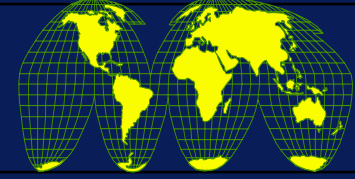
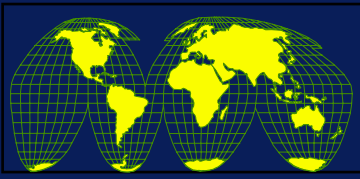


THE GLCN INTERPRETATION PROCESS

BY

ANTONIO DI GREGORIO



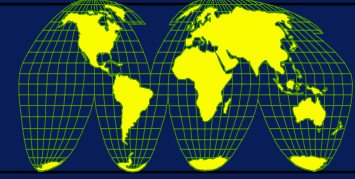
PREMISES:

THE FINAL GOAL OF THE GLCN MAPPING ACTIVITY IS THE CREATION OF A NATIONAL LAND COVER DATA BASE THAT SHOULD BE MULTI-USERS ORIENTED (UNIQUE SOURCE OF L.C. INFORMATION FOR MANY DIFFERENT DISCIPLINES/APPLICATIONS).

THE PREVIOUS SENTENCE SEEMS QUITE OBVIOUS AND THE IDEA NOT REALLY INNOVATIVE, BUT WE SHOULD ASCK OURSELF HOW MANY NATIONAL L.C. DATA BASES WE KNOW THAT REALLY MET THOSE REQUIREMENTS.

IT WOULD BE INTERESTING TO ASSESS THE NUMBER OF END USERS AND THE LEVEL OF EFFECTIVE UTILIZATION OF THESE DATA BASES BOTH AT NATIONAL AND REGIONAL LEVEL.

WE MUST ALWAYS REMEMBER THAT THE GAP BETWEEN ACTUAL AND POTENTIAL USERS OF THE DATA MAINLY DEPENDS BY THE ABILITY OF THE MAP PRODUCERS TO SATISFY THE NEEDS OF THE END USERS COMMUNITY.



THE GLCN DATA SET MAIN CHARACTERISTICS:

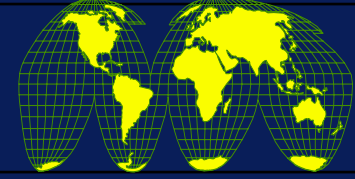
- *STANDARDIZED CLASS DEFINITION*
- *STANDARDIZED CARTOGRAPHIC RULES*
- *HIGH LEVEL OF INFORMATION*
- *HIGH FLEXIBILITY TO BE RECOMBINED ACCORDING TO THE USER NEEDS*

IT IS THE SYNERGY OF THESE FOUR DIFFERENT ASPECTS THAT MAKE THE GLCN DATA SET UNIQUE.

In this part of the course we will focus on the aspect 3. How to produce a data base that will contain an adequate number of thematic information to respond to many different application/users.

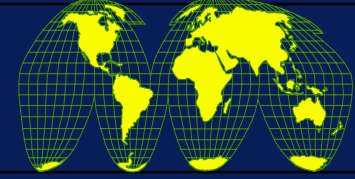
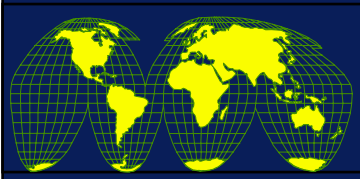


FAO – UNEP GLCN WORKSHOP
Beijing, 24 - 29 Apr 2005



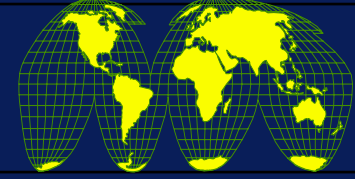
Africover/GLCN basic concept:

- **Ability to map very high level of details (tailored to the inherent characteristics of each country) maintaining at the same time a regional harmonization.**
- **The data-base starts from local/national level to be later assembled at sub-regional/regional level**



