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Minerals Intelligence Capacity Analysis

The European Raw Materials Intelligence Capacity Platform (EU-RMICP)

February 3rd, 2016

MICA Kick-off Meeting, Copenhagen

Daniel Cassard, François Tertre and the WP6 Team

BRGM, EGS, GeoZS, GEUS, GTK, JRC and UJF/LIG



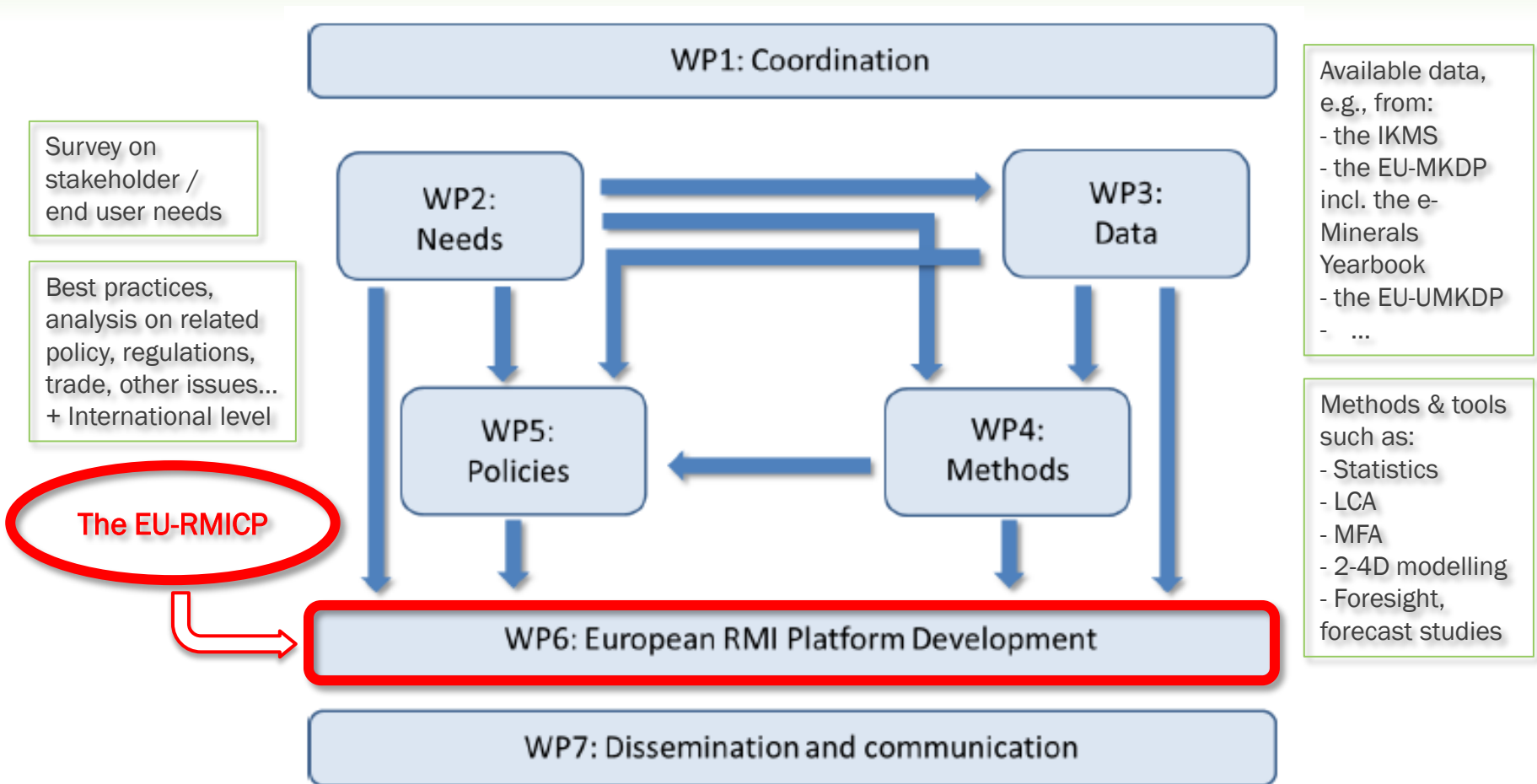
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689648.

PERT diagram: general organization



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WP6 objectives: a brief summary (1/3)

1 – A statement of fact:

If specialists have – at least for some facets or sub-domains - the necessary knowledge on how **to efficiently use all the data which are available to perform various studies**, most of the stakeholders do not have the essential skills allowing such an efficient use of these data for solving problems they may meet. Actually:

- (i) they neither have a clear and global vision of all the methods and tools that can be used,
- (ii) nor know how to implement these methods and tools, their limits of use (requisite characteristics of the initial dataset, scale, accuracy...),
- (iii) how to choose the best available technique (BAT) to obtain the expected result(s) and/or, if necessary,
- (iv) how to combine or link together several of these techniques.



