FNS - Cloud
Food Nutrition Security

Introduction to FNS-Cloud

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Outline

- Background & landscape
- FAIR Principles - Data map & catalogue
- FNS Cloud
- Data standardization & interoperability
- Use cases, Field Labs and Demonstrators
- FNS Education, Training & Support
- Business model & sustainability

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FNS-Cloud: Aims & Objectives

VISION

FNS-Cloud will help overcome European research infrastructure fragmentation by integrating and federating existing food nutrition security (FNS) data, tools and services, to provide added value, open access and FAIR data that can reduce knowledge gaps, enable better research and exploitation, inform policy and help deliver sustainable diets to European citizens.

1. Implement and test 'cloud' via Use Cases (WP4) and Demonstrators (WP5) to test existing and new proof-of-principle data and tools across FNS domain
2. Develop, integrate and test innovative FNS Cloud Services
3. Enable harmonisation and standardisation of FNS data (sources and format) and external services for integration and interoperability
4. Engage FNS User Communities (especially researchers) to improve co-operation and reduce barriers to innovation and exploitation
5. Develop sustainable FNS Cloud governance and business models, as part of the wider EOSC

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FNS-Cloud: Project Information

Funding: Horizon 2020 – Innovation Action (SFS-26-2019, Food Cloud Demonstrators)
Duration: 48 Months (starting 1st October 2019)
Budget: €10.9m
Beneficiaries: 35

Coordinator (CO): RTDS (AT) – Stephen Webb

Scientific Coordinator (SCO): QIB (UK) – Paul Finglas

Executive Board (EB): WP Leaders (RTDS, PMT, JSI, UCD, QIB, EuroFIR, UWTSD, JdlC)

External Experts Advisory Board (EEAB): variety of relevant experts and stakeholders from different countries and domains

General Assembly (GA): decision-making body consisting of a representative from each partner

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Sustainable Food Systems

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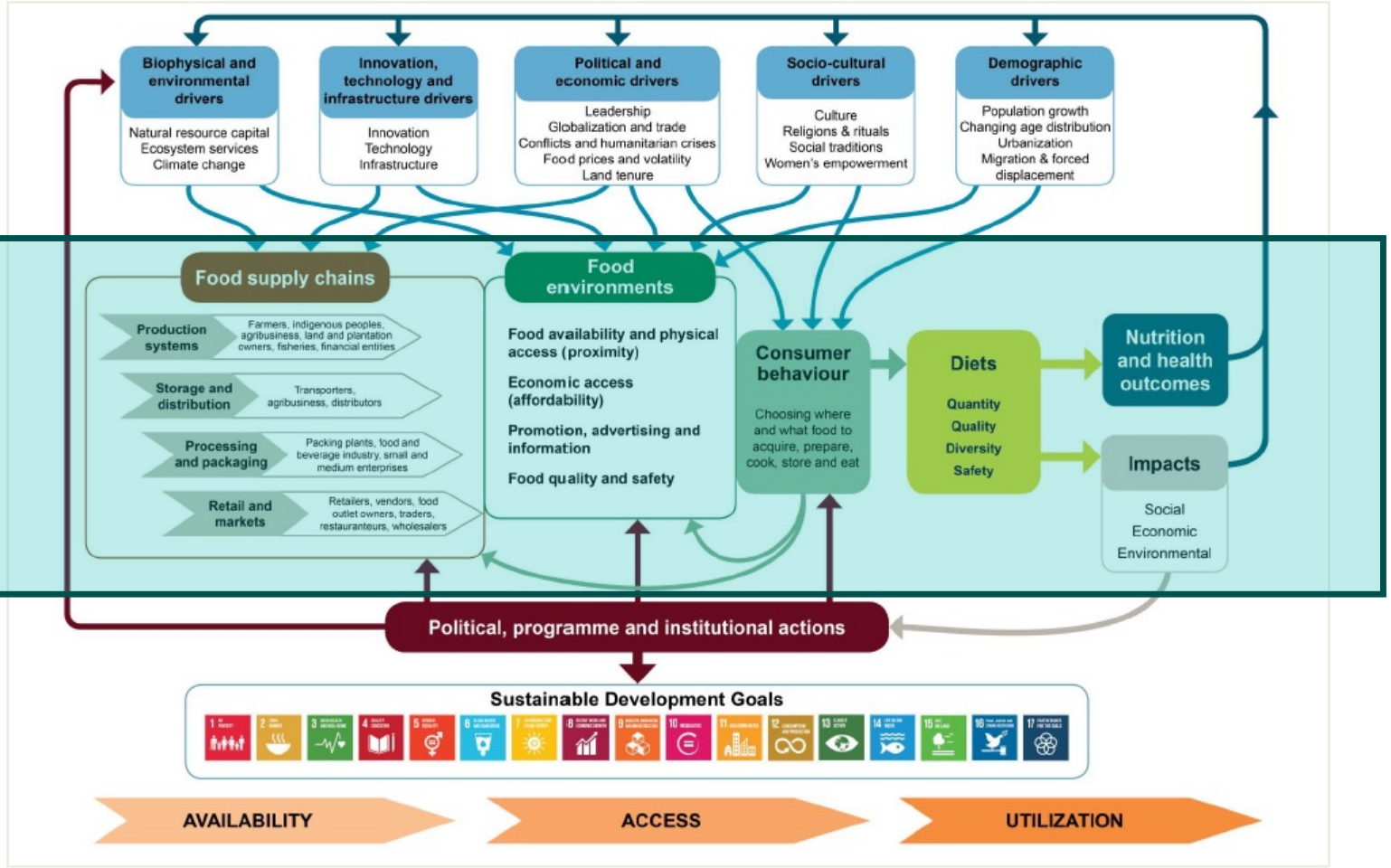

