Structuring your PhD proposal

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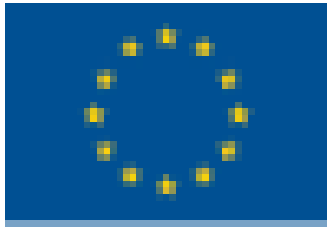
CHANGES workshop Beskidzki Raj, Poland – Sept. 19 2011

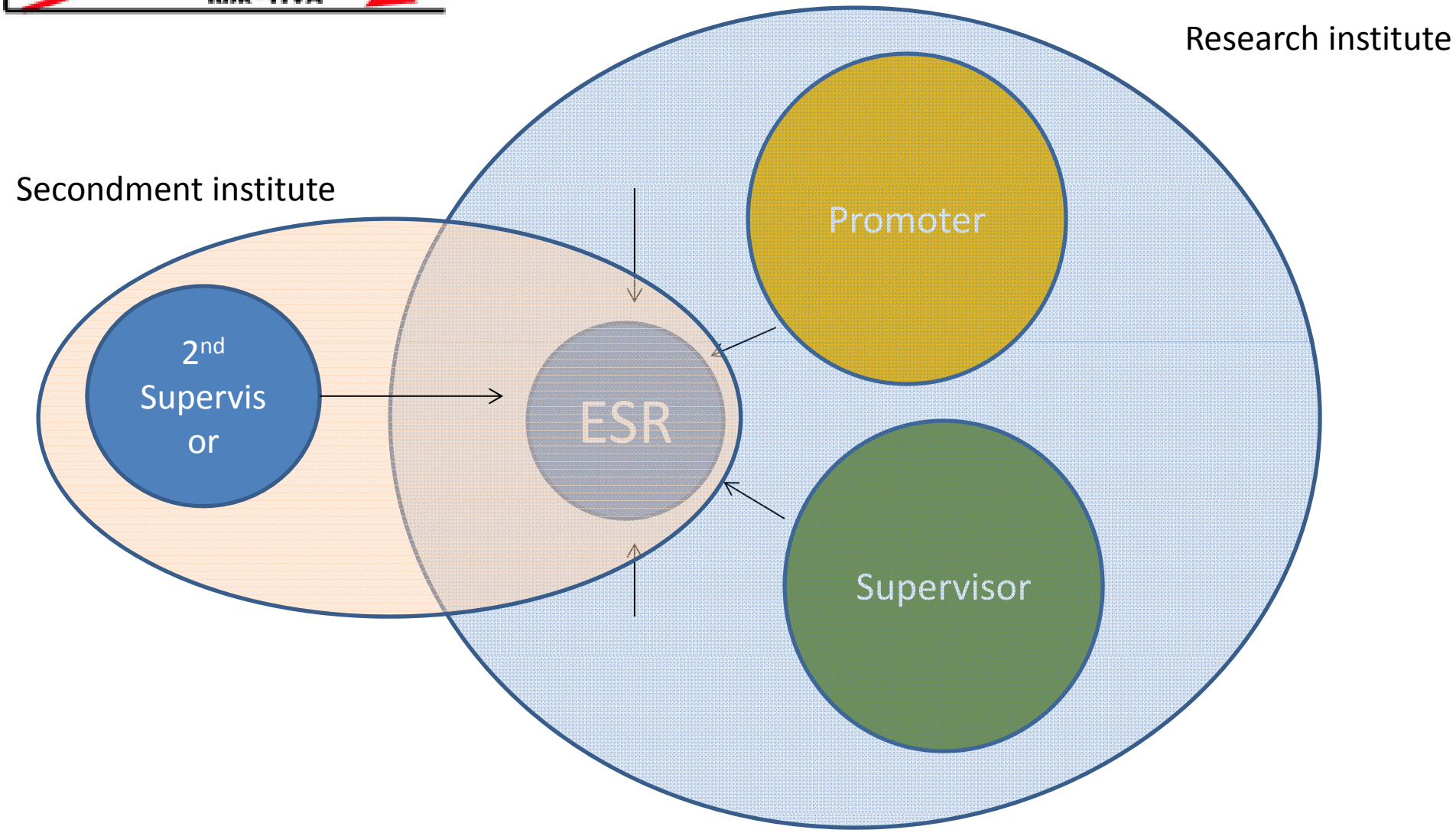


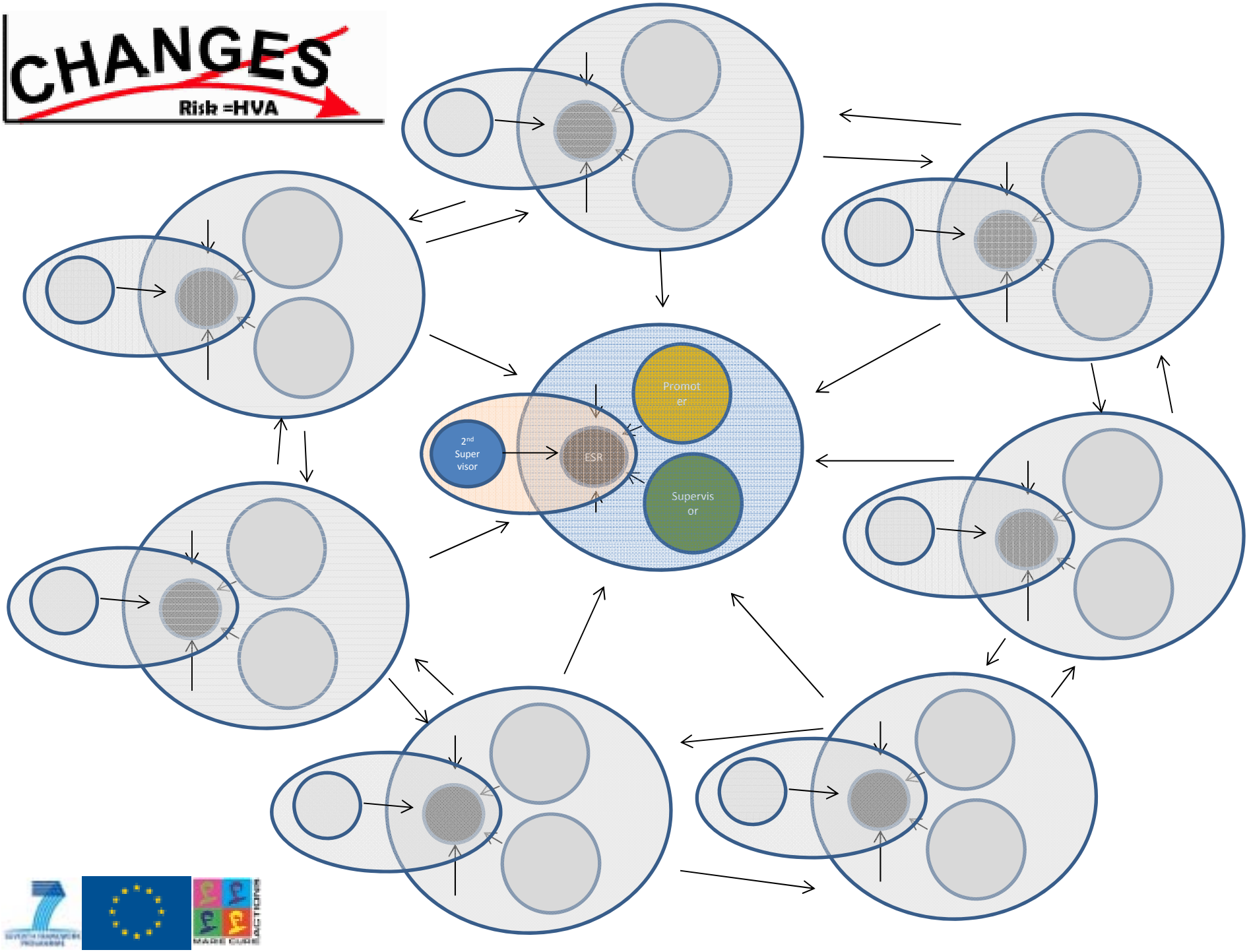
Research Skills

Formulating research problems, objectives and research questions

The logic of research

Professional Skills (PS-01)
Research work plan development and scientific writing


Research institute
Secondment institute
Promoter
2nd Supervisor
ESR
Supervisor


CHANGES
Risk =HVA
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CHANGES

Risk =HVA

To boldly go where no (wo)man has gone before.