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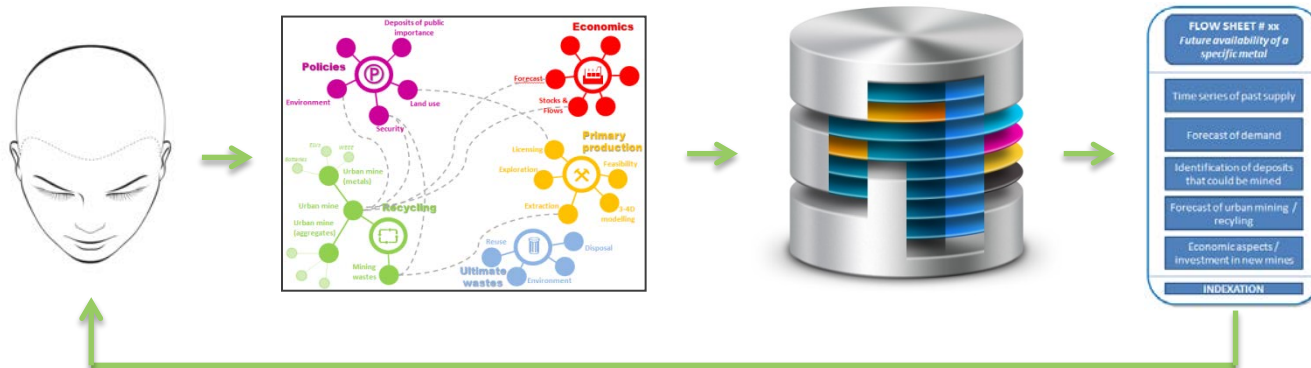


WP6 objectives: a brief summary (2/3)

2 – The objective of the MICA project is:

→ to fill this gap in the chain of use of data and to allow the end user to select in a seamless way the best available bunch of technologies for answering his/her question(s)/problem(s).

→ to reach this objective WP6 will create a database of methodologies and tools descriptions with an ontology-based interface to visualize the database content and the relationships between the different techniques, and to search for the most appropriate method(s) and tool(s).



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WP6 objectives: a brief summary (3/3)

3 – How it will work? The concepts of FACT & FLOW SHEETS

- WP2 will provide a **MAPPING** of stakeholders' needs /expectations.
- From this, WP4 and WP5 will deliver detailed descriptions of several methods and tools which are named here “**FACT SHEETS**”. From each fact sheet, WP6 will generate an **inventory of the "functionalities"** which can be seen as a fact sheet metadata.
- WP6, with the assistance of domain experts from WP3, WP4 and WP5, will set up a series of pre-established scenarios called here “**FLOW SHEETS**” (+ metadata) which will describe the sequences of operations (**data, methods and tools needed**) to answer complex queries. Metadata related to structured, semi- and non-structured data served by the **IKMS** (EURare), the **EU-MKDP** (Minerals4EU), the **EU-UMKDP** (ProSUM) and the **Minventory** website will also be used by the **EU-RMICP**.



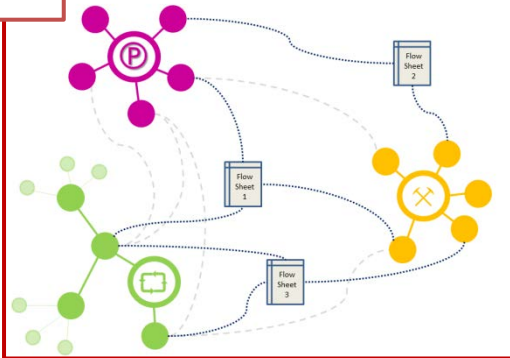
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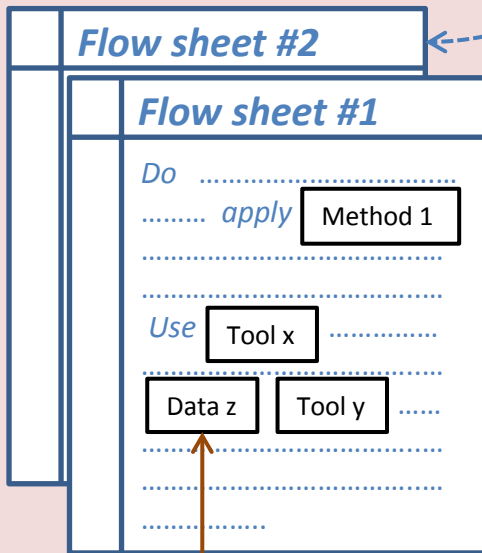


End user query

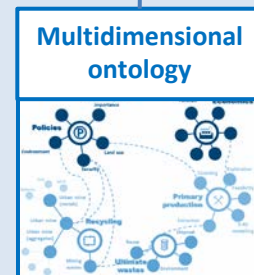
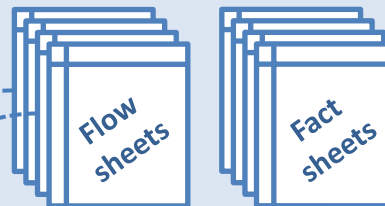
DDG