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Agri-food system research: fragmentation

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FAIR Data

Access by user communities is unevenly distributed …

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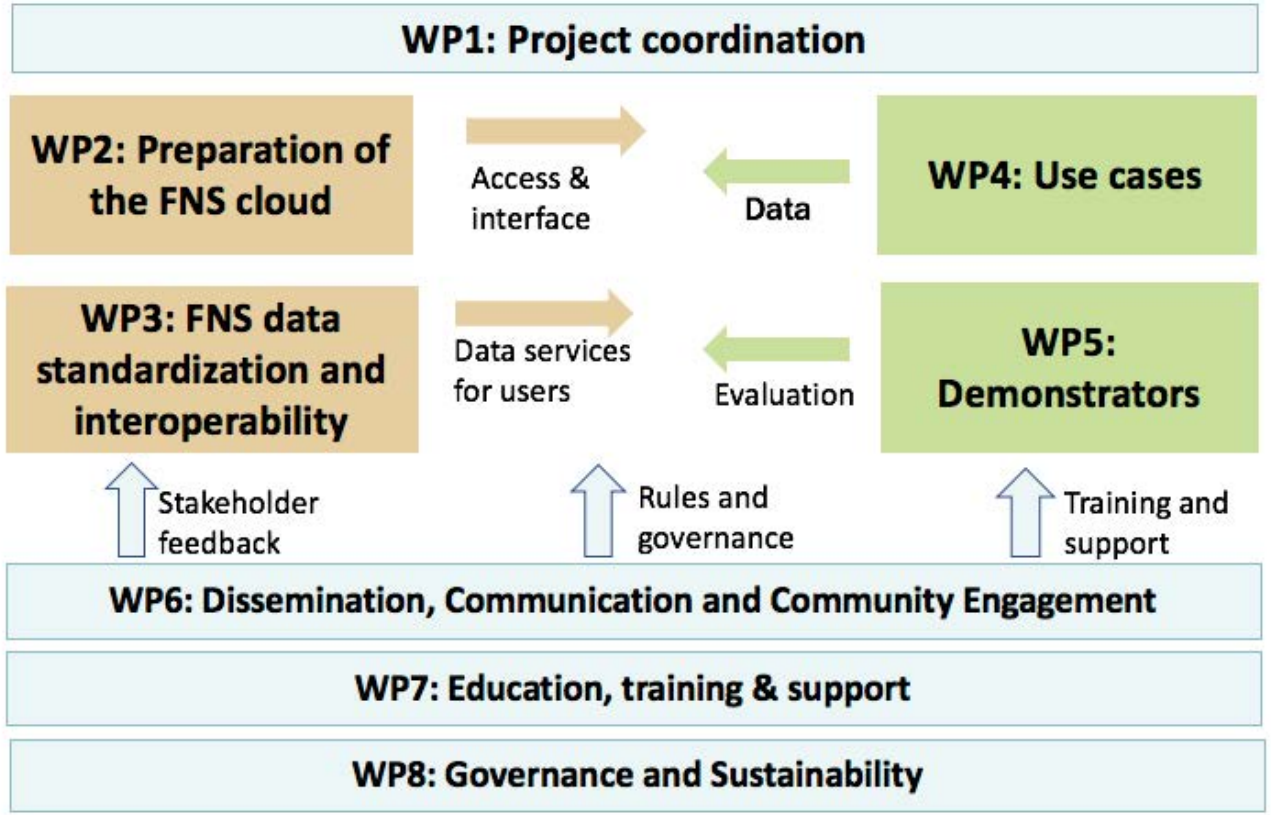
WP Leaders

WP1	RTDS (non-profit)
WP2	PMT (profit SME, tech)
WP3	JSI (institute, tech)
WP4	UCD (university, FNS)
WP5	QIB (institute, FNS)
WP6	EuroFIR (association, FNS)
WP7	UWTSD (university, Edu)
WP8	JdlC (individual, law)



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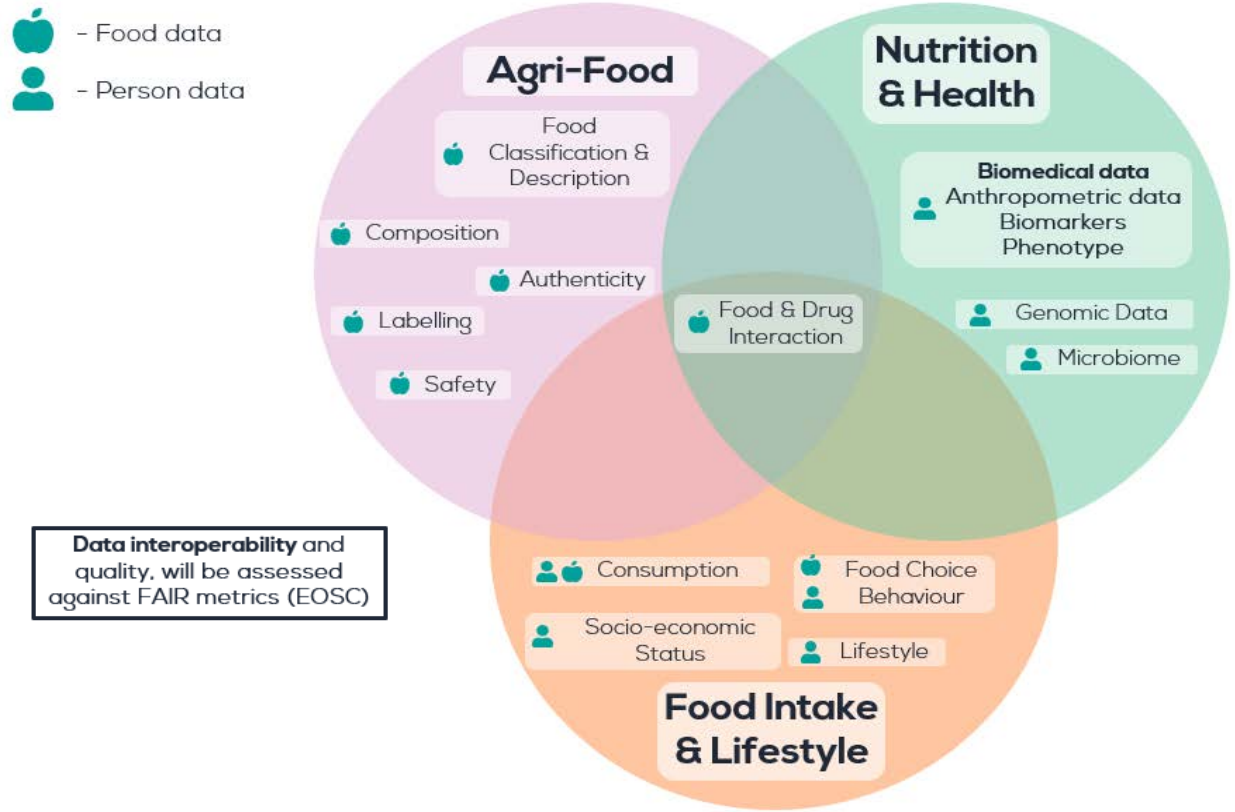
FNS-Cloud Data Map & Catalogue (F&A)

