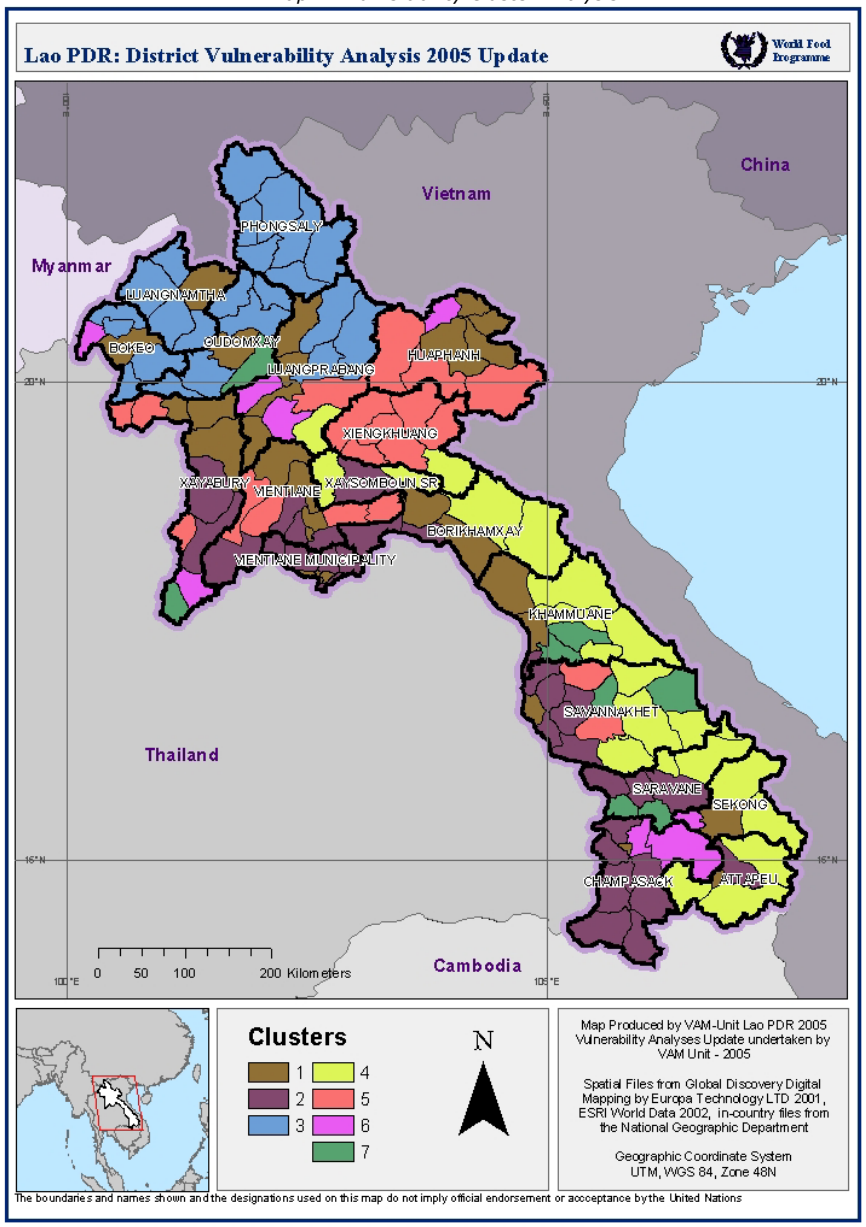
Map II- Vulnerability Cluster Analysis



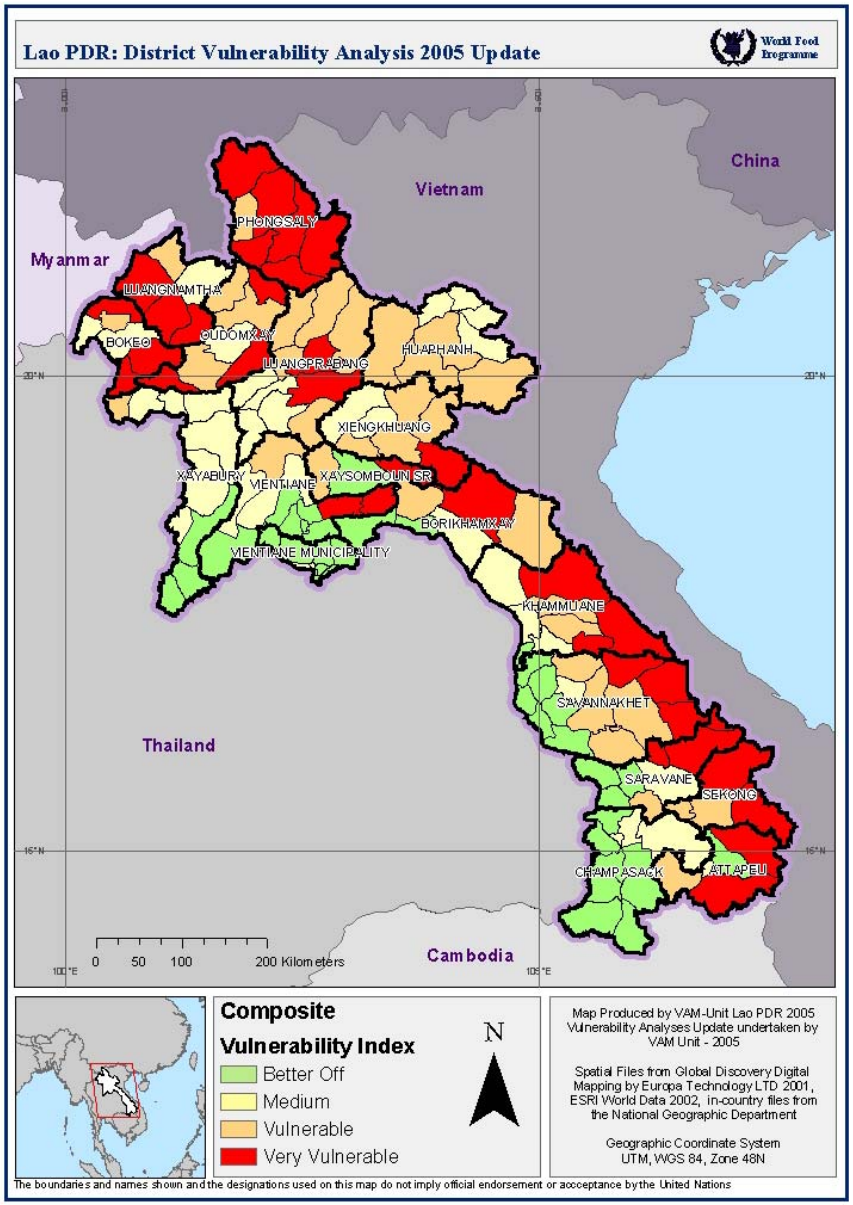
Cluster	1	2	3	4	5	6	7
Rice production per capita	Low	High	Low	Low	Average	Low	High
Cropping diversity	Average	Average	Low	Low	Low	High	Average
Livestock ownership	Average	High	Low	Low	High	Average	Average
Access to forested areas	Low	Average	Average	High	High	Low	Low
Access to roads and rivers	High	High	Low	Low	Low	High	High
Malaria incidence	Low	High	Low	High	Low	Low	High
UXO impact	Low	Low	Low	High	High	Average	High
Incidence of no or low education	Low	Low	High	High	Average	Average	High

United Nations World Food Programme, Laos

District Vulnerability Analysis Lao PDR: July 2005 Update

-A Summary-

Map I- Composite Vulnerability Index



In order to assess which districts are more vulnerable to food insecurity in Lao PDR, the WFP VAM (Vulnerability Analysis and Mapping) unit has undertaken a district level analysis. The results presented here in summary, are an update for 2005.

The eight indicators used in the analysis were selected because they all are assumed to have a relationship to vulnerability to food insecurity, and reliable and timely data at the district level was available for all (or most) districts in the country. The indicators used include:

Indicator	Data source	Definition/Formula
Rice Production (wet season & dry season) per Capita	Agricultural Census 98/99, Provincial Rice Production Statistics 2000-2001	This indicator was calculated as: (Dry season planted area in ha * yield in t/ha + wet season planted area in ha * yield in t/ha) * 60% milling recovery rate from paddy to rice / population in 2003
