

RISIS



RESEARCH INFRASTRUCTURE FOR SCIENCE
AND INNOVATION POLICY STUDIES

DOCUMENTATION OF RISIS DATASETS EUPRO

*B. Heller-Schuh, M. Barber, Xh. Bilalli Shkodra,
Th. Scherngell, G. Zahradnik (AIT)*
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Outline

1	Basic Characteristics	2
2	Database content.....	3
2.1	Definition and description of observations.....	3
2.2	Data acquisition and processing (e.g. data cleaning)	4
2.3	Information on all variables/indicators	6
2.3.1	FP_2021	6
2.3.2	EUREKA_2021	11
2.3.3	JTI 1.0	13
2.3.4	COST 1.0.....	14
2.4	Sectorial, temporal and geographical coverage	15
2.5	Quality and accuracy of data	25
3	Technical Specifications	28
3.1	Information on the data base system	28
3.2	Technical variable definition	29
3.3	Description of the Entity Relationship Model.....	32
3.4	Interfaces for access and to other infrastructures.....	34
4	Scientific use cases and main references.....	36
	Appendix.....	39

2 Database content

2.1 Definition and description of observations

Units and definition of observations

Basically, EUPRO covers information on **projects** (such as project objectives and achievements, project costs, total funding, start and end date, contract type, information on the call), and **participants** (standardized name of the participating organisation, organisation type, and geographical location).

According to different funding principles, the four individual EUPRO programme modules differ slightly in structure and content and comprise the following information:

FP

- *programmes*: start and end date, previous and successor programmes, programme funding and objectives
- *projects*: project objectives and achievements, project costs, total funding, start and end date, contract type, information on the call
- *participations*: name and organization type of the participating organisations, link to OrgReg, address and geographical location of the participation entity of the organisation, project funding on the participant level
- *project output*: for FP7 and H2020, title, year, authors and DOI of publications as well as title, abstract and results of project reports are given. For H2020 only, title, description and type of deliverables are available.

EUREKA

- *projects*: title, description, technology and market area, start and end date, duration, project costs
- *participations*: organisation name, organisation type, role in project, address, website, costs

JTIs

- *programmes*: name and call of JTI, JoREP link (programme ID and call ID) for further information on JTI
- *projects*: project title, start date, duration, eligible project costs, European and national funding
- *participations*: name, country of origin, eligible costs, European and national funding on the participant level

COST

- *actions*: title and objective, science fields, start and end date
- *parties*: participating eligible countries and non-COST institutions

- *management structure*: organisation name, title, address and type of membership in the management committee

Number of observations

EUPRO comprises information on **112,038 projects** and **600,969 participations**.

Table 1 disaggregates the units of observation by different FPs and other European funding initiatives.

Table 1: EUPRO database - number of projects and participations

Programme	Period	Projects	Participations
FP1	1984 - 1987	3,348	7,972
FP2	1987 - 1991	3,987	19,184
FP3	1990 - 1994	5,474	30,768
FP4	1994 - 1998	14,524	67,831
FP5	1998 - 2002	16,026	78,562
FP6	2002 - 2006	10,100	75,356
FP7	2007 - 2013	25,778	139,682
H2020*	2014 - 2019	25,604	117,226
EUREKA*	1985 - 2019	5,932	26,233
JTIs**	2008 - 2014	133	2,612
COST	1971 - 2014	1,132	35,543
Total	1971 - 2019	112,038	600,969

Note: *including all projects starting before January 2020, **Including ARTEMIS (calls 2009-2013), ENIAC (calls 2008-2013), ECSEL (2014)

2.2 Data acquisition and processing (e.g. data cleaning)

Where the data are retrieved from

The data on FP projects, EUREKA, JTIs and COST actions are publicly available. Besides available downloadable open data for FP7 and H2020 as excel files, we used a wrapper – a kind of web scraping program – to extract and structure the information from the different XML-Files in an automated way. The program was written in Python, using the BeautifulSoup library which is used for parsing structured data. In order to do this, the wrapper opens each project pre-downloaded XML files and parses the XML content. As mostly of the files have the same structure it is easy to guide the wrapper to the relevant information, which is then stored in a relational form.

The core data sources for the construction of the four components of EUPRO are:

- CORDIS projects database (<http://cordis.europa.eu/>) for **FP** projects. Basic raw data on FP7 and H2020 projects, participants, and project outcomes of the current version (FP_2021) was downloaded in March 2020 in CSV-format.

Additional available data, like e.g., the Fields of Science categories assigned to FP projects, were extracted from the downloadable XML-files, available for FP7 and H2020, which hold the complete project information as accessible on the CORDIS project websites.

- Project level data for EUREKA has been retrieved from the **EUREKA** website (<http://www.eurekanetwork.org>). While raw data for projects starting between 1985 and 2014 were downloaded via web scraping in January 2017, raw data for projects after 2014 were derived from the interactive dashboard (<https://www.eurekanetwork.org/about-us/interactive-dashboard>) in April 2021.
- Project level data for the three **JTI** ARTEMIS, ENIAC and ECSEL has been retrieved from the respective programme websites (<https://www.artemis-ju.eu>; <http://www.eniac.eu>; <https://www.ecsel.eu>). Raw data of the current version (JTI 1.0) was available in PDF-format and was downloaded in May 2017.
- Project level data for **COST** actions has been retrieved from the COST website (<https://www.cost.eu>). Raw data of the current version (COST 1.0) was downloaded via web scraping in May 2014.

How the data are processed in terms of data cleaning

The quality of the raw data extracted from the different programmes websites is not generally sufficient for policy-relevant analyses. AIT has undertaken substantial efforts to improve quality and the level of standardisation of the data and to retrieve and add missing data. Data quality of data was improved by harmonizing different spelling and language variants of organization names and by extending, cleaning and harmonizing the type of participating organizations. Furthermore, organisation names have been linked to organisations listed in OrgReg, the Register of European Public Research and Higher Education Actors.

Data cleaning and standardisation includes four major steps:

- identification of unique organisation name (only for FP data),
- identification of unique organisation type (only for FP data),
- linking of organisation names to OrgReg entities, and
- regionalisation (i.e., assignment to European NUTS3 regions).

The harmonisation of organisation names and the integration of new data is ultimately manual but supported by applying specific matching algorithms developed by AIT. These algorithms are based on statistical properties such as the frequency of adjacent characters in the organisation names and are used to identify similar organisation names that can be attributed to the same organisation. All algorithmically identified name matches are manually checked

for accuracy. Similarly, the linking between EUPRO organisation names and the entities in OrgReg was conducted.

For the data regionalisation, we used a two-stage process. First, we used a mapping from postal codes to NUTS3 regions. Where that was unsuccessful, we made use of RISIS-developed geolocalisation tools, specifying their geographical locations by giving their latitude and longitude coordination. This facilitates all kind of spatial analyses of project-based R&D networks, e.g., the investigation of the network at the level of functional urban areas.

2.3 Information on all variables/indicators

2.3.1 FP_2021

Programme table

Table 2: Description of variables providing information about programmes (FP)

Variable	Description
prgId	internal unique identifier for FP subprogrammes ²
prgType	code (1-8) for the names of the specific framework programme types FP1 to FP7 and H2020 in which the subprogrammes were funded ¹
prgName	full name of subprogramme areas in each of the framework programmes (e.g., FP7-HEALTH – Specific Programme “Cooperation”: Health) ²
prgAcr	subprogramme acronym (e.g., FP7-HEALTH) ¹
prgURL	official website of the subprogramme ¹
prgStartDate, prgEndDate	day, month and year of subprogramme start and end ¹
prevPrg, succPrg	acronym of the predecesing and the succeeding subprogramme ¹
prgFundingMill	financing contribution of the European Union to the complete subprogramme in million Euros ¹
officialJournalReference	reference to the Official Journal of the EU, the main source of the EUR-Lex content ¹
officialJournalReferenceDate	date of reference ¹
legislativeReference	reference to EUR-Lex (eur-lex.europa.eu) ¹
legislativeReferenceDate	date of reference ¹
objective, abstract, subdivision, implementation, remarks	detailed description of the subprogramme, its objectives, subdivisions and implementation (only available for FP1-FP6) ¹

¹ provided by source data set (e.g. CORDIS, unchanged)

² introduced and/or processed by AIT

Project tables

Table 3: Description of variables providing information about projects (FP)

Variable	Description
rcn	unique identifier (record control number) for each project in the database, identical with unique identifier of all projects in the CORDIS projects database ¹
projectReference	(not-unique) project index, for internal use in the European Commission (matches with Project Id in CORDA) ¹
title	full title of the project ¹
projAcr	(non-unique) project acronym or abbreviation of the project title ¹
startDate, endDate	day, month and year of project start and end ¹
totalProjectCosts	official project costs as indicated in the project proposal ¹
projectECFunding	financing contribution of the European Union; since not all projects are financed completely, figures in "Project Funding" are equal to or smaller than figures in "Project Cost". ¹
fundingSchemeld	funding scheme identifier (corresponding Funding Schemes see Table 4) ²
call	call identifier from FP6 onwards ¹
objective	conceptual orientation of the project ¹
projectUrl	official website of the project ¹

Table 4: Description of variables providing information about funding_schemes (FP)

Variable	Description
fundingSchemeld	internal unique funding scheme identifier ²
fundingSchemeCode	abbreviation of funding schemes ¹
fundingSchemeName	different types of contracts which regulate size, financing and funding of the research projects (e.g., STREP – Specific Targeted Research Project, CA – Coordination action) ¹

Participation tables

Table 5: Description of variables providing information about participations (FP)

Variable	Description
participID	internal unique identifier of each participation ²
rcn	link to projects table (Table 3) ¹
role	role of participant in the project; differentiates between "coordinator", "participant" and "partner" (in MSC-Actions); note that for some projects in FP6-IST and FP7-ICT also the role "coordinator Contact" is specified ¹
orgld	link to organisations table (Table 6) ²
acronym	abbreviation of the organisation name (available only for FP7 and H2020 projects) ¹

endOfParticipation	indicates that organisations left the projects, but also changes of organisations' names or addresses during project run-time ¹
geold	link to geography table (Table 8) ²
address, postcode, city	street level address information ¹
ecContribution	amount of EC funding on participant level ¹
orgUrl	link to the organisation's website ¹
pic	9-digit Participant Identification Code used for all FP participants in EU programmes ¹
vatNumber	Value Added Tax Registration Number; unique number that identifies a taxable person (business) or non-taxable legal entity that is registered for VAT ¹
NUTS_assignment_id	Link to table defining strategy used to identify NUTS3 region for the participation (Table 9). ²

Table 6: Description of variables providing information about organisations (FP)

Variable	Description
orgId	internal unique identifier for each organisation; corresponds with the entries in the field orgId in the participations table (Table 5) ²
orgName	standardised EUPRO organisation name; the FP database currently covers a period of more than 30 years during which organisations have changed due to mergers, acquisitions and divestitures. Currently, organisations are labelled by the name valid at the moment of the grant agreement ²
orgTypeId	link to organisation type (Table 7) ²
orgRegId	link to RISIS-OrgReg, the Register of European Public Research and Higher Education Actors ²

Table 7: Description of variables providing information about the organisation type (FP)

Variable	Description
orgTypeId	internal unique identifier for organisation types; corresponds with the entries in the field orgTypeId in the organisations table ²
orgType	standardised EUPRO organisation type ²
orgTypeDescription	explanation of organisation types ²

Geography

Table 8: Description of variables providing information about the geography of participations (FP)

Variable	Description
geold	internal unique identifier for each geographical location of the participants ²
ctryId	link to ctry table (Table 10) ²
NUTS3	Regional EUROSTAT classification using the 2021 NUTS definitions ²

Table 9: Description of variables providing information about the method used to assign NUTS3 regions to participations (FP)

Variable	Description
NUTS_assignment_id	internal unique identifier for strategy used to assign a NUTS3 region to a participation ²
description	Explanation of strategy used to assign a NUTS3 region ²

Table 10: Description of variables providing information about the country of origin (FP)

Variable	Description
ctryId	internal unique identifier for each participating country ²
ctryCode	standardised country codes of the participating organisational units; abbreviations are given ISO 3166-1 Alpha-2 country codes ³ ; in the case of multinational organisations the participating national branches are listed ²
ctryName	official name of countries ²
ctryTypeId	link to ctryTypes table ²

Table 11: Description of variables providing information about the country type (FP)

Variable	Description
ctryTypeId	internal unique identifier for each participating country ²
ctryType	differentiation between EU member states, associated countries and third countries (including subcategories) – abbreviations ²
ctryTypeDesc	differentiation between EU member states, associated countries and third countries (including subcategories) – full text ²