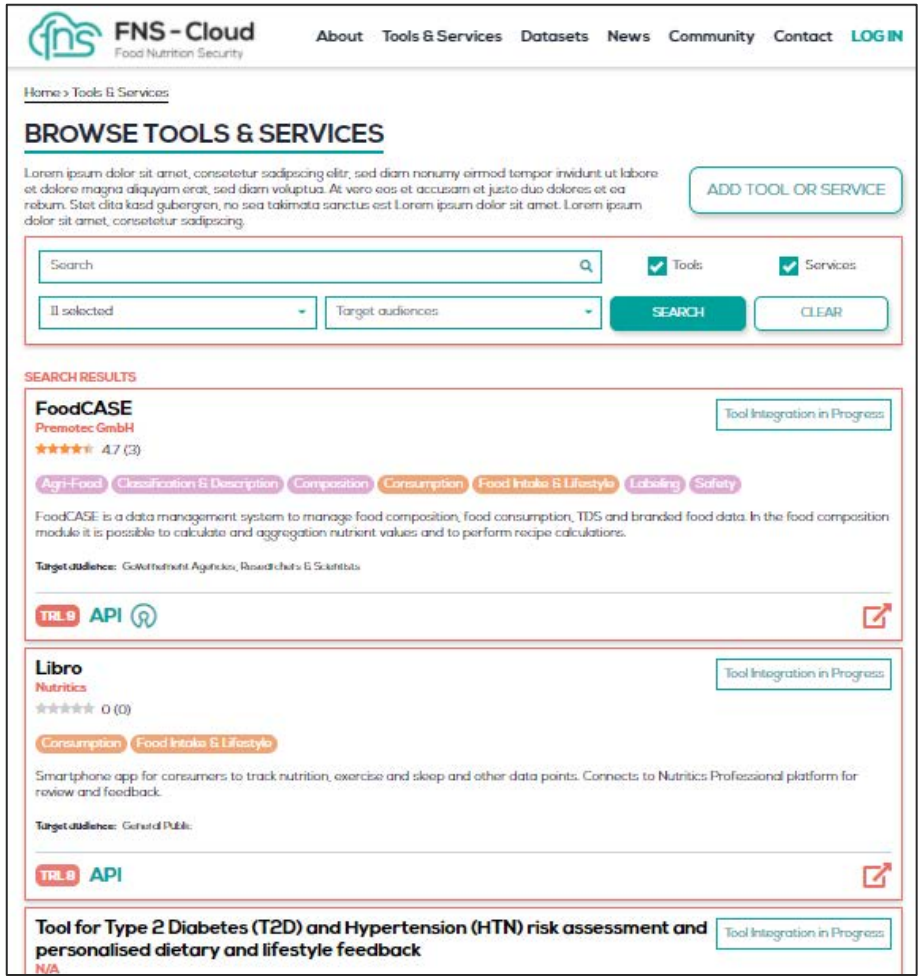
FNS data & tools identified and mapped

- *Extensive catalogue of existing datasets*
- *Repository for new data meeting FNS standards*
- *Searchable catalogue of data and services*
- *Integration with other existing RIs and repositories*

