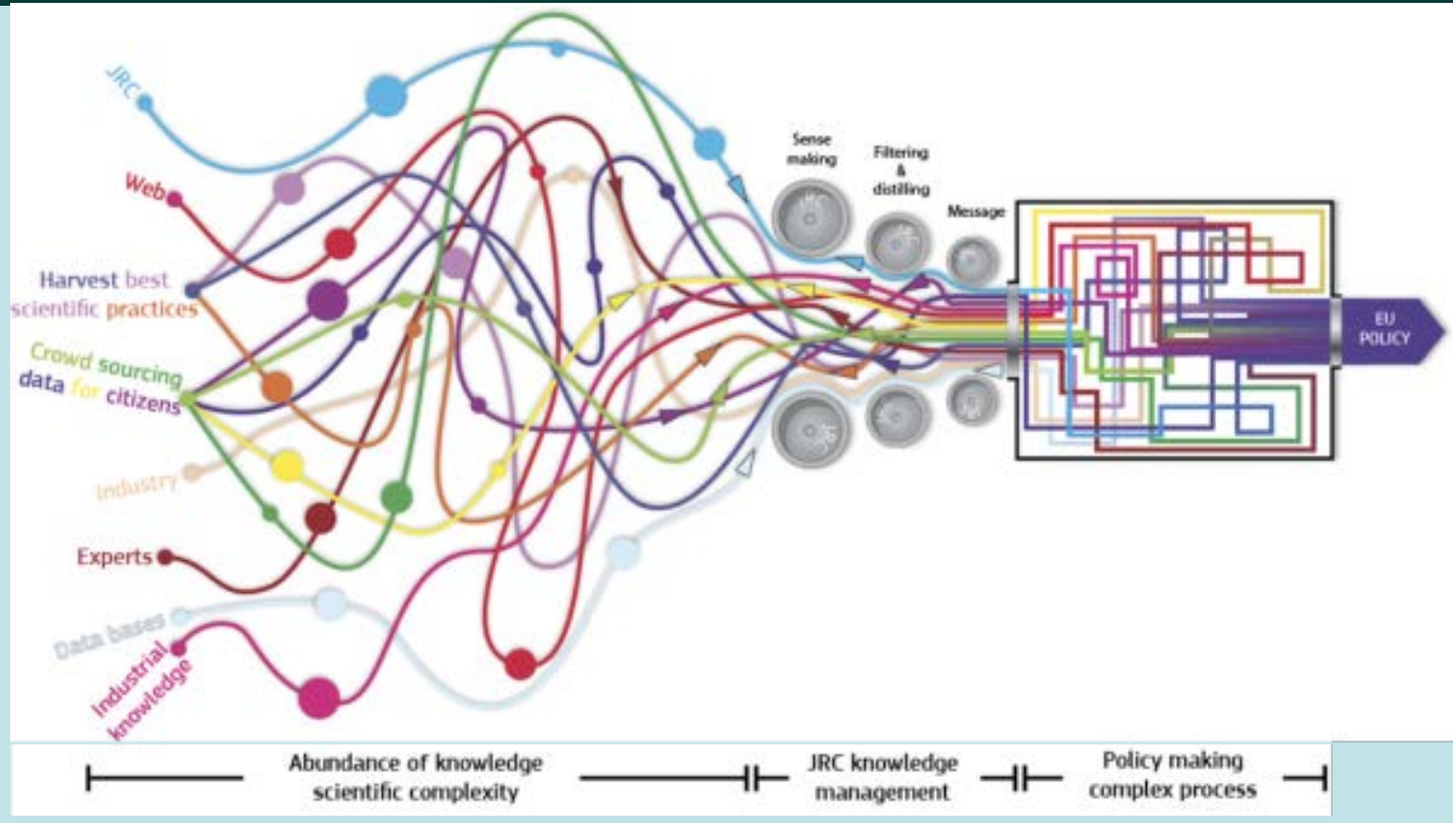
At the interface between Knowledge management and Knowledge production dimensions



European Commission

JRC.F.7 Unit role

- ✓ Harvest knowledge and competence
  - ✓ Exploit respective synergies
- ✓ Mapping policy areas
  - ✓ Anticipating policy-relevant knowledge needs
- ✓ Identifying gaps



- ✓ ***Proposing, networking & contributing***
- ✓ ***Exploiting KM tools and approaches***