Cropping Diversity (major crop classes)	Agricultural Census 98/99, Provincial Rice Production Statistics 2000-2001	Crop Diversity was derived from the main agricultural cropping classes in Laos, where the planted area in hectares of the individual crop classes were added to form the variable (in the absence of information on individual crop yields)
Livestock Ownership (cattle, buffaloes, pigs, chicken and ducks) per Household	Agricultural Census 98/99	This indicator was weighted and calculated as: Buffalo + Cattle + 0.75 * Pigs + 0.10 * Chicken & Ducks
Access to Forested Areas (and Non-Timber-Forest-Products) per Household (NTFP)	Mekong River Commission 97/98	In this analysis, forest cover classes 11 (Evergreen, high cover density) & 61 (Wood – shrub land, evergreen) were combined and an average value per village was extracted to represent village level access to forest
Access to Roads and Rivers (markets and services)	Department of Construction, Post, Transport and Communications, 2002	These indicators were first derived independently and then combined to form one indicator. Access = Roads + 0.5 * Rivers Roads: the distances to national and secondary roads were calculated for all villages and the final indicator was calculated as follows: Roads = Main Roads + 0.5 * Secondary Roads Rivers: the distances to all major rivers were calculated for all villages in Laos
Malaria Incidence	Center for Malariology, Parasitology and Entomology, 2002	This indicator was determined as the number of reported cases of malaria in 2002 divided by population.
Unexploded Ordnance (UXO) Impact	UXO Laos 2002	This indicator was calculated as level of impact (High = 8, Moderate = 4, Low = 2 and all other = 0) and then the indicator was converted into a continuous variable
Incidence of no or low Education	Population Census 1995	This indicator was calculated as the percent of household heads that have never been to school or finished Grade 1

