Every soil profile may be characterized with number of properties, often with an adverse or limited impact on plants. How then is it possible to summarize some properties for some levels within one profile and determine that they are more beneficial for one plant community than for the other? Attempts made worldwide most often relates to “soil quality” defined as capability of soil to perform given function in system. This concept to be a clear one shall be represented with integrated indices which represents properties of soil with numbers (quantification). A methodological approach to index was based on 4 steps model (Karlen et al. 1997, Brożek 2007 (b) (Figure 1).

- Step 1. Determination of soils properties that provides for fluctuation of soils properties within time or space (see methodology). Expert system, linear discriminant analysis, and graphic data analysis implementation in order to find components which better differentiate the selected plant groups.
- Step 2. Transformation of determined and selected soil properties provided in various units into numbers called indicators. Three ways are proposed: more (soil constituent) is better (for plant) means higher indicator, less is better, and a combination of them.
- Step 3. Calculation of indices on grounds of chosen indicators representing a given soil profile. Soil quality index as a sum of indicators were used in our last research (Brożek 2007b).
- Step 4. Application of calculated indices in practice

Drafting and application of the first forest soils indices was proposed during planning of Forest Soil Trophic Indice- ITGL for soils included in Atlas of forest soils of Poland (Brożek i Zwydak 2003. The lowest ITGL – 6.3, were calculated for acid, sandy Haplic Podzol, the highest ITGL – 43,1, were found in loess developed Luvic Chernozem. This however were done on antropogenic effected sites and soils, and it is planed do in protected areas, with natural soils and natural vegetation.
On the grounds of previous work, we obtained numeric relationships between soil properties and major types of habitats regarding forests under long-lasting man's influence. Planned research, using our preliminary work on a local scale (Brożek, Zwydak 2003, Brożek et al. 2006), which has been successful, suggests how to proceed. The research will locate in protected areas where plant/soil relations are natural. Here, we will adopt this approach and apply it at the national scale, in close cooperation with forest authorities. The main aim of the project is:

1. Test and if necessary modify the soil quality indexing method at the national scale;
2. Implement the soil quality indexing method for Poland and assist the national forestry commission in assessing the results in terms of developing national guidelines for sustainable forest management (Figure 2).

**Figure 1: Concept, formulation and application of soil indices**

*Brożek 2007b, amended*

**Step 1. Selection of soils parameters and analysis performance**

- Physical properties
- Chemical properties
- Biological properties

**Step 2. Transformation of analytic data into indicators**

- Method 1
- Method 2
- Method 3

**Step 3. Calculation of indices on grounds of obtained indicators**

\[ \text{SIG, ITGL} = \text{sum of indicators} \]

**Step 4. Indices application**

- Diagnose of trophic variants regarding soil sub-types.
- Ranking list of soil profiles.
- Forest habitats classification.
- Diagnosis of potential natural flora – forest types.
- Monitoring of natural changes in soil.
- Monitoring of soil anthropogenic changes.
Searching for forest habitats soils indices shall be supplemented with detailed research regarding impact of tree stand species composition on soils properties, what can modify value of the calculated indices. For this purpose an examination was planned regarding an impact of different species on soil with reference to:

- Soil acidification, base and acid cations balance, organic carbon content, nitrogen control, and dehydrogenase activity.
- Strength of impact of single trees regarding particular species, in particular stump depression pH.
- Litter impact of various trees species (present at examined area) on soil substrate in lab conditions (model experiment).
- Impact of various trees species on chemical properties of soil solution.
- Impact of various trees species on changes of soil quality indices.

...in protected areas, with natural soils and natural vegetation.