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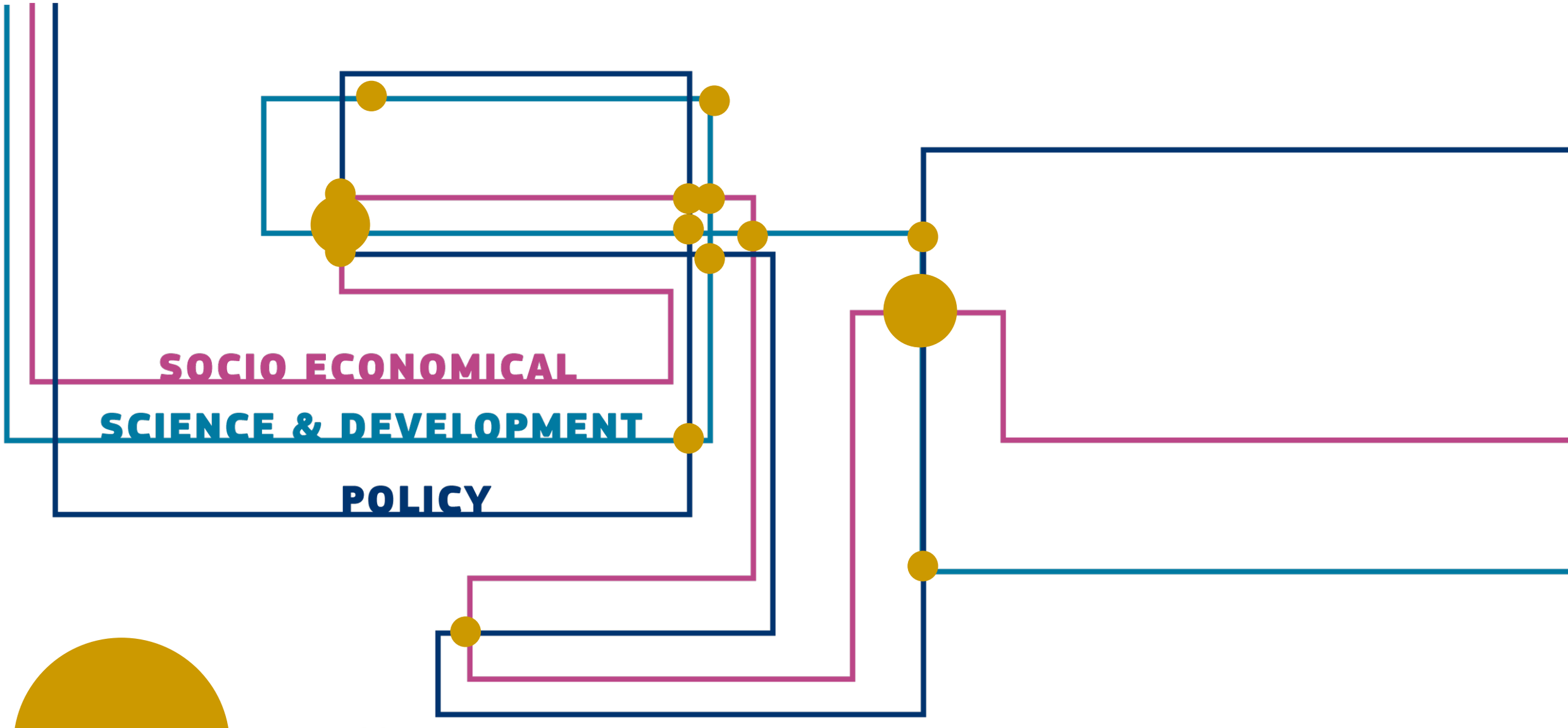