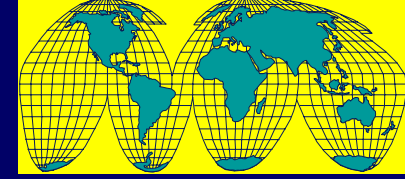
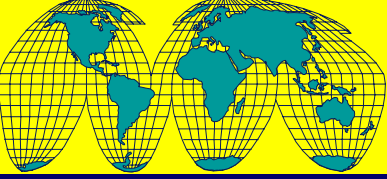
Practical implications at regional level:

- **No fixed legends exist.**
- **The generalization of the information from local to regional is a very flexible process guided (both for types and levels of details) by the need of different users/applications.**
- **The highest level of detail (for each thematic class) is limited only by the lowest level of detail present in one of the national data bases.**



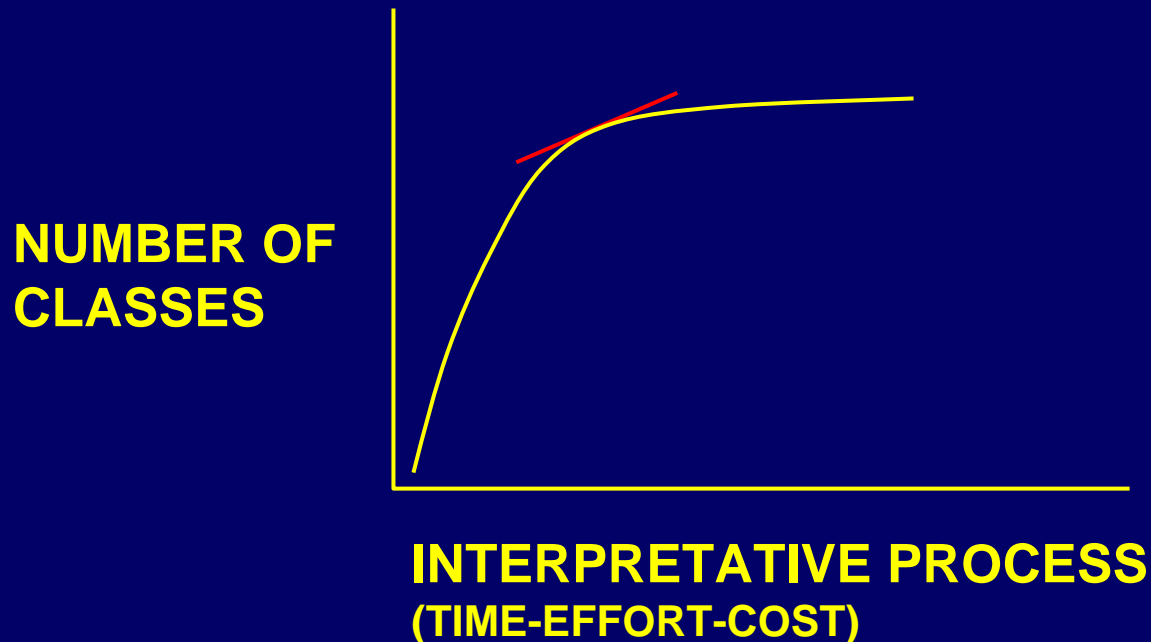
Practical implications at local/national level :

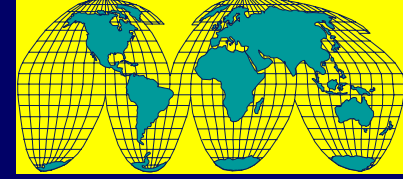
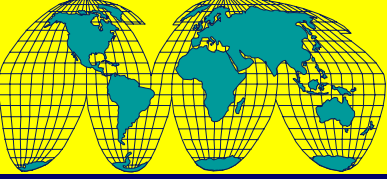
- **The build up of the legend is a dynamic process. No pre-fixed number of classes exist. A step by step interpretative process allow the mapping of the highest level of details possible.**
- **The legend thematic content is always the final result of the interpretative process, thus being the maximum point of equilibrium between the information (land cover variations) related to the inherent characteristics of the study area and the possibility to reproduce them in a bidimensional form (map) at a given accuracy.**



LEGEND ANALISYS

THE GOAL IS TO CREATE A LEGEND THAT IS THE MAXIMUM POINT OF EQUILIBRIUM BETWEEN THE INFORMATION GIVEN BY THE INHERENT CHARACTERISTICS OF THE STUDY AREA AND THE POSSIBILITY TO REPRODUCE THEM IN A BIDIMENSIONAL FORM (MAPPING ACTIVITY ADOPTED = CARTOGRAPHIC STANDARDS - INTERPRETATIVE PROCESS)