Project outputs

Table 12: Description of variables providing information about H2020 deliverables (FP)

Variable	Description
delivId	internal unique identifier for each project deliverable ²
rcn	link to projects table (Table 3) ¹
title	deliverable title ¹
description	short description of the content ¹
deliverableType	Documents, reports; open data; Websites, patent filings, videos etc. ¹
url	direct link to download the document ¹
lastUpdateDate	date of last update ¹

³ <https://www.iso.org/obp/ui/#search/code/>

Table 13: Description of variables providing information about FP7 & H2020 publications (FP)

Variable	Description
publId	internal unique identifier for each project publication ²
rcn	link to projects table (Table 3) ¹
title	publication title ¹
authors, journalTitle, journalNumber, publishedYear, publishedPages, issn, doi	bibliographic information in the case of open access publications ¹
url	direct link to download the document ¹
isPublished	type of publication (Peer reviewed articles, Conference proceedings, Thesis dissertations, etc.) ¹
lastUpdateDate	date of last update ¹

Table 14: Description of variables providing information about FP7 & H2020 reports (FP)

Variable	Description
reportId	internal unique identifier for each project report ²
rcn	link to projects table (Table 3) ¹
title	report title ¹
teaser	short description of the report ¹
summary	extended description ¹
workPerformed	description of the main tasks in the project ¹
finalResults	description of the main achievements ¹
relatedFile	link to related illustrations, images, announcements, etc. ¹
url	link to the project website or further information ¹
lastUpdateDate	date of last update ¹

Thematic classifications

Table 15: Description of variables describing the thematic orientation (FoS) of FP7 & H2020 projects (FP)

Variable	Description
fosCode	unique identifier of each Fields of Science (FoS) Term ¹
fosTerm	verbal representation of fosCode ¹
hierarchyCode	placement of fosCode in the FoS taxonomy ^{4, 1}

⁴ for a complete representation of the EuroSciVoc Taxonomy see Table A 1 in the Appendix

Table 16: Description of variables providing information about the hierarchy of FoS (FP)

Variable	Description
ancestorFosCode	fosCode of the superordinate Fos term ¹
fosCode	link to fosTerms table ¹
depth	number of hierarchy levels between ancestorFosCode and fosCode ¹

Table 17: Description of variables providing information about FP2-H2020 topics (FP)

Variable	Description
topicId	internal unique identifier for each topic ²
prgId	link to programme table (Table 2)
topicCode	topic identifier within subprogrammes ¹
topicName	name of topic within subprogrammes ¹

Table 18: Description of variables providing information about FP1-FP6 subjects (FP)

Variable	Description
subjectId	internal unique identifier for each subject ²
subjectName	one or more of 51 standardized keywords (see Table 29); in the first three FPs distinct combinations of subject indices were allocated by the European Commission to projects of the same subprogram; after FP4 the allocation of subject indices to specific subprogrammes is more ambiguous (only available for FP1-FP6) Caution: allocation of subject indices seems sometimes arbitrary – check reliability of contents of this variable before usage ¹

2.3.2 EUREKA_2021

Table 19: Description of variables providing information about projects (EUREKA)

Variable	Description
projectId	unique identifier for each project in the database ¹
programme	name of the funding programme (cluster names, EUREKA, Eurostars, Globalstars, Network projects); only available for projects after 2014 ¹
programmeType	type of funding programme (clusters, EUREKA, Eurostars, Globalstars, Network projects) ¹
callId	call number within the programmes; only available for projects after 2014 ¹
acronym	(non-unique) project acronym ¹
title	full title of the project ¹

descriptionShort, descriptionLong	conceptual orientation of the project; descriptionShort is only available for projects before 2014 ¹
technologyAreaDetail	thematic field of research on level 3 (see Appendix Table A 3 for the complete list of technology areas on three levels) ¹
technologyAreaPrimary	thematic field of research on level 1 (see Appendix Table A 3 for the complete list of technology areas on three levels) ¹
technologyAreaSimple	simplified grouping of technologyArea_primary (Biotech, Energy, Environment, ICT, Industrial, Other) ¹
marketAreaDetail, marketAreaPrimary, marketAreaSimple	target market area similarly processed like technology areas; marketAreaSimple consists of Biotech / medical, Construction / building, Consumer / services, Energy, Environment, ICT, Industrial, Transportation ¹
fundingYear	year of funding agreement; only available for projects after 2014 ¹
startDate, endDate	day, month and year of project start and end ¹
durationMonths	duration of the projects in months ¹
projectWithdrawn	yes/no; only available for projects after 2014 ¹
actualCostMEuro	official project costs in million Euros ¹

Table 20: Description of variables providing information about participations (EUREKA)

Variable	Description
projectId	link to projects table (Table 19) ¹
cnr	unique identifier (control number) assigned for each participant in a project ²
role	role of participant in the project (as given); differentiates between "Main", "Partner", "Observer", "Contact", "Interested", and "Withdrawn" ¹
participant	(not harmonised) organisation name ¹
participantId	internal EUREKA participant ID; caution: one participant might be represented by different participant IDs ¹
orgregId	link to RISIS-OrgReg, the Register of European Public Research and Higher Education Actors ²
firmregId	link to RISIS-FirmReg, the reference database on private actors; not yet included
orgType	standardised EUREKA organisation type; distinguishes between Large company, SME, R&D Performing SME, Research Institute, University, Government and Other ²
address, city	street level address information ¹
ctry	standardised country codes; country abbreviations are given as ISO 3166-1 Alpha-2 ⁵ codes ²

⁵ <https://www.iso.org/obp/ui/#search/code/>

Website	URL of participant ¹
participantCostMEuro	total costs on the participant level in million Euros ¹

Table 21: Description of variables providing information about localisation of participants (EUREKA)

Variable	Description
projectId	link to projects table (Table 19) ¹
cnr	unique identifier (control number) assigned for each participant in a project ²
latitude_city, longitude_city	geographic coordinates of city ²
NUTS3	regional EUROSTAT classification referencing the subdivisions of countries, where city is localised ²

2.3.3 JTI 1.0

Table 22: Description of variables providing information about programmes (JTI)

Variable	Description
JU_name	unique JTI acronym (ARTEMIS, ENIAC, ECSEL) ¹
JU_call	call ID ²
JoREP_prog_id	link to programme ID in JoREP database ²
JoREP_call_id	link to call ID in JoREP database ²
Proj_info_source	url, where project level data was retrieved ²
Benefic_info_source	url, where beneficiary level data was retrieved ²
Last accessed	date of data retrieval ²
Comments	comments on missing or divergent data ²

Table 23: Description of variables providing information about projects (JTI)

Variable	Description
JU_name	link to programmes table (Table 22) and beneficiaries table (Table 24) ¹
JU_call	link to programmes table (Table 22) and beneficiaries table (Table 24) ²
Proj_acronym	(non-unique) project acronym or abbreviation of the project title ¹
Proj_title	full title of the project ¹
Proj_start date	day, month and year of project start ¹
Duration	duration of the project in months ¹
Proj_eligible_cost, Proj_eligible_cost_remarks	eligible project costs ¹
Proj_JU_funding	JU project funding ¹
Proj_national_funding, Proj_national_funding_flag	national project funding ¹ ; flag indicates estimated data ²

Comment	comments on data retrieval and the calculation of project costs and funding ²
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Table 24: Description of variables providing information about beneficiaries (JTI)

Variable	Description
JU_name	link to projects table (Table 23) ¹
JU_call	link to projects table (Table 23) ²
Proj_acronym	link to projects table (Table 23) ¹
stApplicant	standardised EUPRO organisation name ²
benefic_country	standardised country codes given as ISO 3166-1 Alpha-2 country codes ^{6,2}
benefic_eligible_cost, benefic_eligible_cost_remarks	eligible project costs on the beneficiary level ¹
benefic_JU_funding	JU project funding on the beneficiary level ¹
benefic_national_funding	national funding on the beneficiary level ¹ ; flag indicates estimated data ²
Comment	Comments on data retrieval and the calculation of project costs and funding on the beneficiary level ²

2.3.4 COST 1.0

Table 25: Description of variables providing information about actions (COST)

Variable	Description
ActionNo	unique identifier for each project in the database ¹
Science Field	COST science fields ¹
Title	Full title of the project ¹
Description	conceptual orientation of the project ¹
LastUpdated	date of last update of project information ¹
Start Date, End Date	day, month and year of action start and end ¹
mcChair, mcViceChair	name of management committee chair and vice chair ¹

Table 26: Description of variables providing information about parties (COST)

Variable	Description
ActionNo	link to actions table (Table 25) ¹
StartDate	start date of participation ¹
Type	type of participation (COST or non-COST countries, institutions, bodies, etc.) ¹

⁶ <https://www.iso.org/obp/ui/#search/code/>

Country	name of participating country ¹
InstitutionName	Institution name (not standardised) in the case of COST Near Neighbour Countries, COST International Partner Countries or non-COST Institutions ¹
OrganisationName	name of organisation in the case of Specific Organisations (e.g. public bodies) ¹

Table 27: Description of variables providing information about management structure (COST)

Variable	Description
ActionNo	link to actions table (Table 25) ¹
Type	type of participation (COST or non COST countries, institutions, bodies, etc.) ¹
mcCountry, mcInstitution, mcOrganisation	name of participating country, institution or organisation ¹
mcType	management committee member, observer or substitute ¹
personInstitution, personStreetCity	Institution and address of the management committee member, observer or substitute ¹

2.4 Sectorial, temporal and geographical coverage

Information on the sectorial classifications used

Table 28: FP Organisation type

OrgTypes	Description
EDU	universities and other educational institutions
ROR	public and private research organisations
IND	industry
GOV	governmental institutions
OTH	special interest groups, like unions, chambers, inter-trade organisations, etc

Table 29: Subjects (FP1-FP6)

Subjects
Aerospace Technology
Agriculture
Biotechnology
Business aspects
Construction Technology
Coordination and Cooperation
Earth Sciences
Economic Aspects
Education and Training
Electronics and Microelectronics

Energy Saving
Energy Storage and Energy Transport
Environmental Protection
Evaluation
Food
Forecasting
Fossil Fuels
Industrial Manufacture
Information and communication technology applications
Information and Media
Information Processing and Information Systems
Innovation and Technology Transfer
Intellectual property rights
Legislation and Regulations
Life Sciences
Materials Technology
Mathematics and Statistics
Measurement Methods
Medical biotechnology
Medicine and Health
Meteorology
Nuclear Fission
Nuclear Fusion
Other Energy Topics
Other Technology
Policies
Radiation Protection
Radioactive Waste
Reference Materials
Regional Development
Renewable Sources of Energy
Research ethics
Resources of the Sea and Fisheries
Safety
Scientific Research
Social sciences and humanities
Standards
Sustainable development
Telecommunications
Transport

Waste Management

Table 30: Fields of Science (EuroSciVoc) taxonomy (FP7-H2020)⁷

Level 0	Level 1	Level 2
agricultural sciences	agricultural biotechnology	agricultural genetics
		biomass
		marker assisted selection
	agriculture, forestry, and fisheries	agriculture
		fisheries
		forestry
	animal and dairy science	animal husbandry
		apiculture
		dairy
		pets
	other agricultural sciences	
	veterinary science	
engineering and technology	chemical engineering	biochemical engineering
		chemical engineering software
		chemical process engineering
	civil engineering	architecture engineering
		construction engineering
		structural engineering
		transportation engineering
	electrical engineering, electronic engineering, information engineering	electrical engineering
		electronic engineering
		information engineering
	environmental biotechnology	bioremediation
		biosensing
	environmental engineering	energy and fuels
		geological engineering
		geotechnics
		mining and mineral processing
		natural resource management
		remote sensing
		waste management
		water management
	industrial biotechnology	biomaterials
		bioprocessing technologies
		metabolic engineering
	materials engineering	ceramics
		coating and films
		colors
		composites