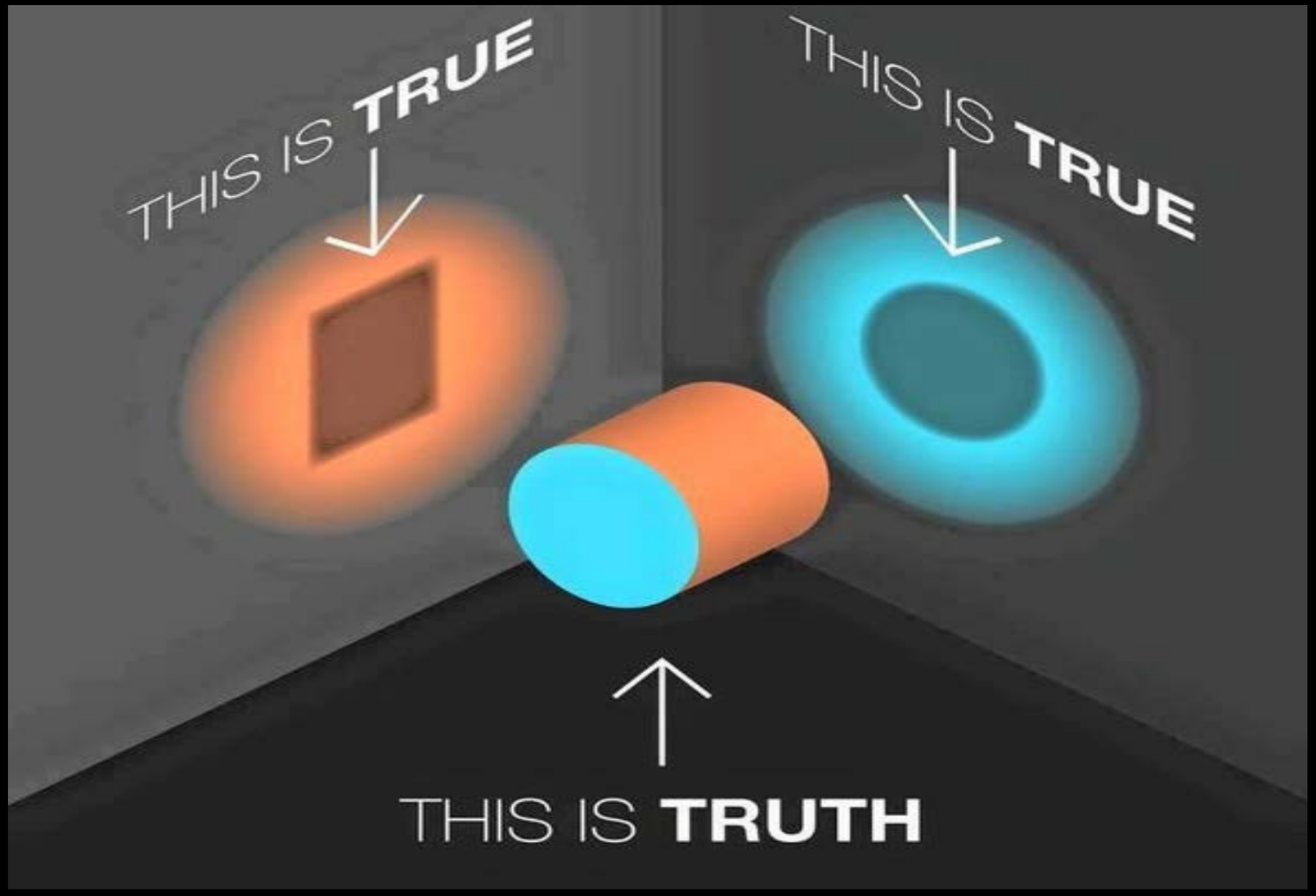
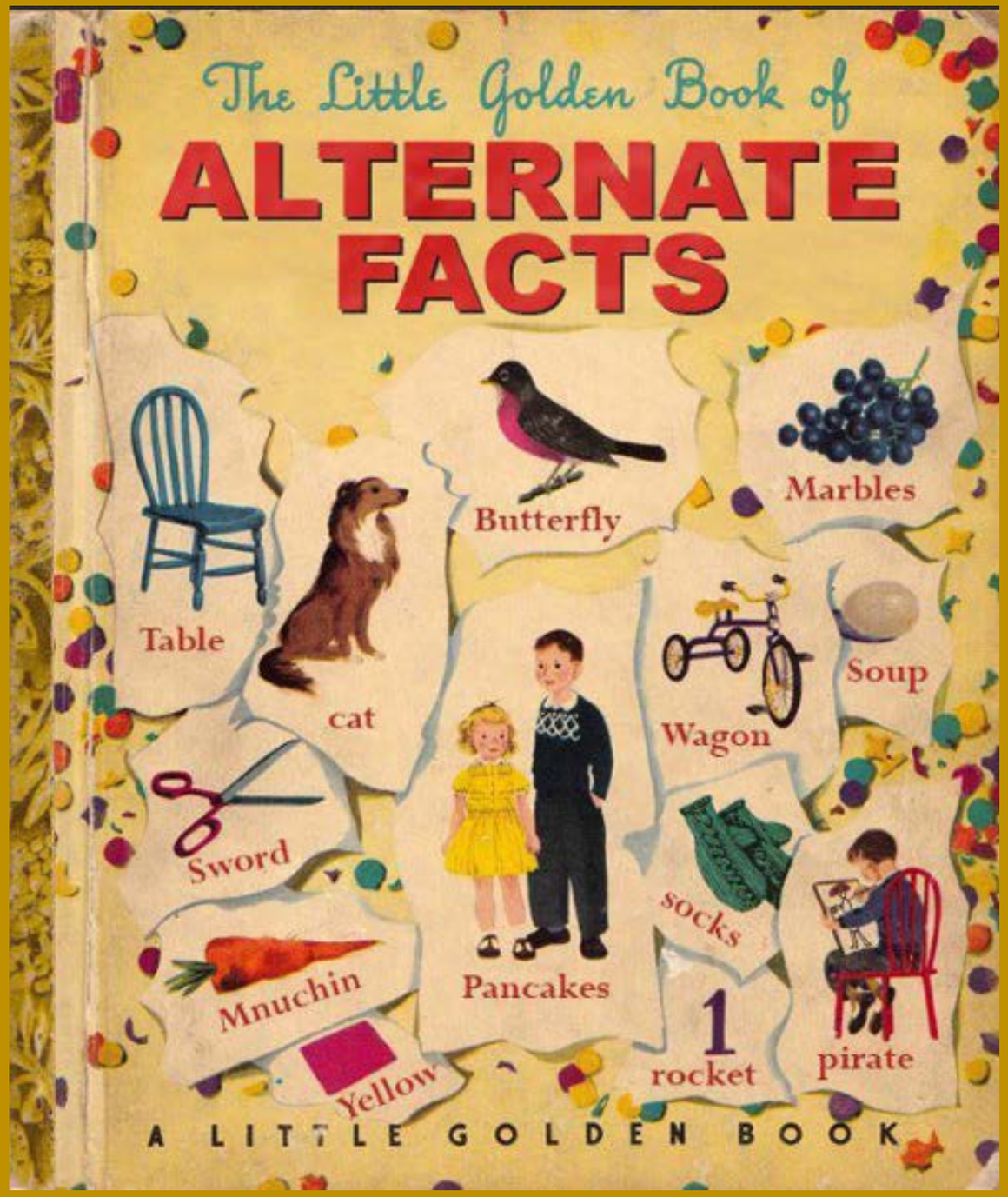