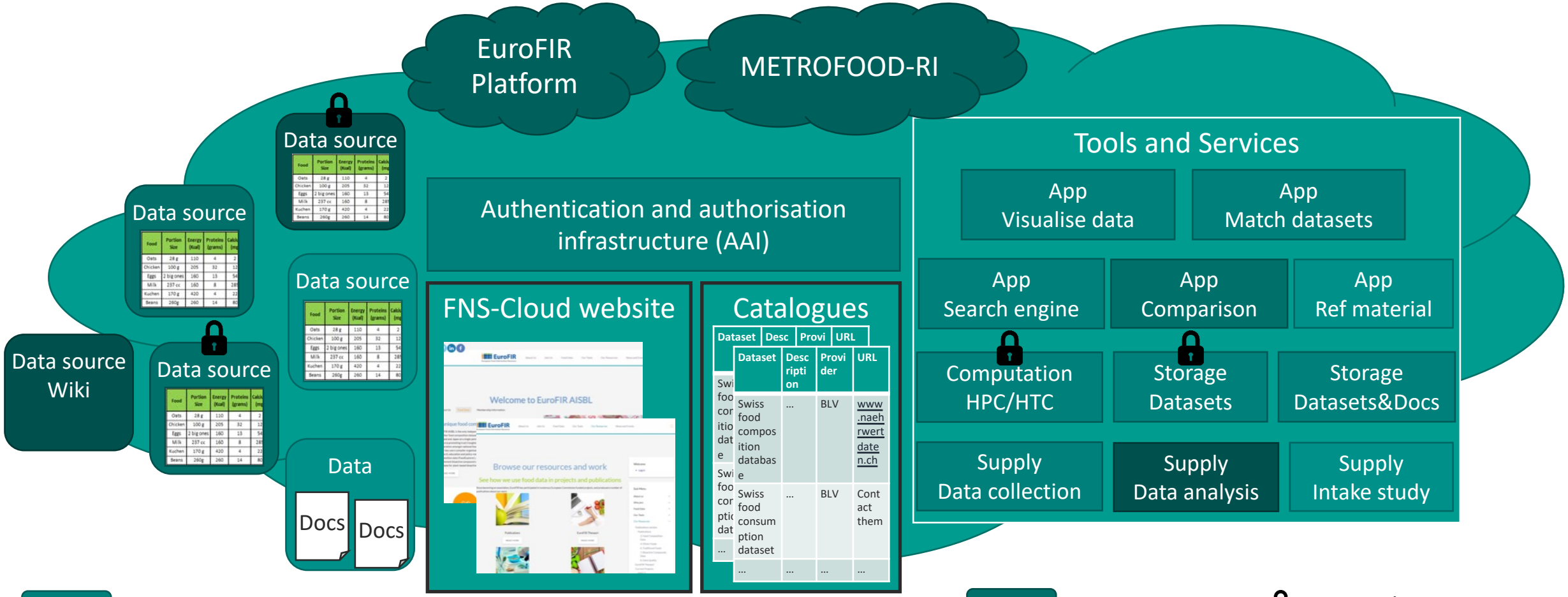
Integrated tools and services

- *Guidelines & recommendations for data/services*
- *APIs for data exchange*
- *Authentication and authorisation mechanisms*





Data sources, tools and services



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Authentication and authorisation infrastructure (AAI)

Website

Admin tools

- File sharing
- User mgmt
- …

Catalogues

Dataset	Description	Provider	URL
Swiss food composition database	…	BLV	www.naehrwertdaten.ch
Swiss food consumption dataset	…	BLV	Contact them
…	…	…	…

Agri-Food

- Dataset search engine
- App for SI brands
- App for CH brands
- Brand matching app
- System for crowd-sourced brands
- MCRA ↔ FoodCASE
- App for TDS data

Nutrition&Lifestyle

- Dietary mapping app
- Libro
- Foodbook24
- eNutriApp
- Tomappo
- Rep for mixed Ethnic group intake data
- App for 65+ intake data

NCDs&Microbiome

- Tool for connected diet, lifestyle and microbiome datasets (e.g., intake, activity, sleep, glucose).
- Repo for analysed metagenomics and metabolomics
- Apps for FNS microbiome
- Diabetes and hypertension app
- App for food-diet-drug interaction

Additional tools

- Quisper
- App to extract data
- FNS-Cloud Onthology
- App to visualise data

EuroFIR Platform

METROFOOD-RI

No specific FNS domain

Agri-Food

Nutrition & Lifestyle

NCDs & Microbiome

Restricted access

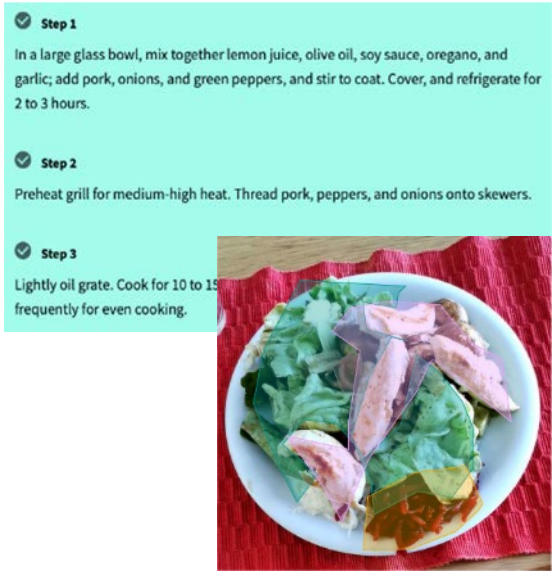
FNS Data Standardisation and Interoperability (I&R)

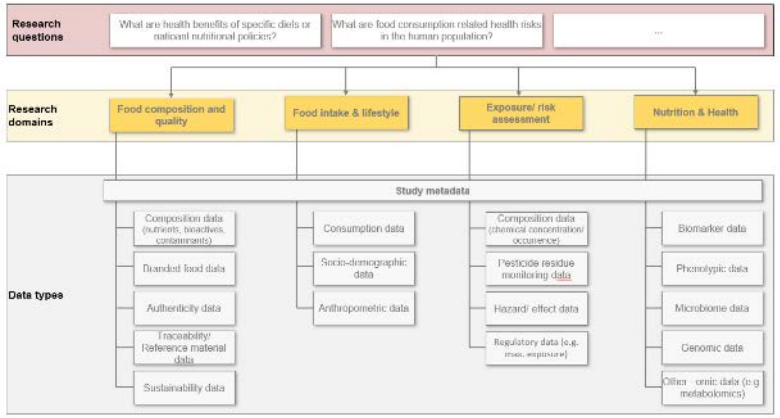
Food & nutrition data is heterogeneous (high variability of data types and formats) – how do we approach this?