⁷ for the complete 5-level table see Table A 1

		crystals
		fibers
		liquid crystal
		metallurgy
		nanocomposites
		paper and wood
		synthetic dyes
		textiles
	mechanical engineering	applied mechanics
		manufacturing engineering
		mechatronics
		thermodynamic engineering
		tribology
		vehicle engineering
	medical engineering	medical laboratory technology
	nanotechnology	nano-materials
		nano-processes
		nanoelectromechanical systems
		nanoelectronics
		nanophotonics
	other engineering and technologies	food and beverages
		microtechnology
humanities	arts	architectural design
		art history
		modern and contemporary art
		performing arts
		visual arts
	history and archaeology	archaeology
		history
	languages and literature	languages - general
		linguistics
		literary genres
		literature - general
	other humanities	
	philosophy, ethics and religion	ethics
		philosophy
		religion
medical and health sciences	basic medicine	anatomy and morphology
		immunology
		medical genetics
		medicinal chemistry
		neurology
		pathology
		pharmacology and pharmacy
		physiology
		toxicology
	clinical medicine	allergology

		anaesthesiology
		andrology
		angiology
		cardiology
		clinical microbiology
		clinical neurology
		critical care medicine
		dentistry
		dermatology
		embryology
		emergency medicine
		endocrinology
		gastroenterology
		general medicine
		gerontology
		hematology
		hepatology
		integrative and complementary medicine
		internal medicine
		nephrology
		obstetrics and gynaecology
		odontology
		oncology
		ophthalmology
		orthopaedics
		otorhinolaryngology
		paediatrics
		physiotherapy
		pneumology
		psychiatry
		radiology
		rheumatology
		surgery
		transplantation
		urology
	health sciences	dietetics
		epidemiology
		health care sciences
		health care services
		infectious diseases
		inflammatory diseases
		medical ethics
		nursing
		nutrition
		parasitology
		public and environmental health

		social biomedical sciences
		sport and fitness sciences
		substance abuse
		tropical medicine
	medical biotechnology	cells technologies
		genetic engineering
		medical bioproducts
		nanomedicine
		prosthetics
		tissue engineering
	other medical sciences	forensic science
		history of medicine
natural sciences	biological sciences	biochemistry
		biodiversity conservation
		behavioural sciences biology
		biological morphology
		biology
		biophysics
		botany
		cell biology
		developmental biology
		ecology
		evolutionary biology
		freshwater biology
		genetics and heredity
		marine biology
		microbiology
		molecular biology
		morphology
		neurobiology
		reproductive biology
		synthetic biology
		zoology
	chemical sciences	analytical chemistry
		electrochemistry
		inorganic chemistry
		nuclear chemistry
		organic chemistry
		physical chemistry
		polymer science
	computer and information sciences	artificial intelligence
		computational science
		computer security
		data science
		databases
		internet
		software

	earth and related environmental sciences	atmospheric sciences
		environmental sciences
		geochemistry
		geology
		geophysics
		hydrology
		oceanography
		palaeontology
		physical geography
		soil science
	mathematics	applied mathematics
		pure mathematics
	other natural sciences	
	physical sciences	acoustics
		astronomy
		atomic physics
		classical mechanics
		condensed matter physics
		electromagnetism and electronics
		molecular and chemical physics
		nuclear physics
		optics
		plasma physics
		quantum field theory
		quantum mechanics
		relativistic mechanics
		string theory
		theoretical physics
		thermodynamics
social sciences	economics and business	business and management
		economics
	educational sciences	didactics
		inclusive education
		pedagogy
		special education
	law	admiralty law
		constitutional law
		criminology
		human rights
		international law
		law enforcement agencies
		penology
	media and communications	information science
		journalism
		library science
	other social sciences	social sciences interdisciplinary

	political science	government systems
		political communication
		public administration
		public policy
	psychology	behavioural psychology
		cognitive psychology
		psycholinguistics
		psychotherapy
		social psychology
	social and economic geography	cultural and economic geography
		transport
		sociology

Table 31: EUREKA concordance table Technology Areas (Level 1 and 2)⁸

Level 1	Level 2
1 ELECTRONICS, IT AND TELECOMS TECHNOLOGY	1.1 Information Processing, Information System
	1.2 Electronics, Microelectronics
	1.3 Telecommunications
	1.4 Multimedia
	1.5 IT and Telematics technology
2 INDUSTRIAL MANUFACTURING, MATERIAL AND TRANSPORT	2.1 Materials Technology
	2.2 Industrial Manufacture
	2.3 Construction Technology
	2.4 Transport and Shipping Technologies
	2.5 Transport Infrastructure
	2.6 Design and Modeling / Prototypes
	2.7 Process control and logistics
	2.8 Signal Processing
	2.9 Aerospace Technology
3 BIOLOGICAL SCIENCES / TECHNOLOGIES	3.1 Medical technology
	3.2 Biology / Biotechnology
	3.3 Micro- and Nanotechnology related to Biological sciences
	3.4 Genome Research
4 ENERGY TECHNOLOGY	4.1 Renewable Sources of Energy
	4.2 Rational use of energy
	4.3 Energy production, transmission and conversion
	4.4 Energy Storage and Transport
	4.5 Other Energy Topics
	4.6 Printing
	4.7 Fossil Energy Sources

⁸ for the complete 3-level table see Table A 3.

	4.8 Mining Technologies
5 TECHNOLOGY FOR PROTECTING MAN AND THE ENVIRONMENT	5.1 Environment technology
	5.2 Waste Management technology
	5.3 Safety technology
6 OTHER INDUSTRIAL TECHNOLOGIES	6.1 Textiles Technology
	6.2 Chemical Technology and Engineering
	6.3 Other Industrial Technologies_subgroup
	6.4 Apparatus Engineering
	6.5 Footwear / Leather Technology
	6.6 Process Plant Engineering
	6.7 Sound Engineering/Technology
7 AGRICULTURE AND MARINE RESOURCES	7.1 Agricultural technology
	7.2 Animal Selection/Production / Husbandry technology
	7.3 Resources of the Sea, Fisheries
	7.4 Biocontrol
8 CHEMISTRY, PHYSICAL AND EXACT SCIENCES	8.1 Micro- and Nanotechnology related to physical and exact sciences
	8.2 Meteorology / Climatology
	8.3 Chemistry
	8.4 Membrane / Filtration technology
	8.5 Analytical Chemistry
	8.6 Mathematics, Statistics
	8.7 Earth Sciences
	8.8 Hydraulics
9 MEASUREMENTS AND STANDARDS	9.1 Measurement Tools
	9.2 Electronic measurement systems
	9.3 Reference Materials
	9.4 Standards
	9.5 Recording Devices
10 AGROFOOD TECHNOLOGY	10.1 Technologies for the food industry
	10.2 Food quality and safety
	10.3 Nutrition and Health

Table 32: COST Science Fields

Science Field	Science Field Full Name
ICT	Information and Communication Technologies
MPNS	Materials, Physical and Nanosciences
ESSEM	Earth System Science and Environmental Management
TUD	Transport and Urban Development
FA	Food and Agriculture
ISCH	Individuals, Societies, Cultures and Health
BMBS	Biomedicine and Molecular Biosciences
CMST	Chemistry and Molecular Sciences and Technologies
FPS	Forests, their Products and Services

Information on the temporal coverage used

EUPRO module	First call year	Last call year
FP 2021	1984	2019
EUREKA 2.1	1985	2019
JTI 1.0	2008	2014
COST 1.0	1971	2014

Information on the geographical coverage and classifications used

Since we have information on the geographical location of the project participants in the EUPRO database, we can analyse their geographical distribution across Europe at the country-level as well as on the regional level by assigning organisation to European NUTS regions⁹ using NUTS classification revision 2016¹⁰.

EUPRO covers participations from the following countries:

- *EU 27 Member States*
- *Associated countries* (with science and technology cooperation agreements that involved contributing to the framework programme budget)¹¹:
UK; Switzerland; Israel; Norway, Iceland and Liechtenstein; Turkey, Croatia, the Former Yugoslav Republic of Macedonia and Serbia; Albania and Montenegro; Bosnia & Herzegovina; Faroe Islands; Republic of Moldova
- *Third Countries* (countries that are not Member States, nor associated countries)¹²
 - *International Cooperation Partner Countries (ICPC)*¹³: Countries eligible for EU funding from Africa, Asia, Caribbean, Pacific, Eastern Europa and Central Asia (EECA), Latin America, Mediterranean Partner Countries (MPC) and Western Balkan Countries (WBC) (for the total list see Annex, Table A 2)

⁹ including the analogous territorial descriptions for Switzerland and Norway

¹⁰ History of NUTS, http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/history_nuts (accessed: 24/04/2014)

¹¹ FP7 Third Country Agreements, http://ec.europa.eu/research/participants/data/ref/fp7/116018/fp7-third-country-agreements_en.pdf (accessed: 24/04/2014)

¹² Cooperation with Third Country Participants in an EC funded FP7 multi-partner research project, http://ec.europa.eu/research/participants/data/ref/fp7/90400/guideline-third-country-participants_en.pdf

¹³ List of International Cooperation Partner Countries (ICPC) - Annex 1 of Work Programme 2013 Cooperation, http://ec.europa.eu/research/participants/data/ref/fp7/206006/wp-2013-annex-1-icpc-list_en.pdf, (accessed: 24/04/2014)

- *High-income countries* (normally not eligible for EU funding): United States of America, Canada, Japan, the Republic of Korea, Singapore, Australia and New Zealand, Taiwan, Hong Kong and Macao, Vatican, San Marino, Monaco and Andorra.

2.5 Quality and accuracy of data

Information on the number of missing values¹⁴

Table 33: Number and ratio of missing values of FP project data

Variable	Missing values	
	Count	Ratio
rcn	-	
projectReference	-	
title	1	0%
projAcr	1	0%
startDate	2,176	2%
endDate	2,999	3%
totalProjectCosts	24,167	23%
projectECFunding	22,626	22%
fundingSchemeld	5,209	5%
call	43,817	42%
objective	9,534	9%
projectUrl	80,510	77%

Table 34: Number and ratio of missing values of FP participation data

Variable	Missing values	
	Count	Ratio
participId	-	
rcn	-	
role	-	
orgId	3,904	1%
acronym	281,004	52%
endofParticipation	281,721	53%
geold	992	0.2%
NUTS3	19,840	4%
address	28,786	5%
postcode	88,691	17%

¹⁴ This section covers information on the variables of the two main tables in each of the data sets, projects and participations. Information on variables of the remaining tables can be provided upon request.

city	14,440	3%
ecContribution	299,738	56%
orgUrl	338,320	63%
pic	280,385	52%
vatNumber	330,259	62%

Table 35: Number and ratio of missing values of EUREKA project data

Variable	Missing values	
	Count	Ratio
projectId	–	
programme*	4,094	69%
programmeType	–	
callId*	4,473	75%
acronym	–	
title	–	
descriptionShort**	1,838	31%
descriptionLong	1	0%
technologyAreaDetail	1,942	33%
technologyAreaPrimary	1,949	33%
technologyAreaSimple	1,744	29%
marketAreaDetail	2,429	41%
marketAreaPrimary	2,485	42%
marketAreaSimple	2,485	42%
fundingYear*	4,094	69%
startDate, endDate	–	
durationMonths	–	
projectWithdrawn	–	
actualCostMEuro	74	1%

Note: * only available for projects after 2014; ** only available for projects before 2014

Table 36: Number and ratio of missing values of EUREKA participation data

Variable	Missing values	
	Count	Ratio
projectId	–	
role	5,757	22%
participant	–	
participantId*	18,473	70%
orgregId	20,634	79%
orgType	16,050	61%
address	4,263	16%
city	4,668	18%

ctry	–	
Website	23,893	91%

Note: * only available for projects after 2014

Table 37: Number and ratio of missing values of JTI project data

Variable	Missing values	
	Count	Ratio
JU_name	-	
JU_call	-	
Proj_acronym	-	
Proj_title	1	1%
Proj_start date	-	
Duration	-	
Proj_eligible_cost	1	1%
Proj_JU_funding	1	1%
Proj_national_funding	25	19%

Table 38: Number and ratio of missing values of JTI beneficiaries' data

Variable	Missing values	
	Count	Ratio
JU_name	-	
JU_call	-	
Proj_acronym	-	
stApplicant	119	4%
benefic_country	-	
benefic_eligible_cost	55	2%
benefic_JU_funding	39	1%
benefic_national_funding	549	19%

Table 39: Number and ratio of missing values of COST action data

Variable	Missing values	
	Count	Ratio
ActionNo	-	
Science Field	-	
Title	-	
Description	307	27%
LastUpdated	-	
Start Date, End Date	-	

Table 40: Number and ratio of missing values of COST parties' data

Variable	Missing values	
	Count	Ratio
ActionNo	-	
StartDate	1572	7%
Type	-	
Country	50	0%
InstitutionName	-	
Organisation name	-	

Estimation of data quality issues with respect to data acquisition, reliability of retrieving system

In general, the original databases of the four funding instruments (FP, EUREKA, JTI, COST) constitute reliable resources on all R&D projects and participations. However, in some few cases information is incomplete or inconsistent, as for instance the address data, project costs, project funding and funding on the participants' level, in particular for earlier FPs.