Collect _ Connect _ Communicate

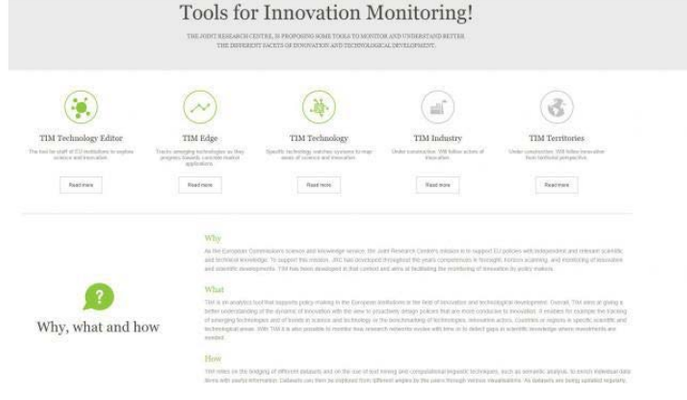
Knowledge Management is about systems thinking





Selected examples – Data Sources

- Traditional scientific data sources:
  Scientific databases, patent databases, DG Research projects, but also e.g. bioRxiv (the preprint server for biology, Cornell Univ) and Europe PMC repository of life sciences articles and resources;
- European Media Monitor (EMM) enhanced for horizon scanning & foresight;
- Tools for Innovation Monitoring (TIM);
- Venture capital databases;
- Speech to text.



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Selected examples

Support to the EC's Scientific Advice Mechanism (SAM)

The SAM's High Level Group requested help in managing the results of literature searches in the context of the development of the group's explanatory note "New Techniques in Agricultural Biotechnology"

F.7 staff developed strategies designed to process large sets of scientific references (such as those obtained by broad literature searches, in different databases) and assist in the identification of documents relevant for specific aspects of the final document.