Collect data → Extract information → Formulate & interlink → Analyse & visualise

Pre-processing of (unstructured) FNS data

- Automated extraction of food concepts from textual data
- Automated recognition of food and drinks from images



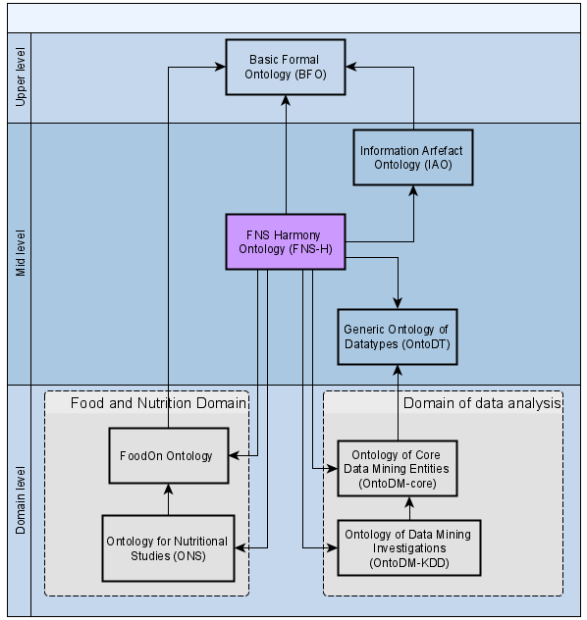


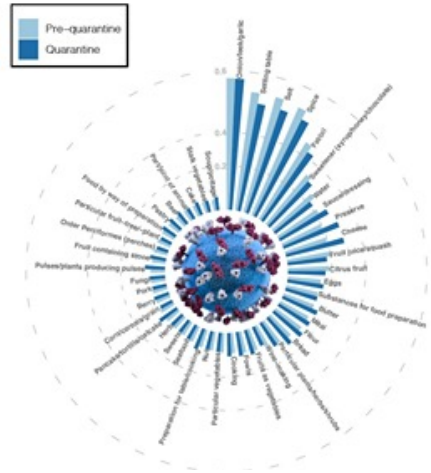
Data curation and annotation

- Design of a new FNS-Harmony (FNS-H) ontology to harmonise and integrate various reference vocabularies and ontologies
- Creation of FoodBase – a new annotated corpus with food concepts
- Development of FoodViz – a new tool for food concepts visualisation and linkage between different food standards

Food matching

- FoodOntoMap – a new data set consisting of food concepts extracted from online recipes and normalized to different food ontologies. It also provides a link between the food ontologies.

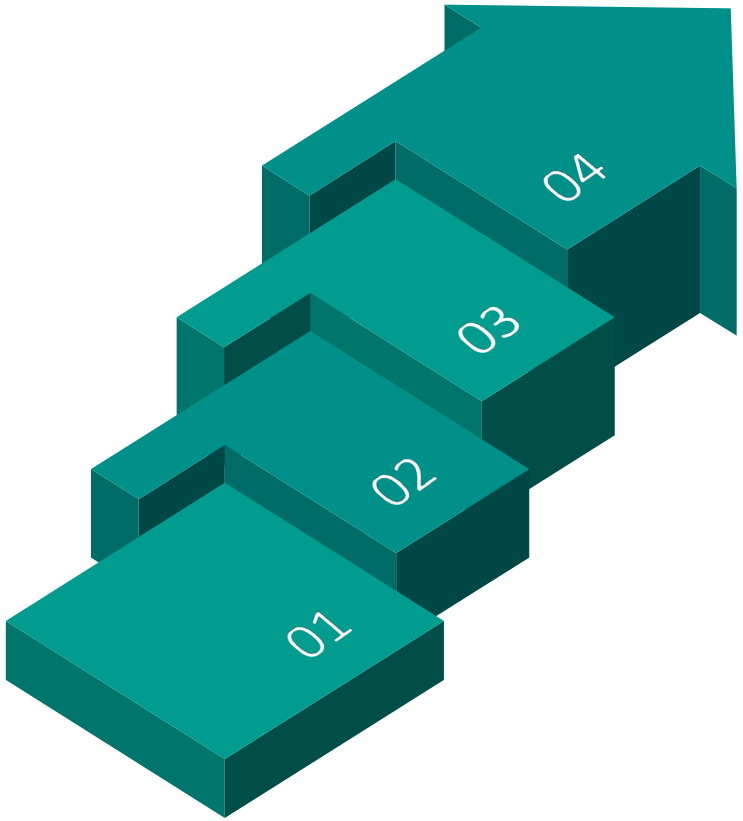




Analysis & visualization tools

- Tools for integration of data on metagenomics and metabolomics
- Tools for metabolomic prediction
- The COVID-19 impact to food consumption patterns
- Tools to visualise pathways and to analyse biological processes like PathViso or WikiPathways

FNS-Cloud implementation



Nine use cases and field labs focus on:

- Making existing and emerging FNS data FAIRer
- Generating proof-of-principle data where none exists
- Testing the FNS-Cloud infrastructure, tools, and services

Feed into three Demonstrators that will:

- Answer research questions, demonstrating modular approach
- Be tested amongst user communities
- Address any limitations and implement improvements
- Analyse advancements in TRL and performance for tools

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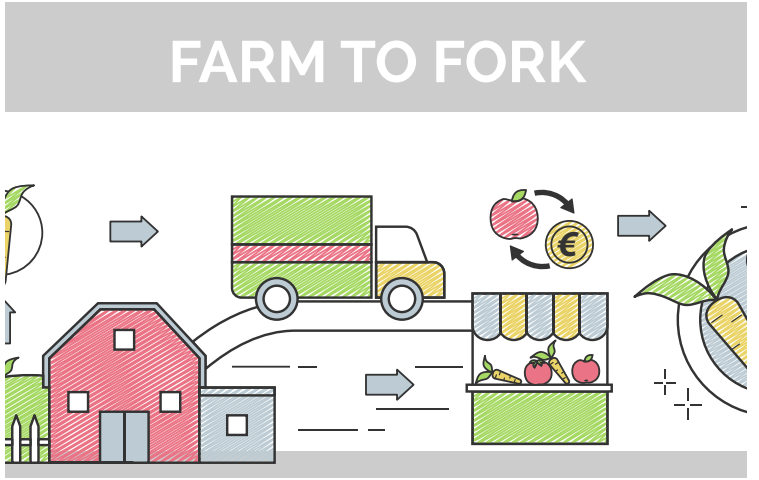
FNS-Cloud Use Cases & Field Trials