Ranked results



MICA Central database
Fact sheets, Flow sheets and Metadata



Experts knowledge

EURMKB



Domain Economics/Forecast

FLOW SHEET # xx

Future availability of a specific metal

Time series of past supply

Forecast of demand

Identification of deposits that could be mined

Forecast of urban mining / recycling

Economic aspects / investment in new mines

INDEXATION

Fact sheets
produced
by MICA

DATA

FACT
SHEET

DATA

FACT
SHEET

FACT
SHEET

Flow sheet example: methods, tools
& data to use for answering a
complex question

Possible sources & sequence of operations

DATA: EURMKB (EU-MKDP
Minerals Year Book)

METHOD: EURMKB (EU-MKDP
Foresight Studies)

DATA: EURMKB (IKMS [REE],
EU-MKDP)

DATA: EURMKB (EU-UMKDP)
METHOD: dynamic MFA

MODEL (predictive): to be
developed

*Indexation of the flow sheet relatively
to other domains, e.g., Recycling/Urban
mine/Urban mine (metals)*

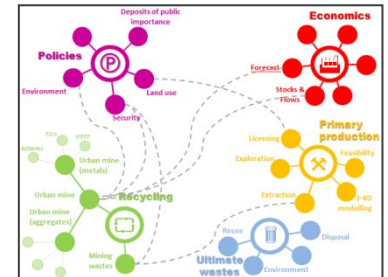
The cornerstone of the EU-RMICP

The Search interface will be developed as a

Dynamic Decision Graph (DDG)

allowing:

- (i) to visualize and navigate in the database content,
- (ii) to refine the initial end user query and,
- (iii) to identify the most appropriate flow sheet(s).



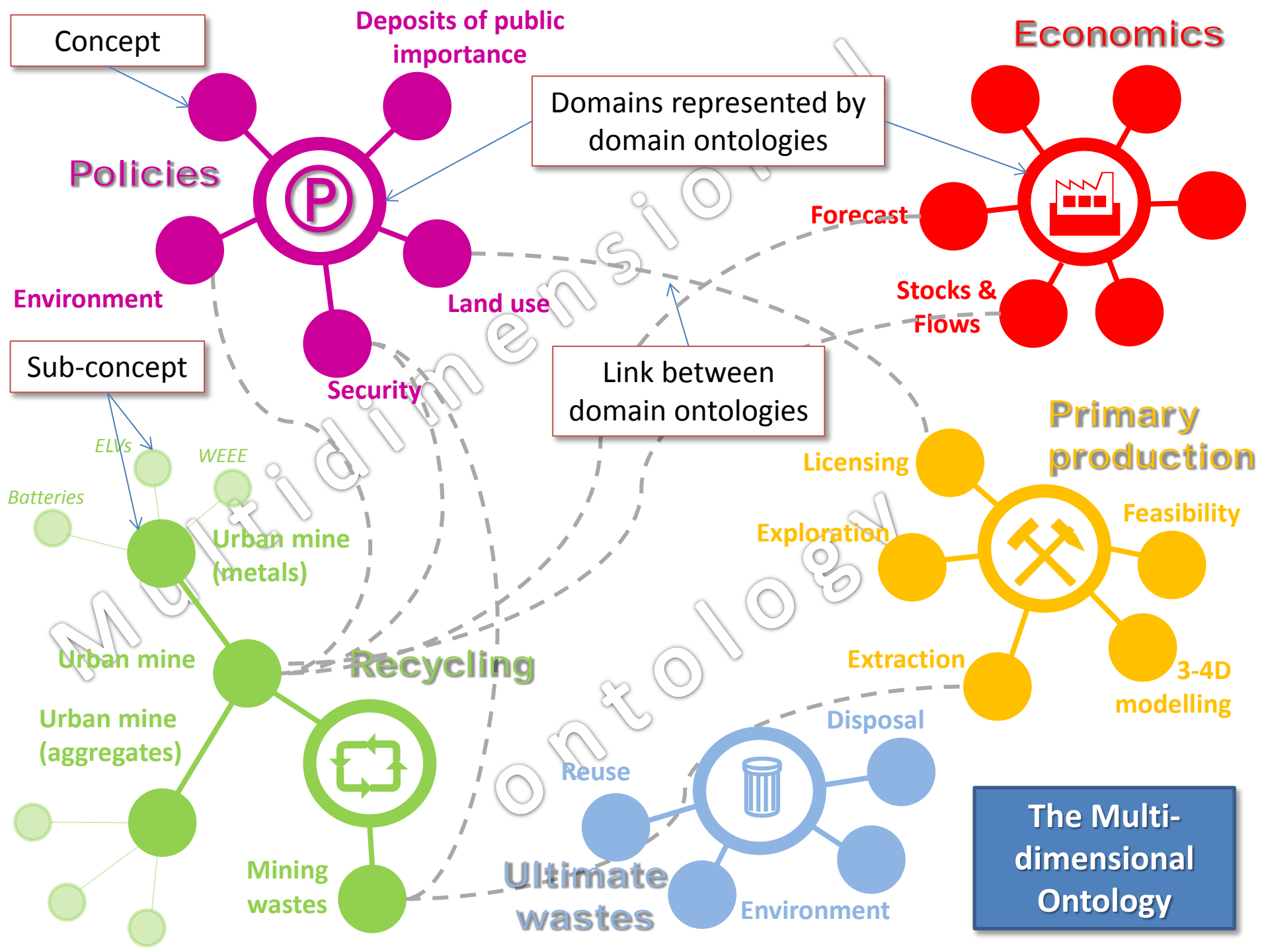
The graph will be based on a **multidimensional ontology** composed of domain and sub-domain ontologies, representing the '**field of questions**' of the **end users** and which will be established in WP6 following the results of the survey made in WP2.