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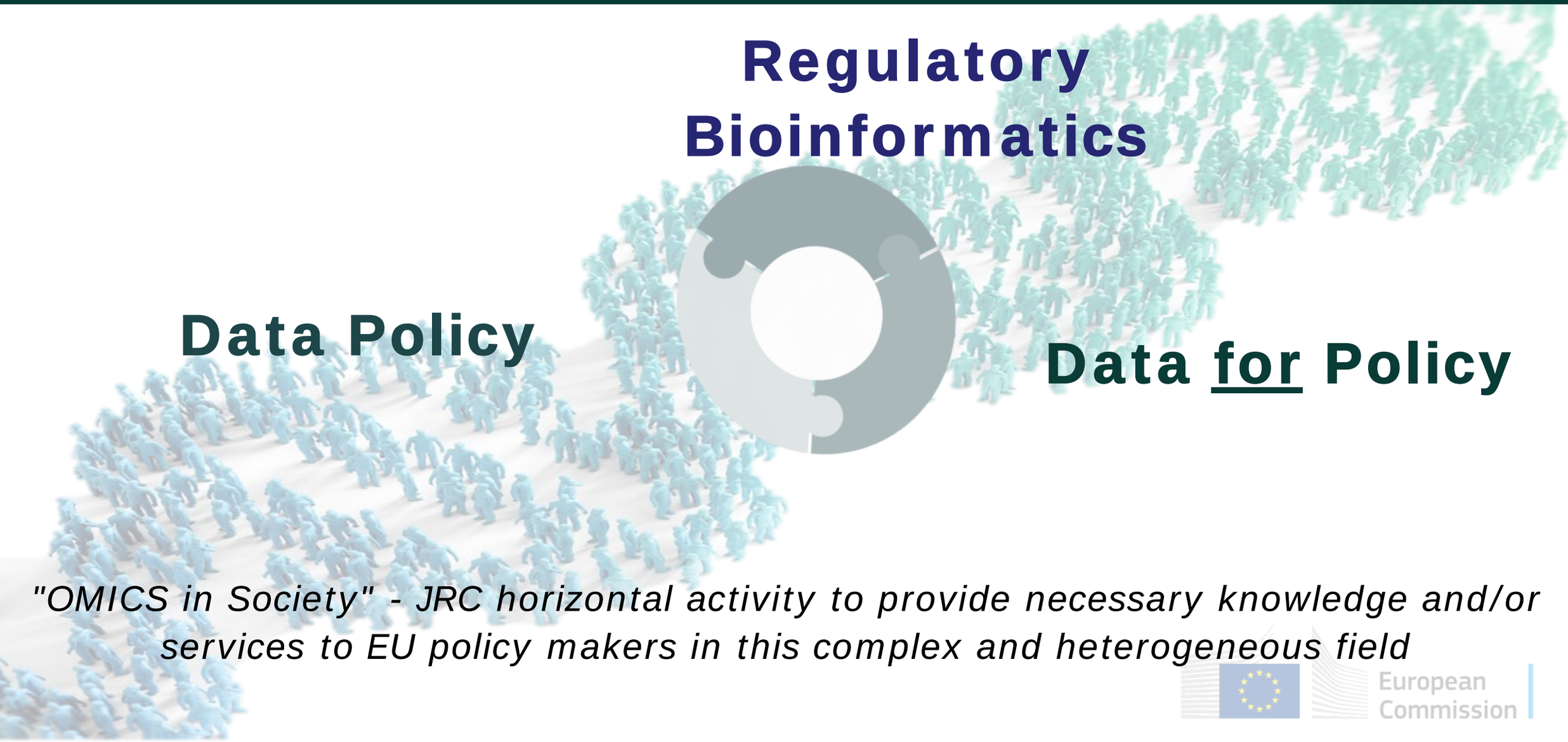
Selected examples – OMICS in Society



"OMICS in Society" - JRC horizontal activity to provide necessary knowledge and/or services to EU policy makers in this complex and heterogeneous field

Selected examples – OMICS in Society

Data Policy

For the policy maker:

To understand and communicate the impact of new omics technologies (e.g. large scale genome sequencing), ensure the development of regulations that encourage innovation in line with bioethics and through a proper citizen dialogue

Selected examples – OMICS in Society

- ✓ *Identification of the challenges to implement Omics technologies*
- ✓ *Social science genomics & GWAS*
- ✓ *NGS x AMR across ≠ ecological compartments*
- ✓ *AMR genetic determinants databases*

Data for Policy

For the research community: Provide high quality data & analysis tools for the design of solid evidence-based policies

Collaborations

- The Global Alliance for Genomics and Health
- the European Molecular Biology Laboratory (EMBL)
- EMBL-EBI
- ELIXIR

Global Alliance for Genomics & Health

EMBL

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Data for policy: data need to be reliable

Two options:

Everyone does the same (no black boxes); simple problems – golden standards (cfr. diagnostics);

Everyone does things that perform the same (black boxes allowed); complex problem - different strategies - no clear "right" or "wrong".