Existing data, use cases to develop …

- Food traceability & metrology search engine (milk, olive oil, fish) (ENEA, IT)
- **Food labelling data and reformulation tools (branded foods db) (NUTRIS, SI)**
- Total diet studies risk assessment (consumers, professionals) (RIVM, NL)
- **Food intake, consumer behaviour & lifestyle (mapping tool, merging strategies, data quality and usability assessment) (UCD, IE)**
- Lifestyle and NCDs cohort data (type 2 diabetes risk) (HUA, GR)

Emerging or no data, field trials to fill gaps …

- **Novel dietary intake and behaviour tools (24 h recall ethnic groups) (UCD, IE)**
- **Novel dietary intake and behaviour tools (eNutri FFQ, elderly) (UoR, UK)**
- Family meal planning (Lifely, IT)
- **Healthy diets for healthy microbiome (QIB, UK)**
- **Alert classification system for food-diet-drug interactions (IMDEA, ES)**

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FNS-Cloud Demonstrators:

Bringing use cases and field trial data, knowledge, tools, and services together to answer research questions

- Agri-food data and tools (DEM01) – traceability, metrology, labelling, (re)formulation, and benefit:risk
- Nutrition & Lifestyle (DEM02) – intake, behaviour, purchase, preparation, consumption, and composition
- Non-communicable diseases and microbiome (DEM03) – healthy diets, healthy microbiome, risk for T2D, food-drug interactions

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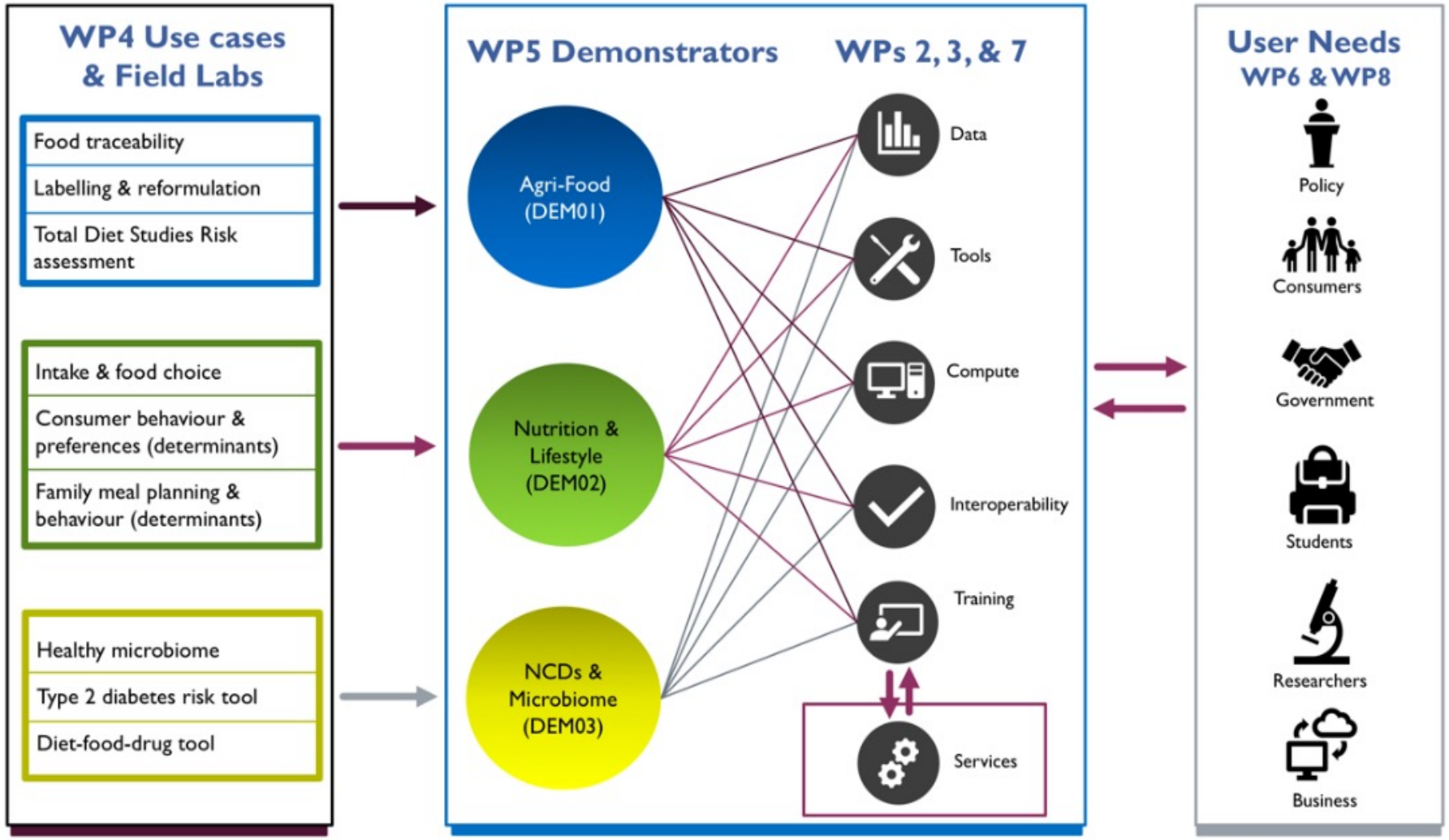
Demonstrators

