E. Harmonized workflow for mapping land-use conflicts and risk factors

E.1 The workflow - a brief description

Geothermal energy is clean, emission-free and sustainable. However, every intervention in the subsurface has consequences which may eventually cause hazards or damages. Therefore, a proper professional installation of geothermal plants taking into account risk factors is important for the development of energy concepts using shallow geothermal energy. On the other hand, some geological conditions or anthropogenic interventions may reduce the efficiency of a geothermal plant or cause health problems or injury.

Existing conflict and risk factors can be presented as a:

- **Conflict layer:** A conflict layer is a thematic map representing one conflict factor without interpretation of its impact on a land-use like shallow geothermal energy. This kind of uninterpreted representation is well suitable for experts who know the impact of on a land-use like shallow geothermal energy.
- **Extent layer:** The extent layer provides information on where the data set specifying one conflict is available. If in a conflict layer a location is not marked, this can mean that there is no conflict or it can mean that no data set was available and that it is not clear, whether a conflict exists. Both cases have to be distinguished! Therefore, each conflict layer has to be combined with an extent layer. The extent layer is also considered for processing the traffic light map. A no-data region has to be included with the yellow light because this indicates that it is not known whether there is no conflict or whether shallow geothermal use is forbidden. This has to be clarified by an individual case check.
- **Conflict map:** The conflict map is a combination of a conflict layer and an extent layer. It will be produced for each conflict factor relevant for a pilot area.
- **Traffic light map:** A traffic-light map in the project's context is an interpreted thematic map which combines various data sets in order to give a short overview of the use of shallow geothermal energy. It consists of 3 categories: Shallow geothermal plants are generally possible (green), attention: more information needed (yellow), shallow geothermal plants are generally prohibited (red). It is an interpreted map where the conflict factors leading to the assignment of each point to a particular category is not obvious anymore. The traffic light map is especially useful for public users who want to get information on whether geothermal use is possible in their region. The traffic-light maps will be produced for open loop and closed loop systems separately.

The first step of mapping land-use conflicts and hazard risk is to develop an inventory of possible risk and conflict factors. After investigating which land-use conflict and risk factors are relevant for each pilot area and after collecting the data describing the factors, the input data concerning the data structure has to be analysed (**Figure 20**). A table helps to sort data describing the conflict factors by the aspects of property group, feature class and data model, because the following workflow is the same for objects of the same data structure regardless on whether the factor is anthropogenic or geogenic. The structure of data describing any factor may be different from pilot area to pilot area and from country to country. Therefore, each partner has to sort his conflict layers according to his needs and input data.