Data for policy: health data & the digitisation of health

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Different collections of different data sets

Patient benefit? Healthcare benefit? Equity? Ethics? Sustainability? Economics?

Commission Communication on enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society (e.g. electronic health records)

Declaration of cooperation towards access to at least 1 million sequenced genomes in the European Union by 2022

"By pooling health data, using artificial intelligence and blockchain and promoting innovation, Europe can significantly improve people's lives. Earlier and better diagnosis of diseases, safer roads – this is only a glimpse of what embracing digital change can look like"

European Commission

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Declaration for delivering cross-border access to **genomic database**

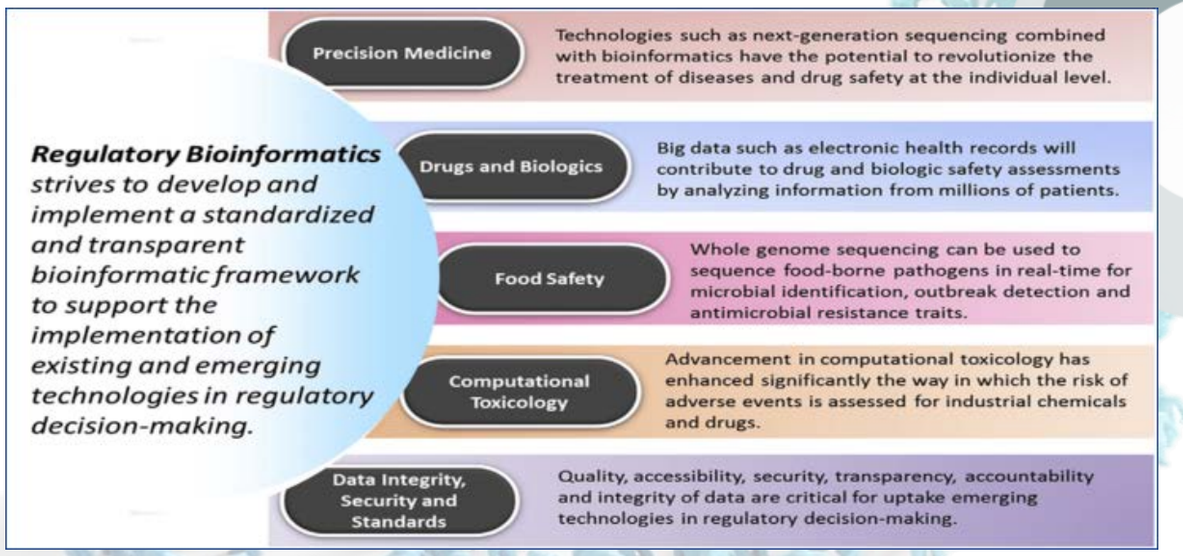
- 1 million **genomes accessible** in the EU by 2022
- **Linking access** to existing and future genomic database across the EU
- Providing a sufficient scale for **new clinically impactful** results in research

European Commission

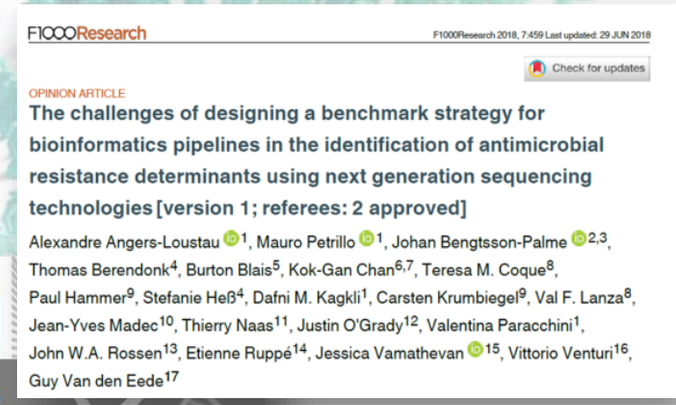
Selected examples – OMICS in Society

Regulatory Bioinformatics

To develop and implement standardised bioinformatics frameworks fit for use in regulatory decision-making contexts