Use cases and field labs will feed in to 3 DEMONSTRATORS that will:

- Be performed with user communities
- Identify how the FNS-Cloud Services perform and user satisfaction
- Address any limitations and implement improvements
- Analyse advancements in TRL and performance

Demonstrators engaging with users



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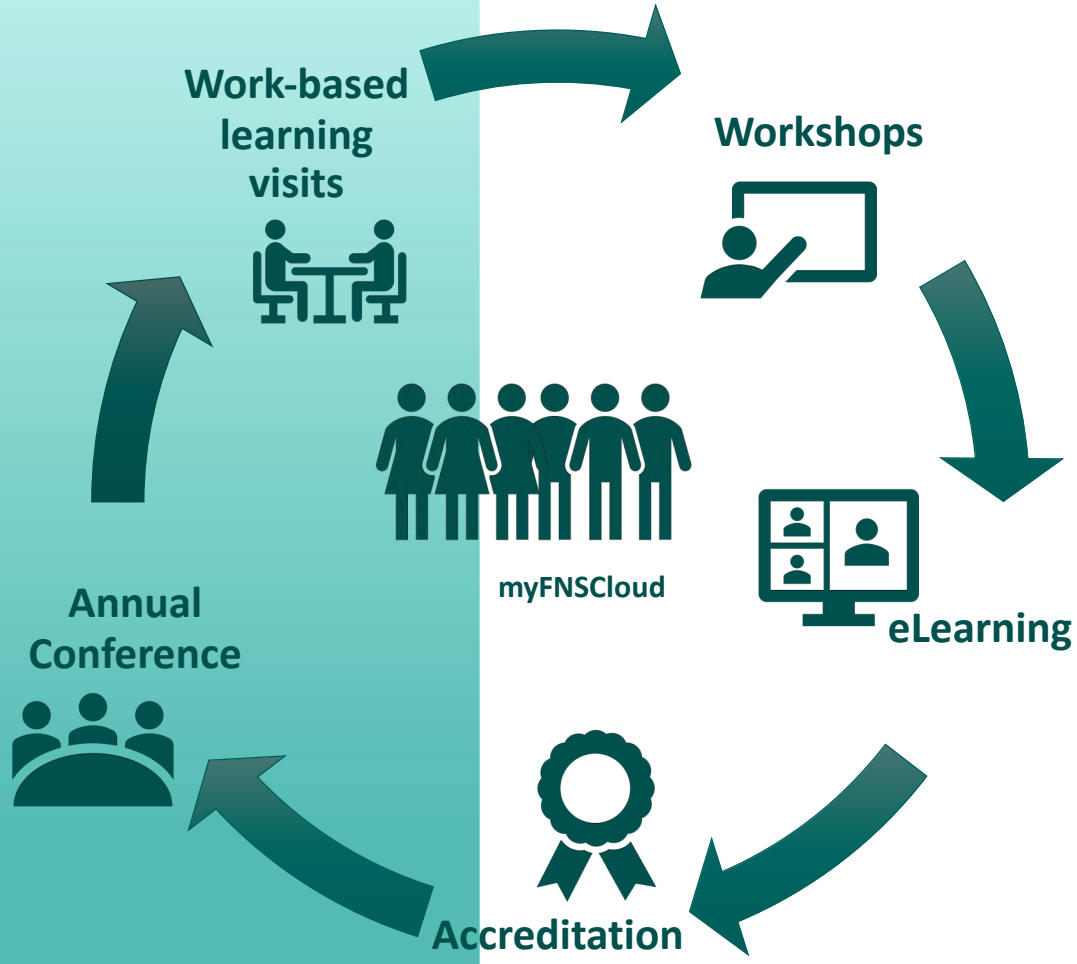
FNS-Cloud Education, Training & Support



Delivering education, training, and support to enhance skills and build confidence amongst user communities

- **Train-the-trainer programme** at hubs across EU (IFA-ISEKI - AT, ILSI-Europe - BE, EFFoST - NL, and EuroFIR - BE)
- **Community of Practice** (myFNSCloud), bespoke platform hosting resources and networking (EuroFIR - BE, UWTSD - UK)
- **Work-based learning** to enhance professional practice (UWTSD – UK)
- **Annual conference and social media** (EuroFIR - BE, UWTSD - UK, ILSI-Europe - BE, EFFoST - NL)

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Sustainability: Guided interviews with Consortium Members

Before FNS-Cloud	During FNS-Cloud	After FNS-Cloud
Was there any element of the tool/ service that preceded re FNS-Cloud?	Which elements are being developed under FNS-Cloud? Who has contributed and to what?	What is your wish after the project? Do you see this tool/ service being made available via FNS-Cloud?
Who created it? What are the conditions of use? Do you have any written and signed proof of this agreement? (i.e., licence)	Who is the tool for? Which is the audience?	What conditions of use If so, what and why? What costs are associated with maintaining and updating?