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The mechanics behind (1/2)

The DDG will allow answering complex queries such as: "*Could recycling play a significant role in future metal availability?*"

This will generate the following sequence of operations:

Behaviour of the stakeholder	Click on
Logically looks for 'Recycling', main term of the initial question and specifies the question	🔍 Concept Recycling / Urban mine
Specifies the question, introducing the term 'Metals'	🔍 Sub-concept Recycling / Urban mine / Urban mine (metals)
Specifies the question, taking into account the forward-looking dimension	🔍 Concept Economics / Forecast
Identifies the adapted flow sheet(s)	🔍 🔗 📄 Select, read and download the flow sheet(s)



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The mechanics behind (2/2)

The Dynamic Decision Graph mechanics principles are the following:

At the inception:

- 1 – All domains and all super concepts are visible (activated)
- 2 – All flow sheets are activated but not visible

A click on a concept:

- ➔ Leaves all ontologically-related concepts visible and
- ➔ Leaves all flow-sheet-related concepts visible and
- ➔ Makes visible related sub-concepts (if any) and
- ➔ Switches off (disables) all other non-related concepts and
- ➔ Disables all non-related flow sheets

- ▶ At each stage, remaining activated flow sheets can be visualized in a new window. These flow sheets **are ranked by relevance**, in function of the series of selected concepts / sub-concepts.
- ▶ A (sub-) concept may remain visible (activated) because it inherits the properties of the super (father) concept.