DOI: 10.1016/j.yrtph.2016.05.021



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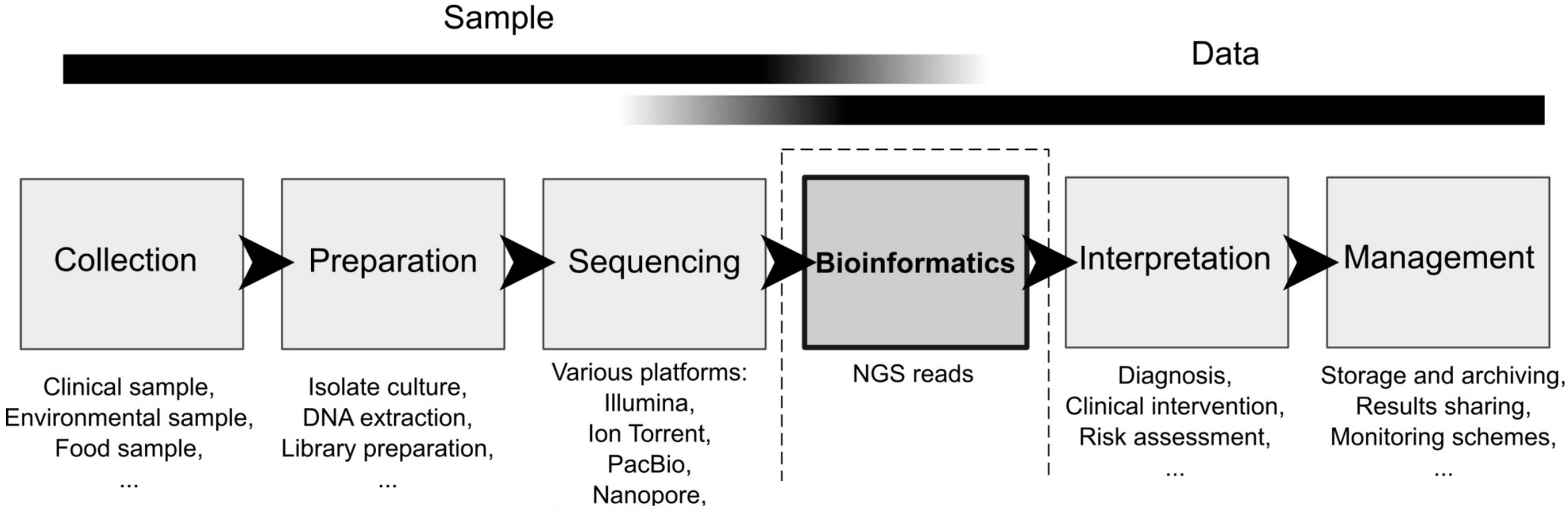
Analytical performance of NGS-based methods