With regard to the data acquisition and retrieving system the data is sound and complete. The retrieving system used was a wrapper – a type of web scraping program.

- *Soundness*: The raw data which is extracted from the websites is copied one-on-one and simply restructured in a relational form.
- *Completeness*: The wrapper parses the HTML content of all project webpages and is guided to the relevant information. Each webpage follows a given structure. Hence, each piece of information is located in the same place and information won't be missed by the wrapper.

3 Technical Specifications

3.1 Information on the data base system

Current data base system used

The four modules of the EUPRO database are realised as Microsoft Access 2016 database.

Planned future technical changes concerning data base system

As part of the RCF Platform, EUPRO is one of the datasets to be incorporated. For that purpose, an API – Application Programming Interface will be developed for the transfer of the data to the Platform. While having a MS Access version of the EUPRO database has its benefits, for server-side web programming, an appropriate relational database

management system (RDBMS) and a database server needs to be used. Therefore, a MySQL version for the four modules of the EUPRO database will be provided as well.

3.2 Technical variable definition

Labelling and data type of all variables¹⁵

Table 41: Data type of variables providing information about projects (FP)

Variable	Data type
rcn	Number
projectReference	Text
title	Text
projAcr	Text
startDate	Date
endDate	Date
totalProjectCosts	Number
projectECFunding	Number
fundingSchemeld	Number
call	Text
objective	Long Text
projectUrl	Text

Table 42: Data type of variables providing information about participations (FP)

Variable	Data type
participID	Number
rcn	Number
role	Text
orgId	Number
acronym	Text
endofParticipation	Text
geold	Number
address	Text
postcode	Text
city	Text
ecContribution	Number
orgUrl	Text
pic	Number
vatNumber	Text

¹⁵ This section covers information on the variables of the two main tables in each of the data sets, projects and participations. Information on variables of the remaining tables can be provided upon request.

Table 43: Data type of variables providing information about projects (EUREKA)

Variable	Data type
projectId	Text
programme	Text
programmeType	Text
callId	Text
acronym	Text
title	Text
descriptionShort	Long Text
descriptionLong	Long Text
technologyAreaDetail	Text
technologyAreaPrimary	Text
technologyAreaSimple	Text
marketAreaDetail	Text
marketAreaPrimary	Text
marketAreaSimple	Text
fundingYear	Number
startDate, endDate	Date
durationMonths	Number
projectWithdrawn	Text
actualCostMEuro	Number

Table 44: Data type of variables providing information about participations (EUREKA)

Variable	Data type
projectId	Text
role	Text
participant	Text
participantId	Text
orgregId	Text
firmregId	Text
orgType	Text
address	Text
city	Text
ctry	Text
Website	Text

Table 45: Data type of variables providing information about projects (JTI)

Variable	Data type
JU_name	Text
JU_call	Text

Proj_acronym	Text
Proj_title	Text
Proj_start date	Date
Duration	Number
Proj_eligible_cost, Proj_eligible_cost_remarks	Number
Proj_JU_funding	Number
Proj_national_funding,	Number
Proj_national_funding_flag	Text
Comment	Long Text

Table 46: Data type of variables providing information about beneficiaries (JTI)

Variable	Data type
JU_name	Text
JU_call	Text
Proj_acronym	Text
stApplicant	Text
benefic_country	Text
benefic_eligible_cost, benefic_eligible_cost_remarks	Number
benefic_JU_funding	Number
benefic_national_funding	Number
Comment	Long Text

Table 47: Data type of variables providing information about actions (COST)

Variable	Data type
ActionNo	Text
Science Field	Text
Title	Text
Description	Long Text
GeneralInfo	Long Text
LastUpdated	Date
Start Date, End Date	Date
mcChair, mcViceChair	Text

Table 48: Data type of variables providing information about parties (COST)

Variable	Data type
ActionNo	Text
StartDate	Date
Type	Text
Country	Text

InstitutionName	Text
OrganisationName	Text

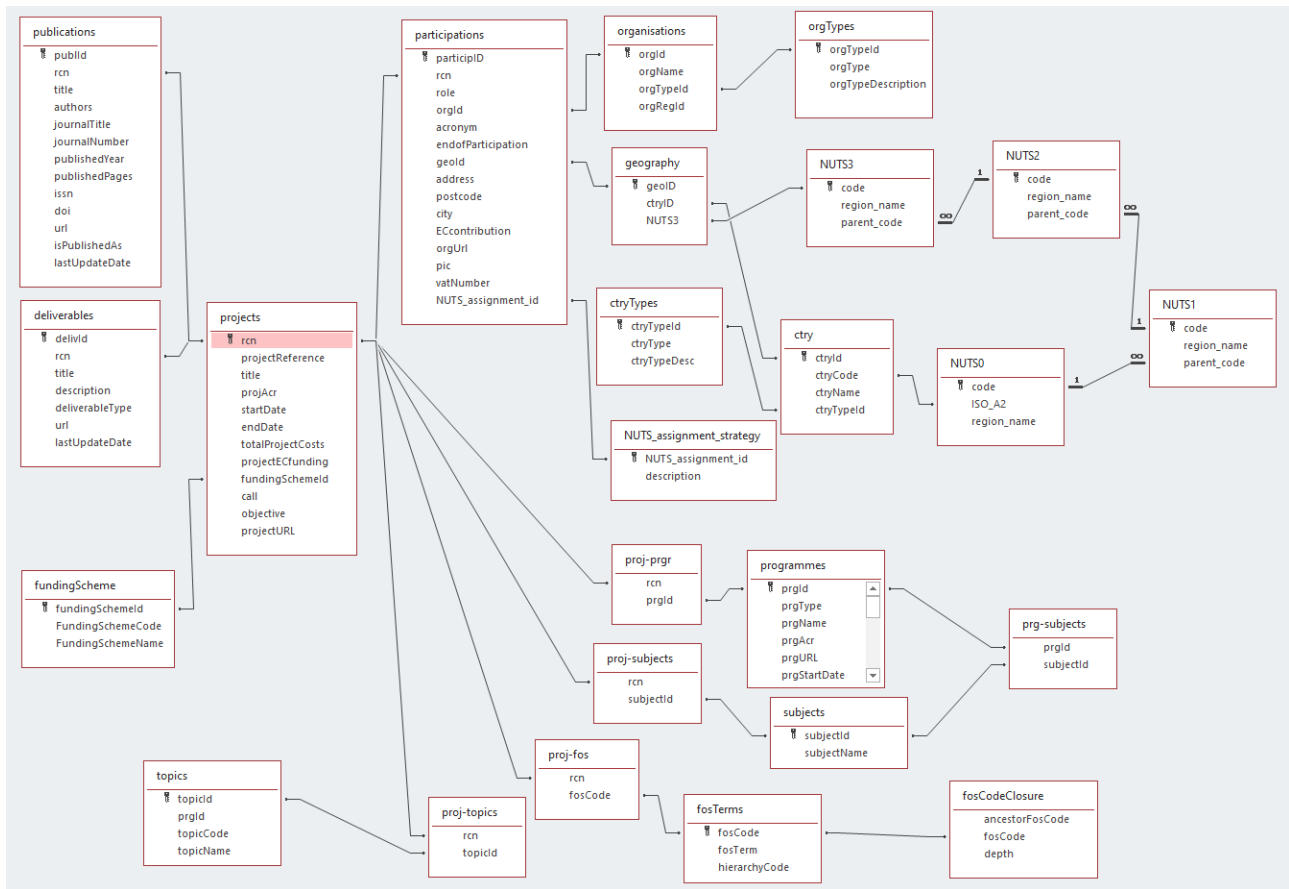
3.3 Description of the Entity Relationship Model

FP 2021 currently consists of 22 tables (Figure 1). The relation between *projects*, *programmes*, *participations*, and project outputs (*reports*, *deliverables*, *publications*) and thematic classifications (*fosTerms*, *subjects*, *topics*) is realised via *rcn* (record control number), which is a unique identifier for each project in the database and identical to the unique identifier for the project in the CORDIS projects database. Thematic classifications (*subjects*) used for FP1-FP6 programmes and projects are given in the *subjects* table (linked by *subjectId* to *programmes* and *projects*). The thematic classification of FP7 and H2020 projects is provided in the *fosTerms* table, linked by *fosCode* to the *projects* table. further information on FP *topics* are linked by *topicId* to the *projects* table. The *participations* table is linked by *geold* to the *geography* table, which holds the geocoded data of the participants on city level and is linked (1) to the *regions* table, to provide the respective NUTS 3 code in which the city is located, and (2) to the *ctry* table, which holds the names of the country of origin. By the table *ctryTypes*, countries of origin are assigned to different country categories (EU27, associated countries and third countries).

Every organisations is linked by *orgId* to the *organisations* table, which provides the link to RISIS-OrgReg, the Register of European Public Research and Higher Education Actors, and to the *orgTypes* table, which differentiates the organisations in universities, research organisations, governmental institutions, etc.

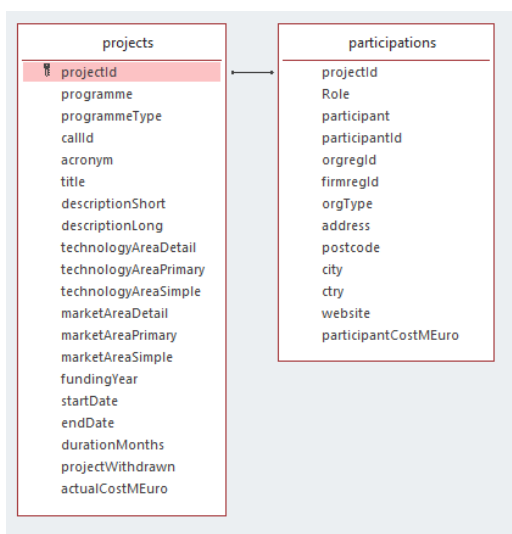
Data of the scientific output of each project is comprised in *reports*, *deliverables*, and *publications*.

Figure 1: FP Entity Relationship Model



The logic of the **EUREKA** database structure is simple (Figure 2). Projects and participations are linked by projectId.

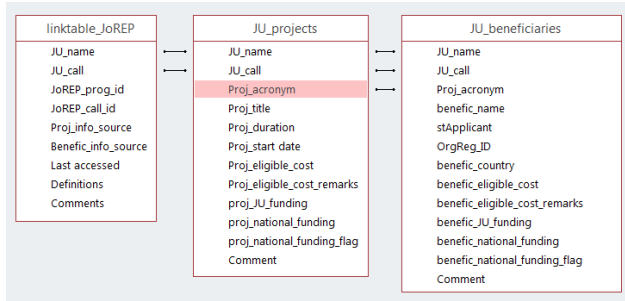
Figure 2: EUREKA Entity Relationship Model



The structure of the **JTI** database is also very simple (Figure 3). Data on programmes and the resulting projects are linked via JU_name (JTI name) and

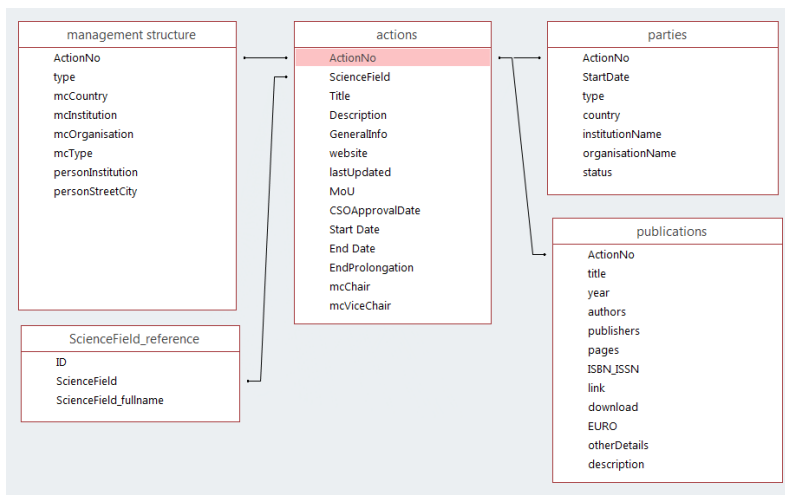
JU_call (specific call name). Beneficiaries are connected to their specific projects via Proj_acronym (project acronym).

Figure 3: JTI Entity Relationship Model



In the **COST** database (Figure 4) ActionNo connects the tables about the underlying management structure of the COST action, the participating parties and the resulting publications.