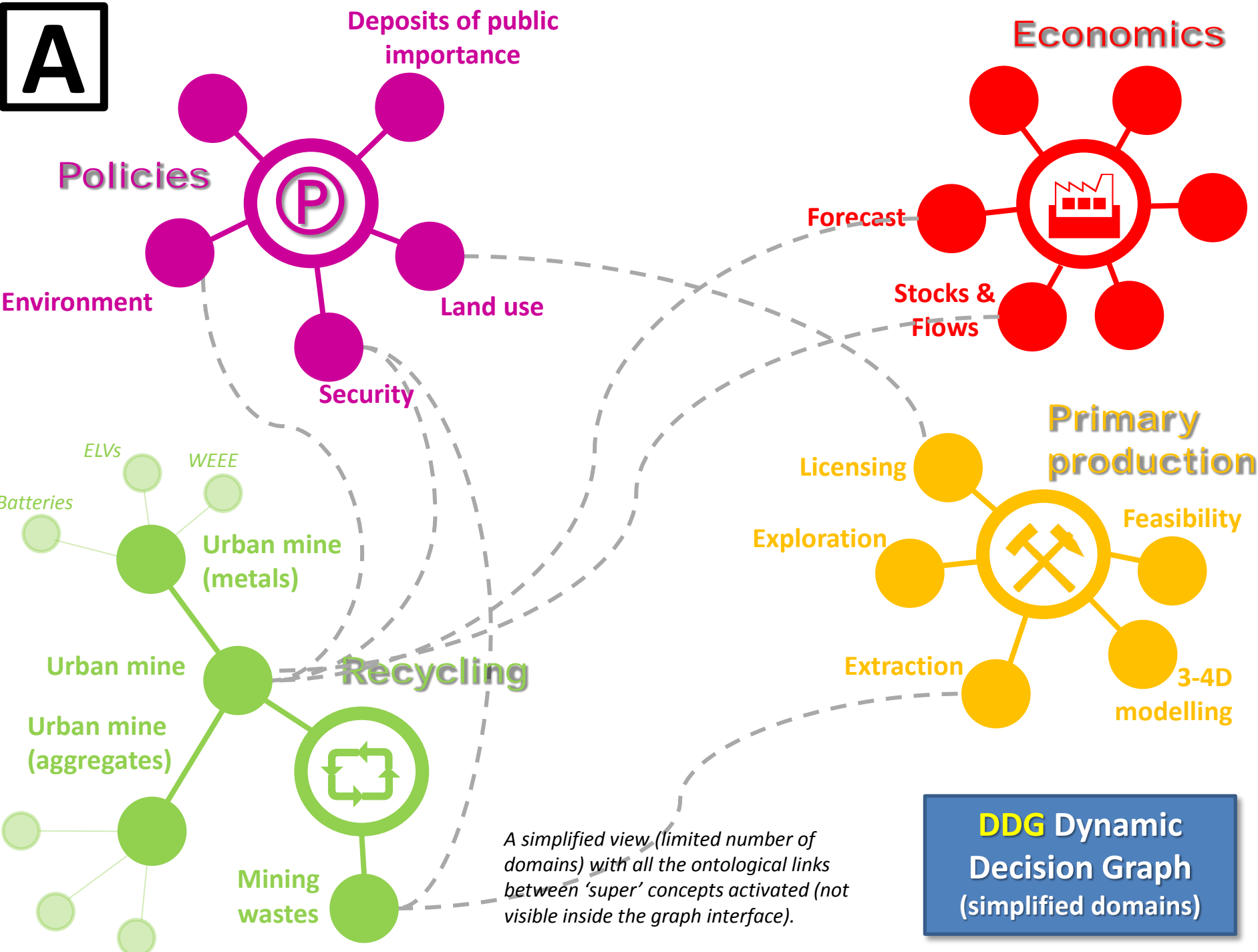


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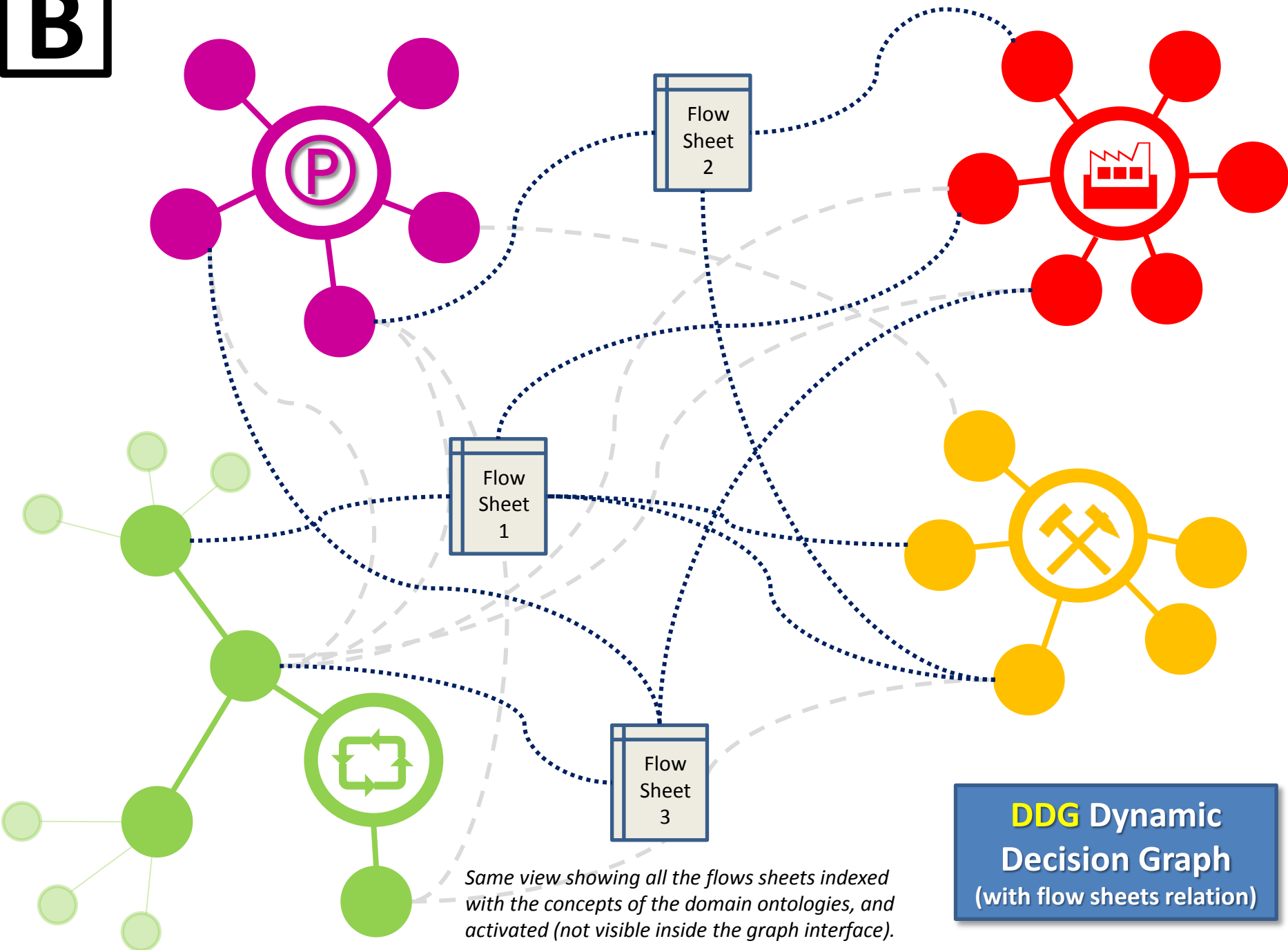
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A