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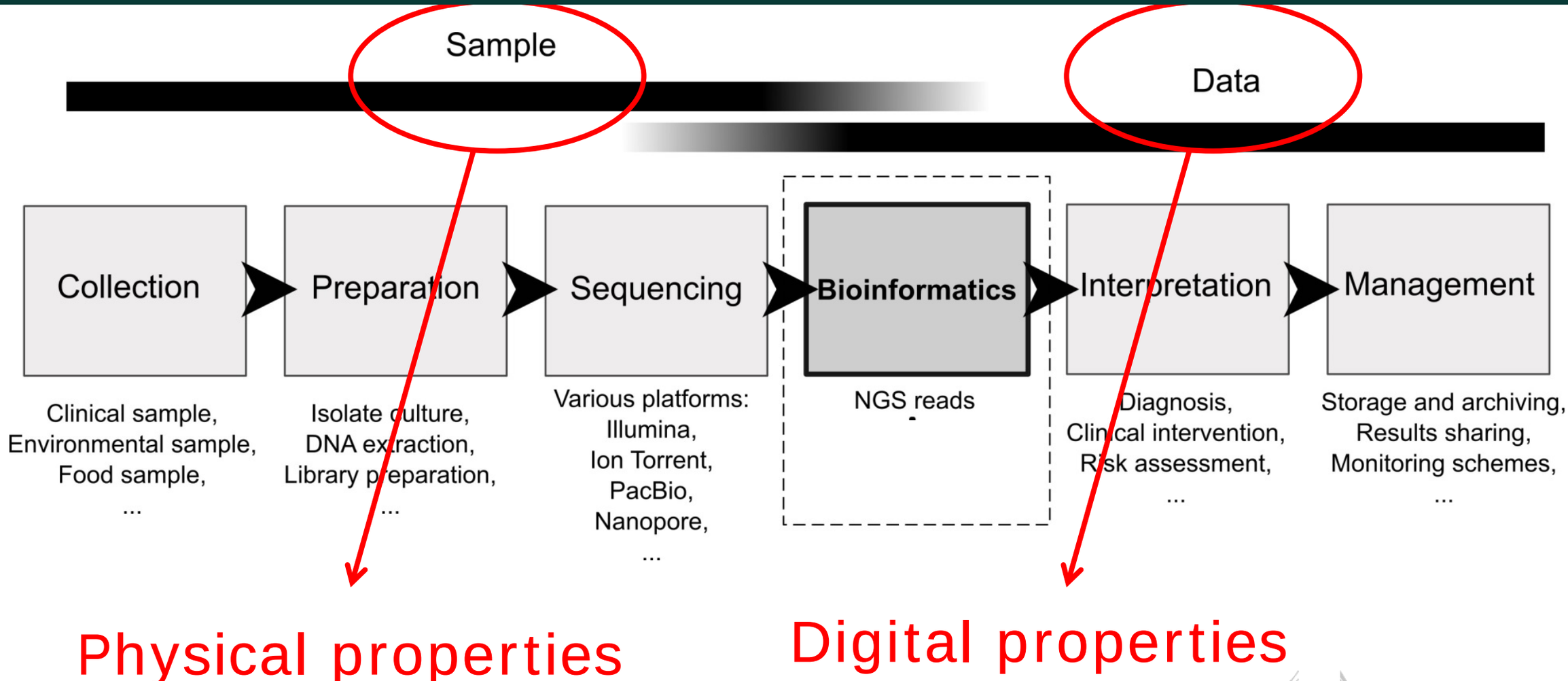

Analytical performance of NGS-based methods

A review of methods and databases for metagenomic classification and assembly

Florian P. Breitwieser, Jennifer Lu and Steven L. Salzberg

Briefings in Bioinformatics, 2017, 1–15

An even bigger issue than incorrect species labels is contamination.
The vast majority of genomes in GenBank today are 'draft' genomes. In any draft genome, some of the contigs might be contaminants, i.e. they might not belong to the species that was presumably sequenced, even though every contig is assigned to the same species. Common contaminants include human DNA, which creeps into many sequencing projects by accident. If the laboratory that created the assembly did not screen out these contaminants, they are submitted to GenBank as part of the organism. GenBank itself runs a contaminant screen on all assemblies, and contigs that appear to be contaminants are reported back to the submitter, who is encouraged to remove them and resubmit.
Despite the best efforts of GenBank curators, though, **thousands of contaminants have already made their way into the draft genome data**.

Do we have the equivalent for NGS?

FOOD BIOLOGICAL CONTAMINANTS

Baseline Practices for the Application of Genomic Data Supporting Regulatory Food Safety

"Laboratories should use these validation and verification activities to determine whether bioinformatics workflows conform to the requirements of a given activity and whether the software satisfies its intended use and user needs."

OPINION ARTICLE

The challenges of designing a benchmark strategy for bioinformatics pipelines in the identification of antimicrobial resistance determinants using next generation sequencing technologies [version 1; referees: 2 approved]

Alexandre Angers-Loustau [1], Mauro Petrillo [1], Johan Bengtsson-Palme [2,3], Thomas Berendonk[4], Burton Blais[5], Kok-Gan Chan[6,7], Teresa M. Coque[8], Paul Hammer[9], Stefanie Heß[4], Dafni M. Kagkli[1], Carsten Krumbiegel[9], Val F. Lanza[8], Jean-Yves Madec[10], Thierry Naas[11], Justin O'Grady[12], Valentina Paracchini[1], John W.A. Rossen[13], Etienne Ruppé[14], Jessica Vamathevan [15], Vittorio Venturi[16], Guy Van den Eede[17]

Thank you for your attention !!

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