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Overview: FNS Cloud core tools (1)

BENEFICIARY	TOOL	POSSIBLE CO-OWNERSHIP	INPUTS	USERS	EXPLOITATION
FOODCASE	Catalogues	Designers, e.g., QIB	Users (FNS domain)	Users (FNS domain)	Service
ENEA Italian national agency for new technologies, energy and sustainable economic development	Search engine	PMT & ENEA	Extracted data	Users (agri-food domain)	METROFOODS-PP
Prifysgol Cymru Y Drindod Dewi Sant University of Wales Trinity Saint David	myFNSCloud	None	VeryConnect; FNS domain	Researchers	Engagement
The Hyve	FAIRSPACE	None	FNS-Cloud DIME, ontology, semantic model	Researchers (FNS, Microbial)	Service

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Outcome: Beneficiaries want to…

- List tool in the catalogues and it keep updated (subject to funding)
- Further develop the tools (subject to funding)
  - Academic: willing to finance it in-house or through other projects
  - Commercial: charge for use and updates but not necessarily for-profit
- High degree collaboration within and some collaboration across beneficiaries
- Interoperability across tools to be confirmed (Demonstrators)
- Users: agri-food, food, nutrition, and health researchers, consumers (end-users)

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Business model & Sustainability

Minimum viable product	Catalogues, CoP (myFNSCloud and server), and Secretariat
Need to know …	Business model for the FNS-Cloud tools and services as well as commercial tools
Business models depend on: (1) **nature of the tool** and (2) **beneficiary**, and (3) **exploitation**	Exploitation route (e.g., licensing, licence type) is most unclear
Beneficiaries do not want a legal entity that comes with membership fees	Membership fees potentially contradictory in levelling-up, as per the call

Tools & Services

- Tools:
  - Core tools & services
  - Food intake software & apps
  - Other tools and applications

- **Services under development:**
  - FNS-Cloud ENA Metadata Extraction
  - FNS-Cloud Ontology Classification
  - FNS-Cloud Food Marching
  - FNS-Cloud Microbiome Data Analysis

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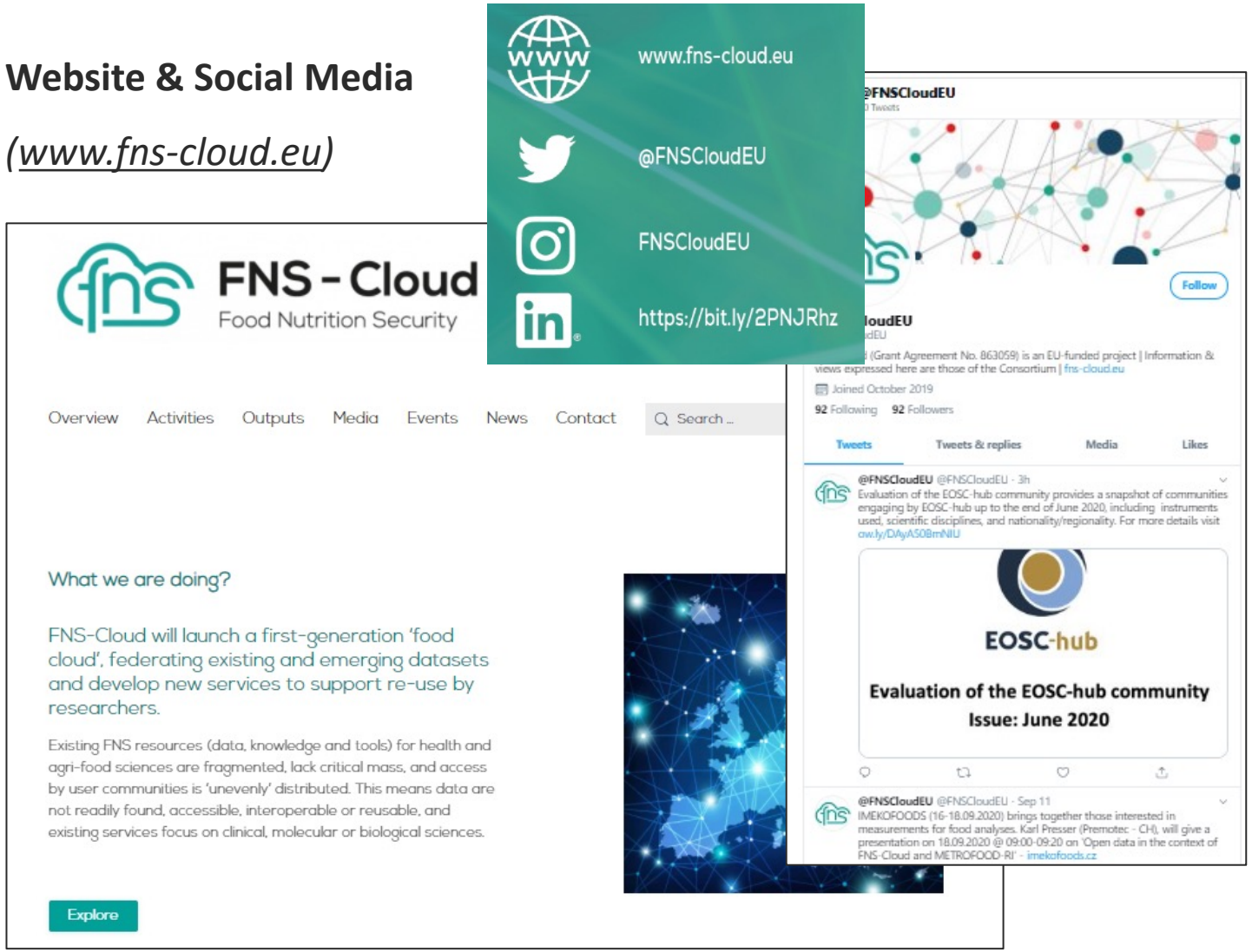
Dissemination, Communication & Community Engagement

Website & Social Media

(www.fns-cloud.eu)



Community Engagement

- Deliver four **workshops** (topics: Governance and oversight, Talent and Culture, and Management and IT) to ensure FNS-Cloud is fit-for-purpose
- Assist Demonstrator teams in identifying & engaging **user communities**

FNS-Cloud Events

- Organise **stakeholder events**, including final meeting with Demonstrator showcases

DCE Plan and Tools

- **Rolling DCE plan** including stakeholder analysis, KPIs, tools, formats, branding etc.
- Work with those developing the **user interface**, which will be accessed via the **FNS website**

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FNS-Cloud Partners

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