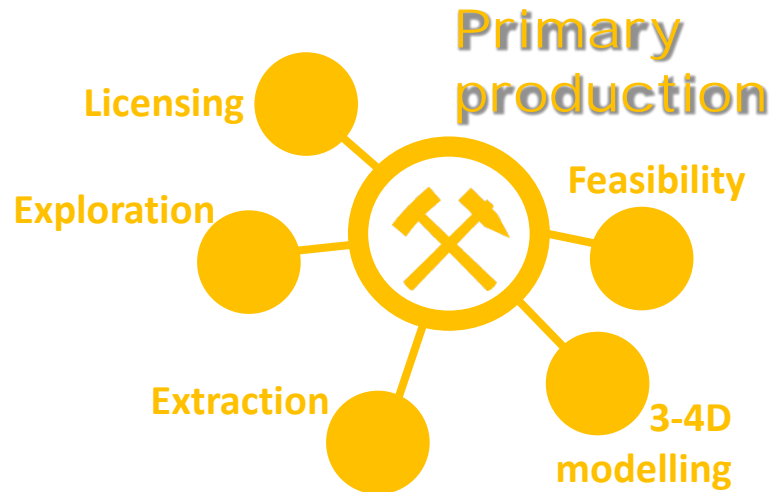
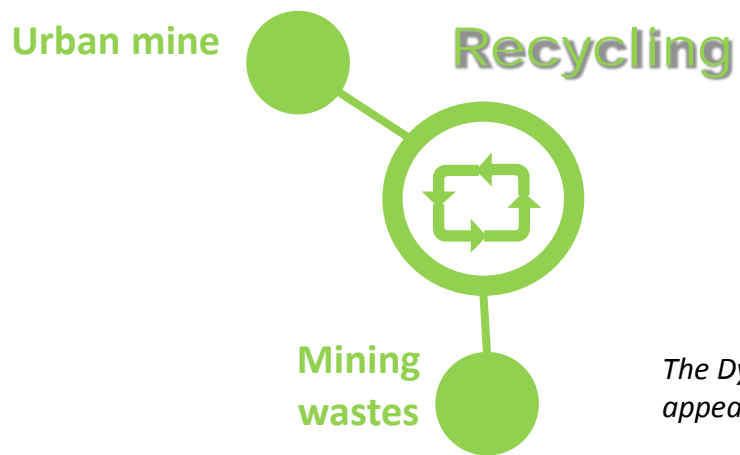
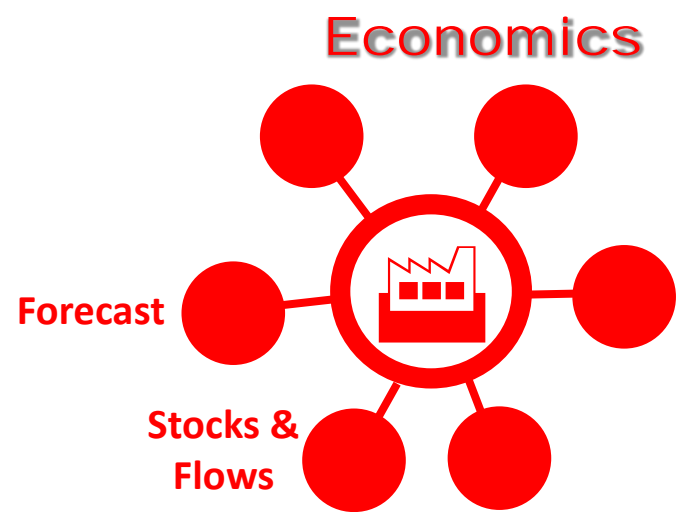
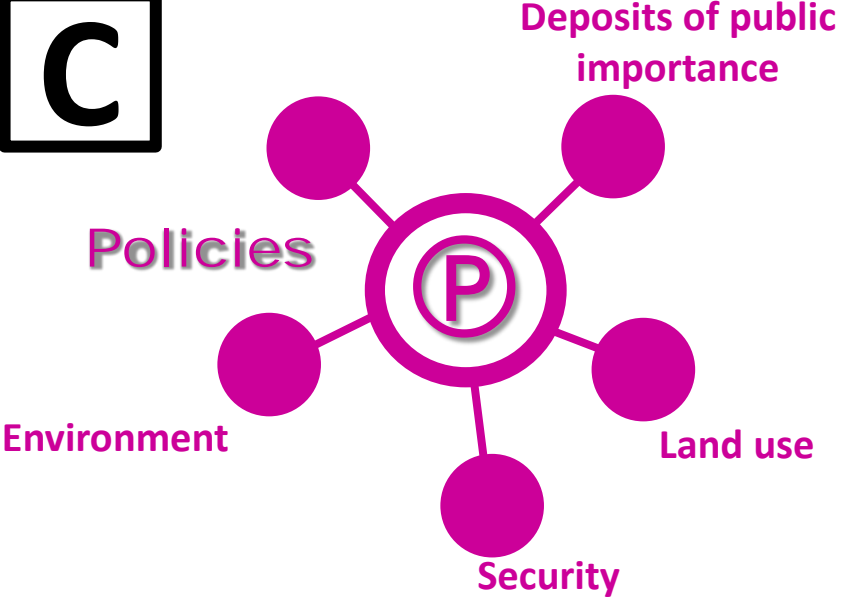


B



Same view showing all the flows sheets indexed with the concepts of the domain ontologies, and activated (not visible inside the graph interface).

**DDG Dynamic
Decision Graph**
(with flow sheets relation)



The Dynamic Decision Graph as it appears to the end user at the inception.