Figure 4: COST Entity Relationship Model



3.4 Interfaces for access and to other infrastructures

Technical information on interfaces with other infrastructures

Integration of EUPRO within RISIS has been core in order to increase the scientific value of EUPRO for cross-dataset empirical analyses, on the one hand, and to be able to gain from RISIS developed facilities, such as geolocalisation tools, for the further advancement of EUPRO, on the other hand. Inter-operability with other datasets is considered as a key element for the further establishment and sustainable attractiveness of EUPRO for new research endeavours, in particular those relating to the investigation of impacts of publicly funded R&D networks.

The following integration activities has been conducted during RISIS II:

- The link to **RISIS-OrgReg** enables the direct inter-linking with other RISIS core datasets featuring public research organisation, in particular LeidenRank and RISIS-ETER. At the moment, organisations included in FP_2021 are linked to RISIS-OrgReg by orgRegId in the *organisations* table. Accordingly, participants included in EUREKA_2021 are linked to OrgReg by orgregId in the *participations* table. Likewise, the link to companies listed in **RISIS-FirmReg** will be established as soon as the first release of the register is available.
- With the application of the new geolocalisation tools developed in RISIS to EUPRO, we have been able to analyse the spatio-temporal development of FP networks in much more flexible manner and integrate it in geographical terms with other RISIS datasets. One promising example in this context has been a combination of EUPRO with the **Nano S&T dataset**, investing Nanoscience and -technology networks in publications and patents (coming from Nano S&T dataset) with Nanoscience and –technology FP networks (coming from EUPRO) (see Villard et al. 2017).
- EUPRO has been inter-linked directly at the organisational level with **RISIS-ETER** in order to analyse the relationships between several characteristics of European Higher Education Institutions (HEIs) coming from RISIS-ETER, and their participation patterns in the EU FP coming from EUPRO. First research endeavors in this direction have been conducted within in RISIS (see Lepori et al. 2015), further research projects in this direction are currently under way.
- **JoREP** has – in contrast to EUPRO – a programme perspective on joint transnational research programmes, i.e. it gathers systematic information on a series of transnational programmes from 2000 to 2014. In EUPRO we have established a direct link (programme identifier) of programmes available in EUPRO and also in JoREP. These are at the current stage EUREKA and JTIs, and enables the relational investigation of networks of performers in these programmes (coming from EUPRO), and programme characteristics (coming from JoREP).
- **RISIS-KNOWMAK** draws upon project data from the EUPRO FP module to compute and visual indicators of knowledge creation in the European Research Area (see Lepori et al. 2017). Projects are annotated¹⁶ with topical

¹⁶ <https://gate.ac.uk/projects/knowmak>

classes relevant for Key Enabling Technologies (KET) and Societal Grand Challenges (SGC), include detailed subclasses. The link to RISIS-KNOWMAK has been further extended to include annotation of all projects based on their descriptions, including FP projects outside the scope of RISIS-KNOWMAK as well as EUREKA projects. With the full annotation, alternative indicator definitions may be used, and specific projects may be associated with KETs and SGCs.

Integration with RCF

The EUPRO version that is made available for access to researchers in RISIS is foreseen to be fully incorporated in RCF, under the condition of controlled access and that security of usage is given (i.e. access for selected users with a concrete research project to the parts of the dataset needed for the research). Note that underlying cleaning and standardisation data (e.g. name variants) will not be made available via RCF. Linking to other datasets in the RCF will be realized via the RISIS registers (providing the respective identifiers to the registers in EUPRO). Most probably, as mentioned above in the planned future technical changes section, there will be an API (Application Programming Interface) developed for the transfer of the EUPRO data to the RCF Platform. Anyhow, the technical issues for incorporation of EUPRO into RCF (e.g. database system, how can a user access which parts of the dataset, etc.) are to be defined in more details in close cooperation with WP4 beginning with autumn.

4 Scientific use cases and main references

Summarizing the research activities of external researchers accessing EUPRO via RISIS, we can distinguish the following main research directions for which EUPRO has been mobilized:

- Observing and characterizing **structure and dynamics of knowledge creation** and networks, disaggregated across different topics and/or geographical spaces (e.g., for climate change, biodiversity, Nanoscience; done by researchers from University of Coimbra, Université Paris-Est Marne-la-Vallée)
- Observing **FP participation patterns and networking of firms** in specific industries (e.g., pharmaceutical and chemical industries, done by researcher from Université Paris-Est Marne-la-Vallée based on the inter-linking of EUPRO with CIB)
- Using EUPRO to quantify and model **impacts of publicly funded R&D networks** on knowledge creation and technological diversification (e.g., done by researchers from Utrecht University, Université Paris-Est Marne-la-Vallée)

- Analysis of **country-specific participation patterns in the FP**, with a special focus on topical orientation and main partners (e.g., done for Israel by researchers from the Samuel Neaman Institute)
- Observing **R&D hot spots** and activities funded by FP projects, at an organizational level in specific topics and geographical locations across Europe (e.g., on marine biotechnology, done by researchers from the EMBRIC project)
- Using real-world network data to test **novel statistical models for dynamic network analysis**, and to test these models in concrete empirical applications (done by researchers from University of Lugano)
- Tracing and investigating **characteristics of universities in terms of FP funding**, e.g., relation of FP funding to other university characteristics, disciplinary background of funding, etc. (done by researchers from Vrije University Brussels)

Selected recent references to publications using EUPRO

- Barber, M., Guffarth, D. and Scherngell, T. (2015): Determinants of spatial distribution of European aerospace: contrasting R&D and supply. 55th Congress of the European Regional Science Association, 26-29 August, Lisbon, Portugal, 2015
- Freitas, F. and Carrozza, C. (2017): Tracing research and development impacts using geographic data and a FP7 dataset. 2017 Annual Conference of the EU-SPRI Forum, June 7-9, Vienna Austria
- Heller-Schuh, B., Lepori, B. and Neuländtner, M. (2020): Mergers and acquisitions in the public research sector. Toward a comprehensive typology. **Research Evaluation**, <https://doi.org/10.1093/reseval/rvad015>
- Lata, R., Scherngell, T. and Brenner, T. (2015): Integration Processes in European R&D: A comparative spatial interaction approach using project based R&D networks, co-patent networks and co-publication networks, **Geographical Analysis** 47, 349-375
- Lepori, B., Veglio, V., Heller-Schuh, B., Scherngell, T. and Barber, M. (2015): Participations to European Framework Programs of Higher Education Institutions and their association with organizational characteristics, **Scientometrics** 3, 2149-2178
- Lepori, B. and Guerini, M. (2017): KNOWMAK Manual. KNOWMAK project deliverable D5.2. <https://project.knowmak.eu/wp-content/uploads/2018/02/KNOWMAK-D5.2-KNOWMAK-Manual.pdf>
- Neuländtner M. and Scherngell T. (2020) Geographical or Relational: What drives technology-specific R&D collaboration networks? **Annals of Regional Science**, <https://doi.org/10.1007/s00168-020-01002-5>
- Robinson, D., Schoen, A., Laurens, P. and Laredo, P. (2017): Developing global and local STI indicators for profiling the territorial embedding of marine biotechnology research centres. STI 2017, Paris [Fr], 6-8 September
- Uhlbach, W.-H., Balland, P.-A. and Scherngell, T. (2017): The effects of the European Union Framework Programmes on the technological diversification of European regions. 2017 Annual Conference of the EU-SPRI Forum, June 7-9, Vienna Austria
- Uhlbach, W.-H., Balland, P.-A. and Scherngell, T. (2017): R&D Policy and Technological Trajectories of Regions: Evidence from the EU Framework Programmes. STI 2017, Paris [Fr], 6-8 September



- Wanzenböck, I., Scherngell, T. and Brenner, T. (2014): Embeddedness of regions in European knowledge networks. A comparative analysis of inter-regional R&D collaborations, co-patents and co- publications, **The Annals of Regional Science** 53, 337-368
- Wanzenböck, I., Scherngell, T. and Lata, R. (2015): Embeddedness of European regions in EU funded R&D networks: A spatial econometric perspective, **Regional Studies** 49, 1685-1705
- Wanzenböck, I. and Piribauer, P. (2017): R&D networks and regional knowledge production in Europe. Evidence from a space-time model. **Papers in Regional Science** [doi 10.1111/pirs.12236]
- Wanzenböck, I., Scherngell, T. and Dünser, M. (2017): Impacts of EU funded R&D networks on the generation of Key Enabling Technologies: Empirical evidence from a regional perspective, EMAEE Conference 2017, Strasbourg [FR], 31 May 2017
- Wanzenböck, I., Scherngell, T. and Dünser, M. (2017): RTI policy for co-creation activities and its effects on Key Enabling Technologies: Regional evidence from the 7th EU Framework Programme. 2017 Annual Conference of the EU-SPRI Forum, June 7-9, Vienna Austria
- Wanzenböck, I., Neuländtner, M. and Scherngell, T. (2020): Impacts of EU funded R&D networks on the generation of Key Enabling Technologies: Empirical evidence from a regional perspective. **Papers in Regional Science**, <https://doi.org/10.1111/pirs.12473>
- Villard, L., Perruchas, F., Scherngell, T., Barber M. and Laredo, P. (2017): The role of European Programmes in the European distribution of knowledge, the case of nanoscience and technology. STI 2017, Paris [Fr], 6-8 September

Appendix

Table A 1: Taxonomy of the European Science Vocabulary (EuroSciVoc)¹⁷

level 0	level 1	level 2	level 3	level 4	level 5
27	agricultural sciences	79 agricultural biotechnology	483 agricultural genetics 481 biomass 487 marker assisted selection	n.a. livestock cloning 1275 plant cloning	
		81 agriculture, forestry, and fisheries	30021 agriculture	493 agronomy 499 horticulture 1281 plant breeding 491 plant protection 1279 sustainable agriculture 497 viticulture	1287 fruit 1289 root crop 1751 crops 1833 fodder 30065 oilseed rape 1831 oleaginous plant
			489 fisheries		
			495 forestry	1285 dendrology 1283 silviculture	1755 dendrochronology n.a. coppicing
			507 animal husbandry	1291 animal feed	
			505 apiculture		
			503 dairy		
			501 pets		
		85 other agricultural sciences			
		87 veterinary science			
		65 chemical engineering	415 biochemical engineering n.a. chemical engineering software 411 chemical process engineering		
		77 civil engineering	479 architecture engineering	1271 home automation 1269 smart city 1267 sustainable architecture	1749 sustainable building
			477 construction engineering		
			473 structural engineering	1255 earthquake engineering 1253 hydraulic engineering 1257 structural health monitoring	1747 base isolation 1745 seismic loading
			475 transportation engineering	1263 airport engineering 1259 highway engineering 1265 port and harbor engineering 1261 railroad engineering	
				457 automation and control systems 1211 control engineering	
25	engineering and technology	73 electrical engineering, electronic engineering, information engineering	451 electrical engineering	1209 power engineering	1703 electric power distribution 1707 electric power generation 1825 combined heat and power 1705 electric power transmission
			453 electronic engineering	1213 analogue electronics 449 computer hardware 1217 digital electronics 459 robotics	1203 computer processor 1207 quantum computer 1205 supercomputer 1229 autonomous robots 1233 cognitive robots 1231 soft robotics 1227 swarm robotics
				1215 signal processing	1709 compressed sensing 1223 mobile phone
		71 environmental biotechnology	443 bioremediation	1197 bioleaching 1195 bioreactor 1199 compost 1201 phytoremediation	
			447 biosensing		
		67 environmental engineering	425 energy and fuels	1159 biofuels 1161 electric energy 1171 energy conversion	
				1165 fossil energy	1679 coal 1683 gas 1681 petroleum
				1173 fuel cell 1163 liquid fuels 1167 nuclear energy	
			1169 renewable energy	1693 geothermal energy 1687 hybrid energy	
				1689 hydroelectricity	1823 marine energy 1821 tidal energy 1819 wave power
				1691 hydrogen energy 1685 solar energy 1695 windpower	
			421 geological engineering 427 geotechnics 417 mining and mineral processing 423 natural resource management 419 remote sensing	1157 desalination	
				1179 energy efficiency 1177 energy recovery 1181 recycling 1185 remanufacturing 1183 waste water	
				1187 irrigation	
			429 waste management		
			431 water management		