The PhD Research proposal

- To avoid chaos;
- To avoid overlap in the research;
- To assure the CHANGES objectives will be met;
- To stimulate collaboration;
- To identify data needs;
- To make good planning;
- To help you focus;
- …

You proposal will be like a contract between you, your supervisors and the CHANGES project

The PhD Research proposal

Must contain:

- The problem;
- The objectives;
- The research questions;
- The hypotheses;
- Assumptions;
- The methodology;
- The data requirements;
- Workplan (schedule, secondments, ….)

The PhD Research proposal

… must also contain:

- Its level of **innovation**
  - What is new about this proposal: ideas, concepts, methods, …. ;
- In what manner is this study **better** than previous work;
- If applicable: the study area;
  - In what way is it **representative** and **suitable** to answer the research questions?
- If possible: ideas for publications.

The Research problem

A **general** statement of **why** the scientific research should be done.

This is something that…

- is **not well-understood**;
- can be addressed by **scientific research**.

Why should anyone care about the outcome of this research?

Who would use the results of this research? and for what?

Why should anyone sponsor this research?

The Research problem

Categories of scientific research problems:

- **Social:** something (that might be) *wrong* with human society;
- **Environmental:** something (that might be) *wrong* with the natural world;
- **Management:** a *deficiency* in managing a social or environmental problem;
- **Technical:** a *deficiency* in methods to solve problems;
- **Information**: a *lack* of information, facts that are not known;
- **Knowledge:** a *lack* of understanding: why things happen.

The Research problem

Example: Landslides

- **Social:** Societal impact of landslides;
- **Environmental:** Climate Change and landslide frequency;
- **Management:** Landslide Risk Reduction measures;
- **Technical:** Tools for landslide risk reduction;
- **Information:** New tools for collecting landslide data;
- **Knowledge:** Better understanding of landslide behaviour.

The Research objectives

- These are **scientific statements** of what is expected as the **output** of the research;
- There is usually a single **general objective**;
- This is broken down into a list of **specific objectives** which are then formulated as research questions;
- Each of the objectives must be **at least partially met** at the end of the study.

The Research objectives

Examples of general scientific objectives:

- **Social:** To gain better understanding of the societal impact of landslides
- **Environmental:** To determine the consequences of climate change on landslide frequency
- **Management:** To develop a toolbox with landslide risk reduction measures
- **Technical:** To select or develop methods to optimize slope stability using active and passive measures
- **Informational:** To determine the applicability of LIDAR for the detection of landslides
- **Knowledge:** To gain better understanding in the triggering of mudflows

The specific objectives

Specific objectives

The general objective is usually not operational – i.e. it cannot be addressed as a whole and must **decomposed** in a list of logical, sequential **specific objectives**.

Specific objectives can be addressed by reformulating them in 1 or more **research questions**.

The specific objectives

Example:

General objective: To gain better understanding in the triggering of mudflows.

Specific objective 1: To determine the hydrological and geo-mechanical properties of the slope material in a spatial manner;

Specific objective 2: To identify most likely source areas for landslide and mud-flow activity;

Specific objective 3: To make realistic estimates of movable volumes of slope material;

Specific objective 4: To determine the most suitable rheological model for the mud-flow behaviour.

The research questions

The **research questions** must be formulated in such a manner that the answering the question will automatically result in the (partial) meeting of the specific objective.

- Each research question **must be answered**, therefore it must be a specific question to which an answer can be given.
- The questions must be **scientific** in nature;
- Questions follow the objectives and may be simple re-statements of the objective in *question-form*;
- Questions are of two main types:
  - observational 'What', 'where' or 'which' questions;
  - analytical 'Why' or 'how' questions.

The research questions

Examples:

Specific objective 1: To determine the hydrological and geo-mechanical properties of the slope material in a spatial manner;

RQ 1a: What are the surface materials in the study area?