DDG Dynamic Decision Graph
(User's view)

D

Economics

Policies

P

Unrelated
flow sheet
(disabled)

Flow
Sheet
2

Forecast



Stocks &
Flows

Primary
production



Exploration

Extraction

Sub-concept
(activated)

Urban mine
(metals)

Flow
Sheet
1

Urban mine

Recycling

Urban mine
(aggregates)



Concept
selected by
the user

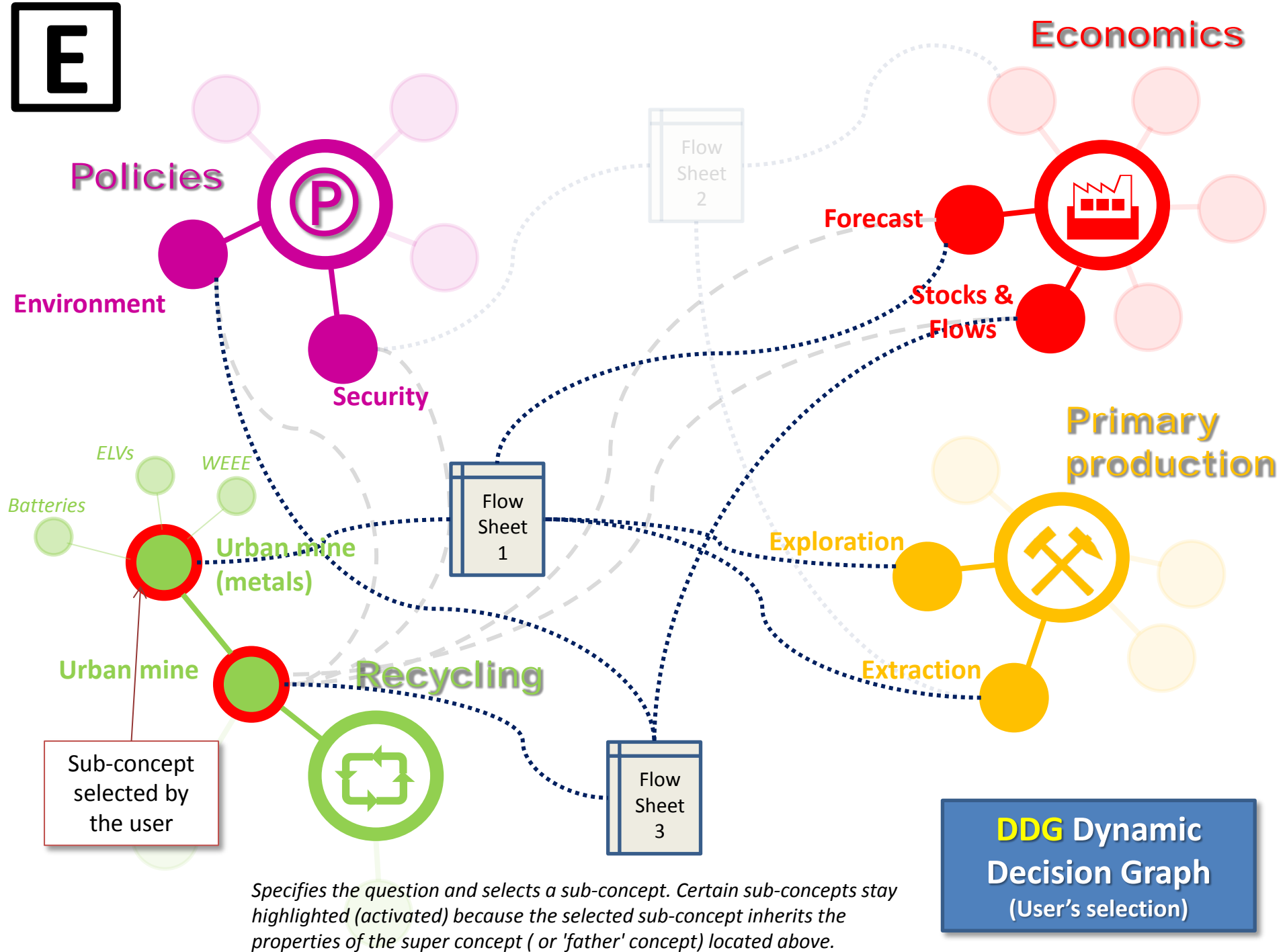
Unrelated
concepts
(disabled)