level 0	level 1	level 2	level 3	level 4	level 5
25	engineering and technology	61 industrial biotechnology	383 biomaterials	1147 bioplastics	1677 polyhydroxyalkanoates n.a. polyhydroxyurethanes 1675 polylactic acid 1673 polyurethane
			385 bioprocessing technologies	1149 biocatalysis 1151 fermentation	
			381 metabolic engineering		
			397 ceramics		
			391 coating and films		
		63 materials engineering	409 colors		
			387 composites	1155 biocomposites 1153 carbon fiber	
			401 crystals		
			393 fibers		
			403 liquid crystal		
			389 metallurgy		
			407 nanocomposites		
			395 paper and wood		
			405 synthetic dyes		
			399 textiles		
			n.a. applied mechanics		
		75 mechanical engineering	469 manufacturing engineering	1247 additive manufacturing 1245 product engineering 1249 subtractive manufacturing	
			467 mechatronics		
			471 thermodynamic engineering	1251 heat engineering 1243 lubrication	
			463 tribology	1241 surface roughness	
			461 vehicle engineering	1239 aerospace engineering 1235 automotive engineering 1237 naval engineering 1239 diagnostic technologies n.a. laboratory samples analysis 1193 bulk nanostructured materials 1189 nanocrystal 1191 two-dimensional nanostructures	1741 aeronautical engineering 1737 aircraft 1739 satellite technology 1731 autonomous vehicle 1733 drive by wire 1735 sea vessels
		57 medical engineering	375 medical laboratory technology		1829 rotorcraft
		69 nanotechnology	435 nano-materials		1699 graphene 1697 silicene
			441 nano-processes		
			439 nanoelectromechanical systems		
			433 nanoelectronics		
			437 nanophotonics		
		59 other engineering and technologies	377 food and beverages 379 microtechnology	1145 food packaging	1143 food safety
31	humanities	109 arts	601 architectural design		
			597 art history	591 folklore	1403 musicology 1793 ethnomusicology 1791 popular music studies
			595 modern and contemporary art	589 film 599 radio and television	
			593 performing arts	1405 dramaturgy	
			603 visual arts		
		113 history and archaeology	611 archaeology	1431 archaeometry 1425 bioarchaeology 1429 ethnoarchaeology 1427 underwater archaeology	
			613 history	30033 ancient history 30036 contemporary history 30034 medieval history 30035 modern history	
		107 languages and literature	583 languages - general	1399 phonetics 1401 phonology 1397 sign language	
			587 linguistics		
			581 literary genres	1393 essay	1789 science fiction
			577 literature - general	585 literary theory	1395 literary criticism
		n.a. other humanities			
		111 philosophy, ethics and religion	605 ethics	1407 ethical principles 30041 ethical theories 1415 epistemology	1795 justice 1837 human rights
			609 philosophy	30040 history of philosophy 1423 ancient philosophy 1421 contemporary philosophy 1417 medieval philosophy 1413 modern philosophy	30040 history of philosophy 1423 ancient philosophy 1421 contemporary philosophy 1417 medieval philosophy 1413 modern philosophy
				1419 metaphysics	30060 ontology 1799 teleology
				30039 philosophy of language	
				1797 political philosophy	
				1409 christianity	
			607 religion	1411 islam	30058 history of islam 30056 muslim culture 30057 muslim society
				30038 judaism	

¹⁷ <https://op.europa.eu/en/web/eu-vocabularies/th-concept-scheme/-/resource/authority/euroscivoc/?target=Browse>

level 0	level 1	level 2	level 3	level 4	level 5
21	35	151 anatomy and morphology	625 muscular system		
		155 immunology	643 immunotherapy		
		149 medical genetics	641 t cell		
		157 medicinal chemistry			
		153	633 alzheimer		
			637 amyotrophic lateral sclerosis		
			629 epilepsy		
			639 multiple sclerosis		
			631 muscular dystrophy	1433 duchenne muscular dystrophy	
			627 parkinson		
			635 stroke		
		145 pathology			
		159	651 adverse drug reactions		
			649 drug resistance	1437 antibiotic resistance	
			645 drug safety	1435 multidrug resistance	
			653 pharmaceutical drug		
		161	647 pharmacokinetics	1439 vaccines	
			30022 cytology		
			655 homeostasis	1441 intestinal homeostasis	
			30023 pathophysiology		
	39	147 toxicology			
		183 allergology	685 drug allergy		
			683 food allergy		
		185 anaesthesiology			
		199 andrology			
		243 angiology	743 vascular diseases	1477 cerebrovascular diseases	
		221 cardiology	713 cardiovascular diseases	1463 arteriosclerosis	
			711 paediatric cardiology		
		197 clinical microbiology			
		241 clinical neurology			
		181 critical care medicine			
		239 dentistry			
		211 dermatology	1801 melanoma		
		203 embryology			
		189 emergency medicine	687 graft versus host disease		
		179 endocrinology	681 diabetes	1447 diabetic nephropathy	
		177 gastroenterology	679 inflammatory bowel disease		
		229 general medicine			
		175 gerontology			
		219 hematology			
		30013 hepatology			
		209 integrative and complementary medicine			
		30012 internal medicine			
		231 nephrology	723 kidney diseases		
			725 renal dialysis		
			695 gynaecology		
		207 obstetrics and gynaecology	697 obstetrics	1457 childbirth	
				1459 fetal medicine	
				1461 postnatal	
		239 odontology	741 dental implantology		
			737 orthodontics		
			739 periodontics		
		225	717 cancer	1475 bladder cancer	
				1471 breast cancer	
				1469 colorectal cancer	
				30053 head and neck cancer	
		213	719 leukemia	1467 liver cancer	
				1473 prostate cancer	
				1465 skin cancer	30063 basal cell
					30064 squamous cell carcinoma
		213	703 glaucoma		
			699 retinopathy		
			701 strabismus		
		187 orthopaedics			
		205 otorhinolaryngology			
		195 paediatrics			
		227 physiotherapy			
		217	707 asthma		
			705 lung diseases		
			709 tuberculosis		
			733 anxiety disorders		
		235	727 obsessive-compulsive disorder		
			735 posttraumatic stress disorder		
			731 schizophrenia		
			729 sleep disorders		
		201	693 medical imaging	1449 computed tomography	
				1455 magnetic resonance imaging	
			691 nuclear medicine	1451 x-ray radiography	
		215 rheumatology			
		223 surgery	715 robotic surgery		
		237 transplantation	30025 surgical procedure		
		233 urology			
		125 dietetics			
		133 epidemiology			
		n.a. health care sciences			
		30011 health care services	623 ehealth		
			621 malaria		
		121 infectious diseases	n.a. RNA virus	n.a. coronavirus	
				n.a. ebola	
				619 hiv	
				n.a. influenza	
	33	123 inflammatory diseases			
		127 medical ethics			
		143 nursing			
		117 nutrition			
		135 parasitology			
		137 public and environmental health	n.a. epidemics prevention	n.a. immunisation	
				n.a. modeling of disease spread	
		119 social biomedical sciences	617 family planning		
			615 sexual health		
		139 sport and fitness sciences			
		141 substance abuse			
		129 tropical medicine			

level 0		level 1		level 2		level 3		level 4		level 5	
21	medical and health sciences	37	medical biotechnology	163	cells technologies	657	stem cells				
				165	genetic engineering	659	gene therapy				
				169	medical bioproducts	675	heart valve				
				171	nanomedicine	677	implants				
				173	prosthetics						
						665	artificial bone				
				167	tissue engineering	671	artificial pancreas	30050	closed-loop systems		
								30052	continuous glucose monitors		
								30051	current studies		
	41	other medical sciences	249	forensic science							
			247	history of medicine							
23	natural sciences	49	biological sciences			999	biochemical research methods				
				315	biochemistry	997	biomolecules	1611	carbohydrates		
								1617	enzymes		
								1615	lipids		
								n.a.	nucleic acid		
								1613	proteins	1815	proteomics
				323	biodiversity conservation						
				321	behavioural sciences biology	1001	behavioural ecology				
						30027	ethology	1003	biological interaction		
				353	biological morphology	1051	comparative morphology				
						1049	functional morphology				
				319	biology						
				329	biophysics						
				311	botany						
				313	cell biology	993	cell metabolism				
						995	cell polarity				
						991	cell signaling				
				349	developmental biology						
				335	ecology	1009	ecosystems				
						1011	invasive species				
				343	evolutionary biology	1013	landscape ecology				
				347	freshwater biology						
						1023	chromosome				
						1015	dna				
						1025	genome				
						1027	heredity				
						1017	mutation				
						1019	nucleotide				
						1021	rna				
				317	marine biology						
						1035	bacteriology				
						1031	mycology	1621	ethnolichenology		
								1619	ethnomycology		
				341	microbiology	1029	phycology				
						1033	protozoology				
						325	virology				
						987	molecular evolution				
				309	molecular biology	989	molecular genetics				
						985	molecular neuroscience				
						983	structural biology				
				353	morphology						
				327	neurobiology	30028	neuroscience				
						1007	cognitive neuroscience				
						1005	computational neuroscience				
				333	reproductive biology						
				339	synthetic biology						
						1039	entomology	1623	apidology		
						1043	ichthyology				
						1037	invertebrate zoology				
				345	zoology	1045	mammalogy	1627	cetology		
								1625	primatology		
						1041	ornithology				
						1079	calorimetry				
						1657	inorganic qualitative analysis				
				361	analytical chemistry	1081	mass spectrometry				
						1083	quantitative analysis	1663	volumetric analysis		
						1077	spectroscopy				
						1133	bioelectrochemistry	1669	electrofusion		
								1667	electroporation		
				373	electrochemistry	1129	electric batteries				
						1135	electrocatalysis				
						1131	electrolysis				
						1137	electrophoresis				
				365	inorganic chemistry	1115	bioinorganic chemistry				
						1111	inorganic compounds				
						1113	metals				
				371	nuclear chemistry	1123	nuclear reactions				
						1125	radiation chemistry				
						1127	radiochemistry				
						1103	alcohols				
						1101	aldehydes				
						1099	aliphatic compounds				
						1089	amines				
						1095	aromatic compounds				
						1109	heterocyclic compounds				
				363	organic chemistry	1105	hydrocarbons				
						1097	ketones				
						1107	organic acids				
						1091	organic reactions				
						1087	organohalogen compounds				
						1085	organometallic chemistry				
						1093	volatile organic compounds				
						1117	photochemistry	1665	photocatalysis		
				367	physical chemistry	1121	quantum chemistry				
						1119	thermochemistry				
				369	polymer science						

level 0	level 1	level 2	level 3	level 4	level 5
23	natural sciences	47	computer and information sciences	929 computational creativity	
				931 computational intelligence	
				935 computer vision	
				927 expert systems	
				925 heuristic programming	
				1589 deep learning	
				1587 reinforcement learning	
				1595 supervised learning	
				1591 transfer learning	
				1591 unsupervised learning	
23	natural sciences	47	computer and information sciences	937 pattern recognition	
				953 multiphysics	
				915 access control	
				917 cryptography	
				923 data protection	
				919 network security	
				951 big data	
				947 business intelligence	
				949 data analysis	
				945 data exchange	
23	natural sciences	47	computer and information sciences	943 data mining	
				941 data processing	
				939 natural language processing	
				957 storage and preservation	
				971 internet access	
				967 internet of things	
				961 internet protocol	
				959 semantic web	
				963 transport layer	
				965 web development	
23	natural sciences	47	computer and information sciences	969 world wide web	1597 web accessibility
				979 application software	1603 graphic design
				975 computer programming	1607 simulation software
				977 malicious software	1605 video games
				30031 software development	
				973 system software	
				981 software architecture	
				1599 device drivers	
				1601 operating systems	
23	natural sciences	45	earth and related environmental sciences	30032 climatology	1813 arctic oscillation
					1809 el niño
					1811 north atlantic oscillation
				835 climatic zones	
				837 dendroclimatology	
				847 atmospheric circulation	1553 atmospheric turbulence
				843 atmospheric pressure	
				839 solar radiation	
				841 troposphere	
23	natural sciences	45	earth and related environmental sciences	831 ozone depletion	
				829 pollution	
				865 aqueous geochemistry	
				869 biogeochemistry	
				863 cosmochemistry	
				859 isotope geochemistry	
				867 organic geochemistry	
				geochronology	
				897 geomorphology	n.a. climatic geomorphology
				895 lithology	1569 speleology
23	natural sciences	45	earth and related environmental sciences	903 mineralogy	1577 crystallography
					1579 optical mineralogy
					1555 experimental petrology
				891 petrology	n.a. igneous petrology
					1559 metamorphic petrology
					n.a. sedimentary petrology
				905 sedimentology	
				901 seismology	1573 microseisms
					1575 plate tectonics
				899 volcanology	n.a. seismometry
23	natural sciences	45	earth and related environmental sciences	30019 geophysics	
				871 drainage basin	
				883 ecohydrology	
				877 hydrogeology	
				n.a. hydroinformatics	
				879 hydrometeorology	
				n.a. isotope hydrology	
				351 limnology	
				n.a. surface hydrology	
				n.a. geological oceanography	
23	natural sciences	45	earth and related environmental sciences	885 ocean chemistry	
				887 physical oceanography	
				827 biostratigraphy	
				819 paleobotany	
				823 paleoclimatology	
				815 paleoecology	
				n.a. paleozoology	
				821 palynology	
				911 cartography	1585 geographic information systems
				907 glaciology	1581 cryosphere
23	natural sciences	45	earth and related environmental sciences	913 natural disaster	1583 glacial geology
				857 edaphology	
				855 land-based treatment	
				853 pedology	
				n.a. soil genesis	
				849 soil morphology	