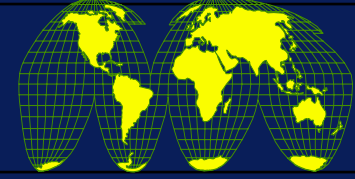
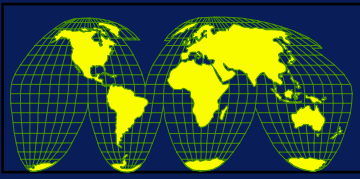


LEGEND GENERATION PROCESS

A FIVE PHASES PROCESS IS APPLIED:

- **PRODUCTION OF A SO CALLED “TEORETICAL LEGEND”**
- **PRELIMINARY INTERPRETATION TO PRODUCE A “PRELIMINARY LEGEND”**
- **FIELD SAMPLES TO PRODUCE AN “INTERMEDIATE ACCURACY ANALISYS” OF THE CLASSES INTERPRETED**
- **PREPARATION OF THE “FINAL LEGEND”**
- **FINAL INTERPRETATION TO PRODUCE THE “FINAL LEGEND”**

THE LEGEND IS ALWAYS THE FINAL PRODUCT OF THE “INFORMATION EXTRACTION PROCESS” (MAPPING EXERCISE)



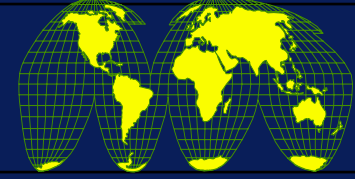
PRODUCTION OF A SO CALLED “TEORETICAL LEGEND”

It is the first step of the GLCN mapping “production chain”

In this phase the GLCN working group:

- Will review the whole existing literature***
- Will review existing L.C. Maps (regional, national, local)***
- Will consider the needs of the different national institutions part of the programm***
- Will check the images covering the study area***
- Eventually will conduct a brief preliminary field study tour***

When all these steps are completed the group starts the discussion/preparation using LCCS of the “TEORETICAL LEGEND”.

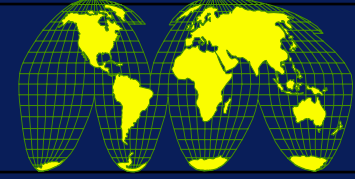


The “Teoretical Legend” is just a first preliminary step in the definition of the thematic content of the future GLCN data base

We must always remember that the legend (thematic content of a map) is ALWAYS THE FINAL PRODUCT OF THE MAPPING ACTIVITY ITSELF

The function of the “Teoretical Legend” is:

- *Allow the GLCN mapping group to deeply discuss the all different Land Cover features present in the country and in the region*
- *Assess the needs of different national institutions and national/regional programmes to better focus the whole mapping activity*
- *Force the group and each single component of it to clearly define (through the use of LCCS) the elements constituting each single land cover class*
- *Give to the GLCN mapping group the first list of thematic classes with wich to start the interpretation activity.*

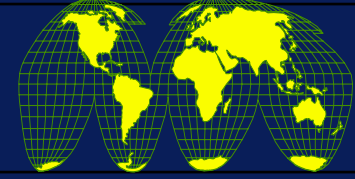
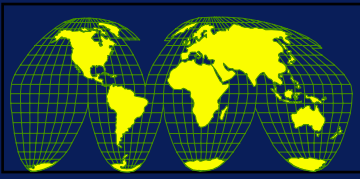


PRELIMINARY INTERPRETATION:

It is the phase where the mapping activity starts. In the following slides we consider an approach based on “visual interpretation”. Different steps should be followed in case an “automatic classification” is applied.