RQ 1b: What are the Ksat, porosity, Cohesion and Phi values of the main lithological units?

RQ 1c: What is the most suitable interpolation method to obtain parameter maps?

RQ 1d: What is the uncertainty of the parameter value maps?

The research questions

Examples:

Specific objective 2: To identify most likely source areas for landslide and mud-flow activity;

RQ 2a: What are the most likely source areas for landslide and mud-flow activity?

Hypotheses

Hypothesis: *"[An] idea or suggestion that is based on known facts and is used as a basis for reasoning or further investigation"*
(Oxford Advanced Learner's Dictionary,1995)

Hypotheses are the **researcher's ideas** on what the research will show, before it is carried out. They are statements that can be:

- **proved,**
- **dis-proved,** or (most likely)
- **modified** by the research.

They are based on previous work, usually discovered in the literature review. They should match the research questions one-to-one.

Another definition of hypothesis in this sense is **anticipated results.**

Hypotheses

Hypotheses should be as specific as possible

Example:
Given the research question *"What are the most likely source areas for landslide and mud-flow activity?"* we can formulate the corresponding hypotheses:

- **Wrong:** "Steep slopes are the most likely source areas"
- **Better:** "Source areas have slopes steeper than xx degrees, sandy soils and non-natural vegetation cover.

The first hypothesis is too general, "steep slopes" could be almost anything.

Assumptions

Assumptions are preconditions for research.
They are:

- taken **as true**;
- **not questioned or verified** during *this* research;
- difficult to **specify**;
- **made explicit and justified** if questionable.

If an assumption is false, the research is (at least partly) invalid.

Assumptions

- Laws of nature (gravity, light, . . .): not stated
- Laws within a discipline (chemistry, soil science, . . . sociology?)
- Facts taken as true, not interfering with the factors being studied

Examples:

"Soils are fairly homogeneous in a study area, so any differences in Landslide activity are due to other factors (*the ones we will study*)";

"The main soil parameters that affect landslide triggering are Ksat, porosity, bulk-density, cohesion and phi."

Assumptions

Preconditions for research logistics.

Examples:

- "The study area is accessible";
- "Permission to access the study area will be granted by local authorities";
- "A translator will be assigned to the research team";
- "Samples will be processed by a laboratory correctly and within a given time".

Assumptions

By definition not all assumptions can be verified, but their

- **plausibility** (concepts) or
- **feasibility** (logistics)

must be argued and defended in the research proposal.

Methodology

The methodology describes the methods that are going to be used to find the answers to the research questions

For each method state:

- the name of the method that was chosen, with a reference to the literature that describes it; *or*
- a detailed description of the method, if it is being developed as part of this research;

In both cases the method must be described in sufficient detail for someone else to be able to apply it.

Methodology

There are many resources for finding methods that give their:

- Description;
- applicability (which situations they fit).

These can be found in:

- Handbooks;
- review articles in journals, or review book chapters;
- technical manuals;
- Other texts (n.b. often not described in enough detail).

Methodology

All fields have "methods" handbooks, etc. , e.g.:

- Miles & Huberman (1994): methods for qualitative data analysis, e.g. in social sciences research;
- Ryerson (ed.) (1998): methods in remote sensing;
- Maidment (ed.) (1993): methods in hydrology;
- Knuth (1997): computational algorithms;
- de Gruijter *et al.* (2006), Cochran (1977): sampling designs;
- FAO (2002): methods for describing soil profiles in the field;
- van Reeuwijk (ed.) (2002): laboratory methods for soil analysis;
- Foody (2002): review of methods for accuracy assessment of land cover maps.

You should know the main methods handbooks in your field.