	level 0	level 1	level 2	level 3	level 4	level 5									
	23	natural sciences	51	mathematics	355	applied mathematics	1055 dynamical systems								
							1057 game theory								
							1059 mathematical model								
							1053 mathematical physics								
							1061 numerical analysis								
							357 statistics and probability								
							1073 algebra	1651 algebraic geometry							
								1653 commutative algebra							
								1655 linear algebra							
							1069 arithmetic	1641 logarithm							
			359	pure mathematics	1063 discrete mathematics	1639 prime numbers									
					1065 geometry	1629 graph theory									
					1067 mathematical analysis	1635 complex analysis									
						1637 differential equations	1817 partial differential equations								
						1633 fourier analysis									
						1631 functional equations									
					1071 topology	1645 algebraic topology									
						1647 computational topology									
						1649 knot theory									
						357 statistics and probability									
		n.a.	other natural sciences												
				273	acoustics	813 ultrasound									
						761 astrochemistry									
						759 astrophysics	1487 black hole								
							1489 dark matter								
				30030	extragalactic astronomy										
						763 galactic astronomy	1493 milky way								
							769 solar astronomy								
							30054 solar physics								
				773	history of astronomy										
			257	astronomy			1501 gamma-ray astronomy								
							1491 gravitational waves								
							1503 infrared astronomy								
							1499 optical astronomy								
							1495 radio astronomy								
							1497 x-ray astronomy								
							1517 big bang								
							1519 galaxy formation and evolution								
							1513 asteroids								
							807 celestial mechanics								
				771	planetary science			1509 comets							
								1805 meteorites							
								1803 meteors							
								1515 planetary geology							
								1511 planets	1807 exoplanetology						
								1507 satellites							
								1515 topography							
						765	space exploration								
				757	stellar astronomy			1479 asteroeismology							
								1481 neutron star							
								1483 supernova							
								1485 white dwarf							
						267	atomic physics								
								269	classical mechanics	809	continuum mechanics				
												1549 fluid dynamics			
										811	fluid mechanics	1547 fluid statics			
										30029	solid mechanics				
										805	statistical mechanics				
801	bose-einstein condensates														
797	mesoscopic physics														
799	quantum gases														
803	soft matter physics														
795	solid-state physics														
			259	electromagnetism and electronics	781	electrical conductivity	1523 semiconductor								
					785	electromagnetism									
					783	microelectronics									
					787	optoelectronics									
					777	semiconductor device									
					779	spintronics	1521 molecular spintronics								
					255	molecular and chemical physics									
							253	nuclear physics	753	nuclear decay					
									755	nuclear fission					
									751	nuclear fusion					
747	cavity optomechanics														
749	fibre optics														
745	laser physics														
271	plasma physics														
30017	quantum field theory	793	quantum physics	1545					quantum optics						
30015	quantum mechanics														
n.a.	relativistic mechanics														
				789	string theory										
			261	theoretical physics	791	particles	1533 fermion								
							1535 gluons								
							1539 higgs boson								
							1543 leptons								
							1527 particle accelerator								
							1541 photons								
							1537 quarks								
							1531 w boson								
							1529 z boson								
					265	thermodynamics									

	level 0	level 1	level 2	level 3	level 4	level 5					
29	social sciences	91	economics and business	523	business and management	1307	business model	1759	e-commerce		
						1311	commerce				
						1313	employment				
						1309	entrepreneurship				
						1295	biological economics				
				521	economics	1301	econometrics				
						1305	macroeconomics				
						1297	microeconomics				
						1293	monetary and finances				
						1299	production economics	1757	productivity		
		1303	sustainable economy								
		105	educational sciences	573	didactics						
				575	inclusive education						
				571	pedagogy	1391	active learning				
						1389	inquiry based learning				
				1387	teaching						
				569	special education						
		89	law	515	admiralty law						
				517	constitutional law						
				511	criminology						
				1837	human rights	n.a.	concepts in human rights				
						n.a.	history of human rights				
						30048	human rights law	n.a.	national state of emergency	n.a.	pandemic risk
						1839	human rights violations	1841	human trafficking		
								30061	political violence		
				30062	sexual violence						
				30049	international protection of human rights						
		n.a.	regional human rights								
		519	international law								
		513	law enforcement agencies								
		509	penology								
		103	media and communications	565	information science						
				567	journalism						
				563	library science						
		95	other social sciences	535	social sciences interdisciplinary	1385	archives				
				1383	public libraries						
		97	political science	543	government systems	1327	sustainable development				
						1335	civil society				
						1337	democracy				
						1333	e-governance				
				1331	nongovernmental organization						
				541	political communication						
		537	public administration	1329	bureaucracy						
		539	public policy								
		525	behavioural psychology								
		93	psychology	533	cognitive psychology	30043	mental processes	1319	attention		
								1325	emotion		
1323	learning										
1317	perception										
1321	personality										
529	psycholinguistics										
527	psychotherapy	1315	psychoanalysis								
531	social psychology										
545	cultural and economic										
99	social and economic geography	547	transport	1343	electric vehicles						
				1349	freight transport						
				1351	navigation systems	1767	inertial navigation system	1835	global navigation satellite		
				1765	satellite navigation system						
				1347	public transport						
				1341	social aspects of transport						
				1345	sustainable transport	1763	intelligent transport system				
				1339	transport planning	1761	air traffic management				
				549	urban studies						
				561	anthropology	1379	ethnology	1787	paleoanthropology		
		1381	physical anthropology								
		1377	social and cultural anthropology								
		1355	census								
		1357	fertility								
		1353	mortality								
		1361	family studies								
		1363	gender studies	1769	gender equality						
		1369	globalization	n.a.	women's studies						
		101	sociology	1375	crisis management		1781	flood risk management			
				1371	public services		1783	seismic risk management			
1373	taxation										
551	ideologies										
555	industrial relations			1359	automation						
1777	ageism										
1779	corruption										
1367	social problems	1775	migration								
		1773	racism								
		1771	social inequality								
		1365	social work								

Table A 2: List of International Cooperation Partner Countries (ICPC) participating in EU FP

Country	Code	Type of Country
ANGOLA	AGO	ICPC - Africa
BENIN	BEN	ICPC - Africa
BOTSWANA	BWA	ICPC - Africa
BURKINA FASO	BFA	ICPC - Africa

BURUNDI	BDI	ICPC - Africa
CAMEROON	CMR	ICPC - Africa
CAPE VERDE	CPV	ICPC - Africa
CENTRAL AFRICAN REPUBLIC	CAF	ICPC - Africa
CHAD	TCD	ICPC - Africa
CONGO	COG	ICPC - Africa
CONGO, DEMOCRATIC REPUBLIC	COD	ICPC - Africa
EQUATORIAL GUINEA	GNQ	ICPC - Africa
ERITREA	ERI	ICPC - Africa
ETHIOPIA	ETH	ICPC - Africa
GABON	GAB	ICPC - Africa
GAMBIA	GMB	ICPC - Africa
GHANA	GHA	ICPC - Africa
GUINEA	GIN	ICPC - Africa
GUINEA-BISSAU	GNB	ICPC - Africa
KENYA	KEN	ICPC - Africa
LESOTHO	LSO	ICPC - Africa
LIBERIA	LBR	ICPC - Africa
MADAGASCAR	MDG	ICPC - Africa
MALAWI	MWI	ICPC - Africa
MALI	MLI	ICPC - Africa
MAURITANIA	MRT	ICPC - Africa
MAURITIUS	MUS	ICPC - Africa
MOZAMBIQUE	MOZ	ICPC - Africa
NAMIBIA	NAM	ICPC - Africa
NIGER	NER	ICPC - Africa
NIGERIA	NGA	ICPC - Africa
RWANDA	RWA	ICPC - Africa
SAO TOME AND PRINCIPE	STP	ICPC - Africa
SENEGAL	SEN	ICPC - Africa
SEYCHELLES	SYC	ICPC - Africa
SIERRA LEONE	SLE	ICPC - Africa
SOMALIA	SOM	ICPC - Africa
SOUTH AFRICA	ZAF	ICPC - Africa
SUDAN	SDN	ICPC - Africa
SWAZILAND	SWZ	ICPC - Africa
TANZANIA	TZA	ICPC - Africa
TOGO	TGO	ICPC - Africa
UGANDA	UGA	ICPC - Africa
ZAMBIA	ZMB	ICPC - Africa
ZIMBABWE	ZWE	ICPC - Africa
AFGHANISTAN	AFG	ICPC - Asia
BANGLADESH	BGD	ICPC - Asia
BHUTAN	BTN	ICPC - Asia
CAMBODIA	KHM	ICPC - Asia

CHINA	CHN	ICPC - Asia
INDIA	IND	ICPC - Asia
INDONESIA	IDN	ICPC - Asia
IRAN	IRN	ICPC - Asia
IRAQ	IRQ	ICPC - Asia
LAO PEOPLE'S DEMOCRATIC REPUBLIC	LAO	ICPC - Asia
MALAYSIA	MYS	ICPC - Asia
MALDIVES	MDV	ICPC - Asia
MONGOLIA	MNG	ICPC - Asia
MYANMAR	MMR	ICPC - Asia
NEPAL	NPL	ICPC - Asia
OMAN	OMN	ICPC - Asia
PAKISTAN	PAK	ICPC - Asia
PHILIPPINES	PHL	ICPC - Asia
SRI LANKA	LKA	ICPC - Asia
THAILAND	THA	ICPC - Asia
VIET NAM	VNM	ICPC - Asia
YEMEN	YEM	ICPC - Asia
BARBADOS	BRB	ICPC - Carribean
CUBA	CUB	ICPC - Carribean
DOMINICAN REPUBLIC	DOM	ICPC - Carribean
GUYANA	GUY	ICPC - Carribean
HAITI	HTI	ICPC - Carribean
JAMAICA	JAM	ICPC - Carribean
SAINT LUCIA	LCA	ICPC - Carribean
SURINAME	SUR	ICPC - Carribean
TRINIDAD AND TOBAGO	TTO	ICPC - Carribean
ARMENIA	ARM	ICPC - Eastern Europe and Central Asia (EECA)
AZERBAIJAN	AZE	ICPC - Eastern Europe and Central Asia (EECA)
BELARUS	BLR	ICPC - Eastern Europe and Central Asia (EECA)
GEORGIA	GEO	ICPC - Eastern Europe and Central Asia (EECA)
KAZAKHSTAN	KAZ	ICPC - Eastern Europe and Central Asia (EECA)
KYRGYZSTAN	KGZ	ICPC - Eastern Europe and Central Asia (EECA)
Russian Federation	RUS	ICPC - Eastern Europe and Central Asia (EECA)
TAJIKISTAN	TJK	ICPC - Eastern Europe and Central Asia (EECA)
TURKMENISTAN	TKM	ICPC - Eastern Europe and Central Asia (EECA)
UKRAINE	UKR	ICPC - Eastern Europe and Central Asia (EECA)
UZBEKISTAN	UZB	ICPC - Eastern Europe and Central Asia (EECA)
ARGENTINA	ARG	ICPC - Latin America
BOLIVIA, PLURINATIONAL STATE OF	BOL	ICPC - Latin America
BRAZIL	BRA	ICPC - Latin America
CHILE	CHL	ICPC - Latin America
COLOMBIA	COL	ICPC - Latin America
COSTA RICA	CRI	ICPC - Latin America
ECUADOR	ECU	ICPC - Latin America