The composite vulnerability index was created using principal component analysis (PCA), which combines the 8 original variables into a single composite indicator (the first principal component). The results of this analysis are displayed in **Map I**.

The strengths of this analysis include:

- A single composite indicator is simple to understand and display.
- This indicator is readily comparable to other analyses, such as the Lao Expenditure and Consumption Survey (LECS) III percent of households below the poverty line, and the National Growth and Poverty Reduction Strategy (2004) identified priority districts.

The weaknesses of this analysis include:

- The creation of an index does not provide an objective benchmark to delineate the vulnerable from those who are not vulnerable; the cut-offs used to group the districts into the four vulnerability categories are subjective.
- The use of an index does not provide analytic leverage for understanding the underlying causes of vulnerability.
- Without any outcome variable for vulnerability, the relationship of the composite indicator to vulnerability can only be assumed. In addition, due to the low levels of correlation between the original indicators, creating a single index using PCA is problematic. Only 30% of the variation in the original data is captured in the index when using just the first principal component.
- A district level analysis can hide smaller pockets of higher or lower vulnerability to food insecurity.

The district typologies, or cluster analysis, uses all eight principal components created in the principal component analysis as input, and groups districts based on the similarities of these components, creating categories of districts that are similar in their levels of the eight original indicators. The clusters' levels of the original eight indicators are compared to the national mean. The assumed relationship to vulnerability to food insecurity is indicated in the table below Map II by red (higher vulnerability), yellow, or green (lower vulnerability). The results of this analysis are displayed in **Map II**.

Strengths of this analysis:

- The information in the original eight indicators is preserved.
- Assumptions are not made in the analysis about the relationship of the indicators to vulnerability.
- Information about each of the individual indicators for the clusters can aid in project design and geographic targeting.

Weaknesses of this analysis:

- Multiple clusters and lack of a simple two dimensional indicator make interpretation more difficult.
- Without any outcome variable indicating vulnerability to food insecurity, the relationship of the clusters to vulnerability must be assumed.
- A district level analysis can hide smaller pockets of higher or lower vulnerability to food insecurity.

The results of these two analyses can be used to prioritize districts based on vulnerability to food insecurity. Additionally, the underlying causes of vulnerability can be inferred. It should be emphasized that this analysis is based on incomplete vulnerability data, as well as older datasets. Analysis at the district level can also hide pockets of vulnerability even within areas that appear to be the least vulnerable, as well as areas of relatively low vulnerability even within areas identified as highly vulnerable.

The geographic distribution of the districts determined to be more vulnerable to food insecurity as described by the composite indicator is similar to the distribution of clusters 3 and 4 in the cluster analysis. These two clusters show very similar patterns in the original eight indicators, with low rice production, low cropping diversity, low levels of livestock ownership, average to high access to forested areas, and low education. Cluster 4, however, also shows higher malaria prevalence and higher UXO contamination. These districts are located in lowland areas that were heavily bombed in the Indochina War. Cluster 3 is composed of districts with more mountainous areas and therefore lower malaria incidence; these are also areas that were not as heavily bombed.

It must be emphasized that this analysis can show the general geographic distribution of vulnerability based on the included indicators, but should be used only in the absence of more specific and reliable data. This analysis will be updated as more recent and reliable data becomes available. However, further information is needed at the household level to be able to identify more clearly the root causes of vulnerability to food insecurity in Laos, the impact at the household level, and the ways people have of coping with this situation. This information can lead to a more informed selection of indicators to include in future district level analysis, as well as indicators that can be regularly monitored through improved early warning systems.