Data requirements

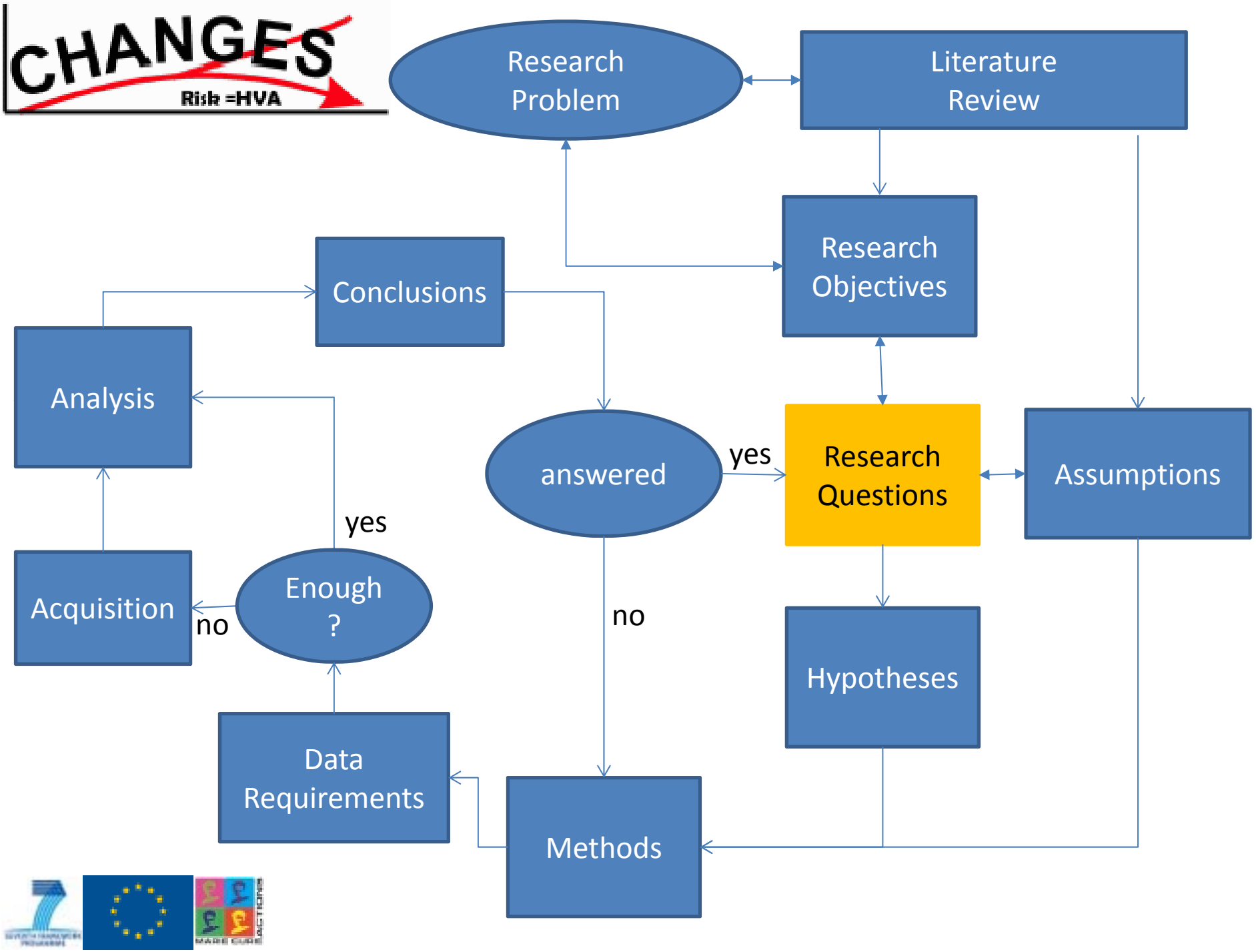
The selected methods define what data is needed

If all data is available and of sufficient quality: proceed with the analysis,

If not:

Data collection, fieldwork, data acquisition, etc. is needed

A fieldwork plan / data acquisition plan + budget and time-table must be included in the proposal


CHANGES
Risk =HVA
Research Problem
Literature Review
Research Objectives
Conclusions
Analysis
answered
yes
Research Questions
Assumptions
yes
Acquisition
Enough ?
no
no
Hypotheses
Data Requirements
Methods

Task

Write in a few lines (max half a page) your ideas on:

- **Your research problem**
- **General research objective**
  - Specific research objectives

- Optional: The research questions