EL SALVADOR	SLV	ICPC - Latin America
GUATEMALA	GTM	ICPC - Latin America
HONDURAS	HND	ICPC - Latin America
MEXICO	MEX	ICPC - Latin America
NICARAGUA	NIC	ICPC - Latin America
PANAMA	PAN	ICPC - Latin America
PARAGUAY	PRY	ICPC - Latin America
PERU	PER	ICPC - Latin America
URUGUAY	URY	ICPC - Latin America
VENEZUELA, BOLIVARIAN REPUBLIC OF	VEN	ICPC - Latin America
ALGERIA	DZA	ICPC - Mediterranean Partner Countries (MPC)
EGYPT	EGY	ICPC - Mediterranean Partner Countries (MPC)
Jordan	JOR	ICPC - Mediterranean Partner Countries (MPC)
LEBANON	LBN	ICPC - Mediterranean Partner Countries (MPC)
Libya	LBY	ICPC - Mediterranean Partner Countries (MPC)
MOROCCO	MAR	ICPC - Mediterranean Partner Countries (MPC)
SYRIA	SYR	ICPC - Mediterranean Partner Countries (MPC)
TUNISIA	TUN	ICPC - Mediterranean Partner Countries (MPC)
FIJI	FJI	ICPC - Pacific
PAPUA NEW GUINEA	PNG	ICPC - Pacific
SAMOA	WSM	ICPC - Pacific
SOLOMON ISLANDS	SLB	ICPC - Pacific
TONGA	TON	ICPC - Pacific
VANUATU	VUT	ICPC - Pacific



Technology Area (level 1)	Technology Area (level 2)	Technology Area (level 3)
1 ELECTRONICS, IT AND TELECOMS TECHNOLOGY	1.1 Information Processing, Information System	Advanced Systems Architecture
		Archivistics/Documentation/Technical Documentation
		Artificial Intelligence (AI)
		Computer Games
		Computer Hardware technology
		Computer Software technology
		Computer Technology/Graphics, Meta Computing
		Data Processing / Data Interchange, Middleware
		Data Protection, Storage Technology, Cryptography, Data Security
		Databases, Database Management, Data Mining
		Electronic Commerce, Electronic Payment, Electronic Signature
		Human Interactive
		Imaging, Image Processing, Pattern Recognition
		Information Processing, Information System
		Information Technology/Informatics
		Internet Technologies
		Knowledge Management, Process Management
		Quantum Informatics
		Simulation
		Simulation, Simulation Engineering
		Speech Processing/Technology
		User Interfaces, Usability
	1.2 Electronics, Microelectronics	Automation, Robotics Control Systems
		Digital Systems, Digital Representation
		Electronic circuits, components and equipment
		Electronic engineering
		Electronics, Microelectronics
		Embedded Systems and Real Time Systems
		High Frequency Technology, Microwaves
		Magnetic and superconductive technology
		Micromachining
		Nanotechnologies related to electronics and microelectronics
		Optical Networks and Systems
		Peripherals Technologies (Mass Data Storage, Display Technologies)
		Printed circuits and integrated circuits
		Semiconductors
		Smart cards and access systems
	1.3 Telecommunications	Audiovisual Equipment and Communication technology
		Broadband Technologies
		Mobile Communications
		Narrow Band Technologies
		Network Technology, Network Security
		Satellite Technology / Systems / Positioning / Communication
		Telecommunications
	1.4 Multimedia	Cultural Heritage
		E-Learning
		E-Publishing, Digital Content
		Human Language Technologies
		Information Filtering, Semantics, Statistics

	1.5 IT and Telematics technology	Multimedia
		Visualisation, Virtual Reality
		Application Service Providing (ASP)
		e-Government
		Environment Management Systems
		GIS Geographical Information Systems
		IT and Telematics technology
		Software for health
		Software for tourism
		Software for transport, logistics and human resources (Enterprise Resource Planning - ERP)
2 INDUSTRIAL MANUFACTURING, MATERIAL AND TRANSPORT	2.1 Materials Technology	Adhesives
		Building materials
		Ceramic Materials and Powders
		Colours and varnish
		Composite materials
		Fine Chemicals, Dyes and Inks
		Glass
		Iron and Steel, Steelworks
		Materials Handling Technology (solids, fluids, gases)
		Materials Technology
		Metals and Alloys
		Optical Materials
		Paper technology
		Plastics, Polymers
		Properties of Materials, Corrosion/Degradation
	2.2 Industrial Manufacture	Cleaning (sandblasting, brushing)
		Coatings
		Drying
		Erosion, Removal (spark erosion, flame cutting, laser/plasma cutting, electrochemical erosion, waterjet cutting)
		Forming (rolling, forging, pressing, drawing)
		Hardening, heat treatment
		Industrial Manufacture
		Joining techniques (rivetting, screw driving, gluing)
		Joining (soldering, welding, sticking)
		Machine Tools technology
		Machining (turning, drilling, moulding, milling, planing, cutting)
		Machining, fine (grinding, lapping)
		Mixing (powder, etc.), separation (sorting, filtering)
	2.3 Construction Technology	Moulding, injection moulding, extrusion, sintering
		Surface treatment (painting, galvano, polishing, CVD, PVD)
		Building Materials, Components and Methods
		Civil engineering
		Construction Equipment
		Construction Technology
		Fire Resistance
		Mechanical Engineering, Hydraulics, Vibration and Acoustic Engineering
		Pipeline Technology
		Pulp Technology related to construction technology
		Sensory/Multisensory Technology, Instrumentation related to construction technology

		Sound Insulation
	2.4 Transport and Shipping Technologies	Design of Vehicles
		Hybrid and Electric Vehicles technology
		Railway Vehicles technology
		Road Vehicles technology
		Shipbuilding technology
		Traction/Propulsion Systems
		Transport and Shipping Technologies
	2.5 Transport Infrastructure	Air Transport technology
		Intermodal Transport technology
		Logistics
		Railway Transport technology
		Road Transport technology
		Traffic Engineering / Control Systems
		Transport Infrastructure
		Water Transport technology
	2.6 Design and Modeling / Prototypes	Design and Modeling / Prototypes
	2.7 Process control and logistics	Process control and logistics
	2.8 Signal Processing	Signal Processing
	2.9 Aerospace Technology	Aeronautical technology / Avionics
		Aerospace Technology
		Aircraft technology
		Helicopter technology
3 BIOLOGICAL SCIENCES / TECHNOLOGIES	3.1 Medical technology	Clinical Research, Trials
		Cytology, Cancerology, Oncology
		Dentistry / Odontology, Stomatology
		Diagnostics, Diagnosis
		Environmental Medicine, Social Medicine, Sports Medicine technology
		Gene - DNA Therapy
		Heart and blood circulation illnesses
		Medical devices technology (instrumentation, medical imaging, radiology)
		Medical technology
		Neurology, Brain Research
		Pharmaceutical Products / Drugs
		Surgery
		Virus, Virology, Vaccines/ Antibiotics / Bacteriology
	3.2 Biology / Biotechnology	Biochemistry / Biophysics
		Biology / Biotechnology
		Cellular and Molecular Biology
		Enzymology / Protein Engineering / Fermentation
		Genetic Engineering
		In vitro Testing, Trials
		Microbiology
		Molecular design
		Toxicology
	3.3 Micro- and Nanotechnology related to Biological sciences	Micro- and Nanotechnology related to Biological sciences

4 ENERGY TECHNOLOGY	3.4 Genome Research	Bioinformatics
		Gene Expression, Proteom Research
		Genome Research
		Population genetics
	4.1 Renewable Sources of Energy	Gaseous biomass
		Geothermal Energy
		Hydropower
		Liquid biomass
		Photovoltaics
		Renewable Sources of Energy
		Solar/Thermal energy
		Solid biomass
		Unconventional and Alternative Energies
		Waste incineration
		Wind energy
	4.2 Rational use of energy	Energy management
		Lighting, illumination
		Process optimisation, waste heat utilisation
		Rational use of energy
		Thermal insulation, energy efficiency in buildings
	4.3 Energy production, transmission and conversion	Energy production, transmission and conversion
		Fuel cell, hydrogen production
		Furnace technology, construction of heating boilers
		Generators, electric engines and power converters
		Heat exchangers
		Heat pump, cooling technologies
		Heating, ventilation
		Turbines, fluid machinery, reciprocating engines, combined heat and power
	4.4 Energy Storage and Transport	Energy Storage and Transport
		Heat storage
		Heat transport and supply, district heating
		Storage of electricity, batteries
		Transmission of electricity
		Transport and storage of gas and liquid fuels
		Transport and storage of hydrogen
5 TECHNOLOGY FOR PROTECTING MAN AND THE ENVIRONMENT	4.5 Other Energy Topics	Combustion, Flames
		Fuel Technology
		Other Energy Topics
	4.6 Printing	Flexography
		Printed Reel Material
		Printing
	4.7 Fossil Energy Sources	Coal and Hydrocarbons
		Fossil Energy Sources
		Gaseous fossil fuel
		Liquid fossil fuel
	4.8 Mining Technologies	Mining Technologies
	5.1 Environment technology	Air Pollution
		Ecology
		Environment technology
		Environmental Engineering / Technology

		Measurement and Detection of Pollution
		Natural Disasters
		Remote sensing technology
		Soil Pollution
		Water Pollution / Treatment
	5.2 Waste Management technology	Biotreatment / Compost / Bioconversion
		Incineration and Pyrolysis
		Land and Sea Disposal
		Radioactive Waste
		Recycling, Recovery
	5.3 Safety technology	Waste Management technology
		Acoustic safety
		Assessment of Risk
		Fire Safety Technology
		Hazardous Materials
6 OTHER INDUSTRIAL TECHNOLOGIES	6.1 Textiles Technology	Radiation Protection
		Safety technology
		Dyeing related to Textiles Technology
		Finisher related to Textiles Technology
		Textiles Technology
	6.2 Chemical Technology and Engineering	Thermoplastic textile fibres
		Weaving related to Textiles Technology
		Woven technical textiles for industrial applications
		Agro chemicals
		Chemical Technology and Engineering
		Colours, dyes related to Chemical Technology and engineering
		Electrical Engineering and Technology / Electrical Equipment
		Man made fibres
		Organic Substances
		Pharmaceutics
6.3 Other Industrial Technologies_subgroup	Plastics and Rubber related to Chemical Technology and engineering	
	Rubber	
	Soaps, detergents	
	Cleaning Technology	
	Other Industrial Technologies_subgroup	
6.4 Apparatus Engineering	Apparatus Engineering	
6.5 Footwear / Leather Technology	Dry filling related to Footwear / Leather Technology	
	Footwear / Leather Technology	
	Tanned leather process related to Footwear / Leather Technology	
6.6 Process Plant Engineering	Plant Design and Maintenance	
	Process Plant Engineering	
6.7 Sound Engineering/Technology	Sound Engineering/Technology	
7 AGRICULTURE AND MARINE RESOURCES	7.1 Agricultural technology	Agricultural technology
		Agriculture Machinery / Technology
		Crop Production technology
		Horticulture technology
		Pesticides
		Plant selection/production technology
		Precision agriculture technology

		Veterinary Medicine
	7.2 Animal Selection/Production / Husbandry technology	Animal Selection/Production / Husbandry technology
	7.3 Resources of the Sea, Fisheries	Aquaculture technology
		Fish / Fisheries / Fishing Technology
		Marine Science
		Resources of the Sea, Fisheries
	7.4 Biocontrol	Biocontrol
		Forest technology
		Sylviculture, Forestry
		Wood technology
8 CHEMISTRY, PHYSICAL AND EXACT SCIENCES	8.1 Micro- and Nanotechnology related to physical and exact sciences	Micro- and Nanotechnology related to physical and exact sciences
	8.2 Meteorology / Climatology	Acoustics
		Laser Technology
		Meteorology / Climatology
		Sensors/Multisensor Technology, Instrumentation
	8.3 Chemistry	Thermodynamics
		Chemistry
		Computational Chemistry and Modelling
		Inorganic Chemistry
	8.4 Membrane / Filtration technology	Organic Chemistry
		Petrochemistry, Petroleum Engineering
		Membrane / Filtration technology
	8.5 Analytical Chemistry	Analytical Chemistry
	8.6 Mathematics, Statistics	Algorithms and Complexity
		Mathematical modelling
		Mathematics, Statistics
	8.7 Earth Sciences	Earth Sciences
		Geology, Geological Engineering, Geotechnics
		Tectonics, Seismology
	8.8 Hydraulics	Hydraulics
9 MEASUREMENTS AND STANDARDS	9.1 Measurement Tools	Acoustic Technology related to measurements
		Analyses / Test Facilities and Methods
		Chemical material testing
		Electrical Technology related to measurements
		Measurement Tools
		Mechanical Technology related to measurements
		Optical material testing
		Optical Technology related to measurements
		Other Non Destructive Testing
		Sensor Technology related to measurements
	9.2 Electronic measurement systems	Electronic measurement systems
	9.3 Reference Materials	Reference Materials
	9.4 Standards	Standards
		Technical Standards
	9.5 Recording Devices	Recording Devices