Flow
Sheet
3

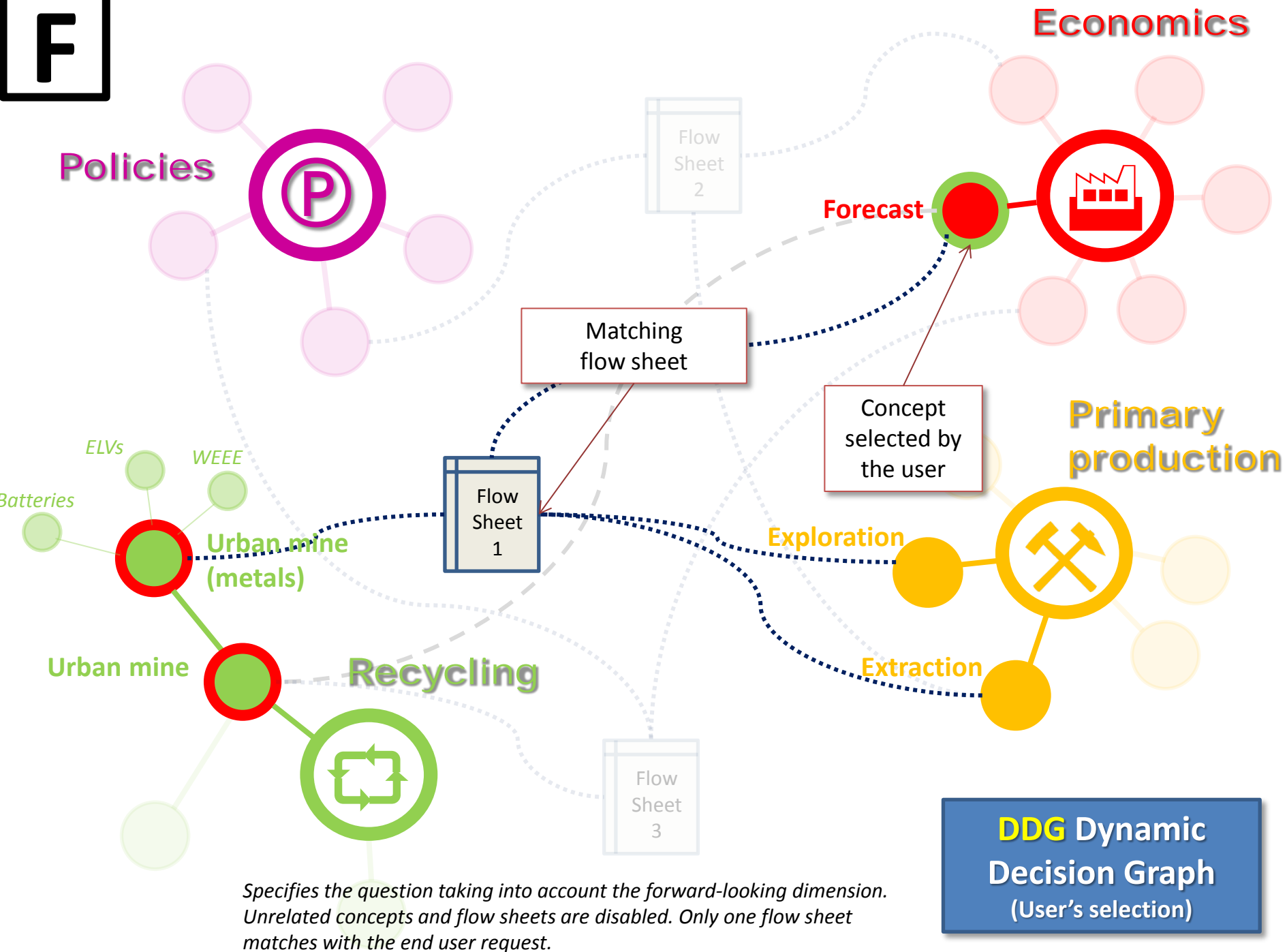
*Selection of a concept: unrelated
concepts and flow sheets disabled.*

DDG Dynamic
Decision Graph
(User's selection)

E



F



Who will do what?

WP6 tasks / sub-tasks	Leader	Supporting Team	Contribution from other WPs
T6.1 Synthesis of stakeholders requirements and analysis of methods functionalities	GTK	BRGM, EGS, GeoZS, GEUS, LIG	
- T6.1.1 Synthesis of stakeholders requirements	GTK	BRGM, GeoZS, GEUS, LIG	WP2, 3, 4, 5
- T6.1.2 Analysis of methods functionalities. Creation of FACT & FLOW sheets + metadata	GTK	BRGM, EGS , GeoZS, GEUS, LIG	WP3, 4, 5
T6.2 Ontologies	LIG	BRGM , GEUS, GTK	
T6.3 Development of the Dynamic Decision Graph (DDG) for visualization, navigation & selection	JRC	BRGM , LIG, GEUS, GTK	
T6.4 Search and ranking	LIG	BRGM	
T6.5 Development of the central database of the EU-RMICP	GEUS & GeoZS	BRGM, GTK, JRC, LIG	
T6.6 Integration to the EU-MKDP / EURMKB	BRGM	GeoZS, GEUS, GTK	



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Building the EURMKB and the EGDI – Our contribution

ERA-NET

The EGDI (European Geological
Data Infrastructure)

**ProSUM &
Minerals4EU
NETWORKS**

**Permanent
Body**

The EURMKB (European Union Raw Materials Knowledge Base)

EUrare

The IKMS (Integrated
Knowledge
Management system)
(REEs)

WMS



Minerals4EU

The EU-MKDP
(Minerals Knowledge
Data Platform)

WMS



ProSUM

The EU-UMKDP
(Urban Mining
Knowledge Data
Platform)

Mining wastes
data

Shared harvesting system

Minventory

EU Raw materials
statistics on resources...

MICA

The EU-RMICP (Raw
Materials
Intelligence Capacity
Platform)

Dynamic Decision Graph



Thank you!

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