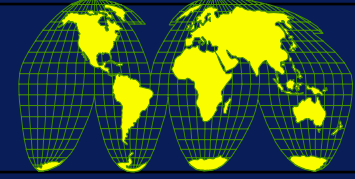
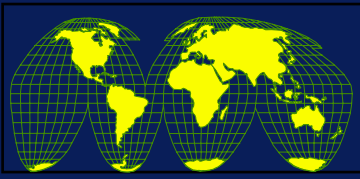
The preliminary interpretation phase can be subdivided in three subphases:

- Definition (inside the component of the group) of the different supervision responsibilities and creation of a working schedule*
- The mapping activity itself*
- The definition of the “Preliminary Legend”*



1 The visual interpretation of the whole country is usually a complex activity executed by a group of different photointerpreters. The management of the group and the GLCN procedures implies that in addition to the person managing the whole activity other responsibilities are created. These persons must be chosen inside the peoples forming the GLCN mapping group. Therefore these persons will have in addition to the normal interpretation activity other extra duties as follows:

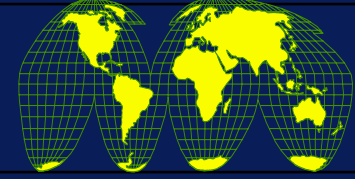
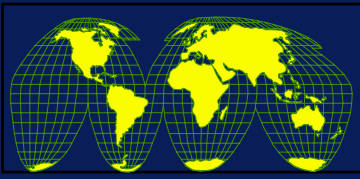
- Responsible for the regular updating of the LCCS legend (Teoretical Legend)
- Responsible of the location of field samples
- Responsible of the interpretation schedule



Responsible legend updating:

As said before the GLCN procedure to create a map is a step by step dynamic process to allow the creation of a data base with the maximum content of thematic information (according to the scale, time, data set available, inherent characteristics of the study area, etc.).

During the “preliminary interpretation” phase the thematic classes listed in the “Theoretical Legend” will be normally modified. For example one or more photointerpreters will find in their area of work classes that were not considered before, or same classes must be re-defined etc. All these modifications of the thematic content of the interpretation cannot be done by the single photointerpreter but must be reported to the “responsible legend updating” that will verify the correctness of the proposed change/new class creation and consequently update the legend and re-distribute the updated legend to the all group.



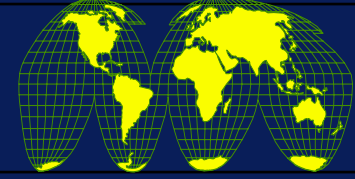
Responsible of the location of field samples:

During the “preliminary interpretation “ phase photointerpreters can select sites (land cover feature) that should be verified during the field campaign. The collection of these sites is the primary responsibility of the “field samples location” person. He/she must not only collect the sample sites but must assure an equal (or almost equal) selection of the thematic classes, an omogeneous distribution of each of them over the study area, create a cluster of samples to optimize the field campaign.

Responsible of the interpretation schedule

:

The complete schedule of the activity must be prepared before. It must be jointly evaluated the time necessary to map each single scene (not too little but also not too much) and therefore each photointerpreter must have a detailed working schedule. The responsible of the intepretation production must verify weekly the work progress of each interpreter and verify if the activities in this phase are on schedule or not.



2 the preliminar mapping activity:

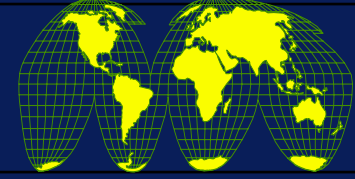
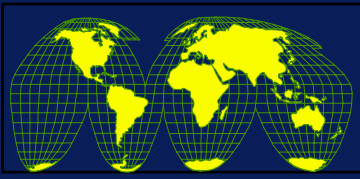
It is the phase where the photointerpretation is done. The interpretation must cover the whole study area, all the polygons must be coded.

Image interpretation itself is not an argument of this course (the participants of the GLCN mapping group should be all experienced photointerpreters) however we can define image interpretation (visual or automatic) as “the clustering (zonation) of the pixels of an image (according to specific parameters of similarity) and the correct coding of these clusters (pixel zonation or polygon) according to a given thematic legend”.

This definition is important because allow us to clearly distinct two types of separate actions:

- **Clustering or Zonation**
- **Coding**

Mistakes in one of the two actions will produce different effects in the GLCN mapping procedures



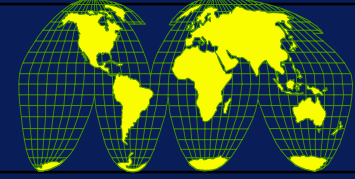
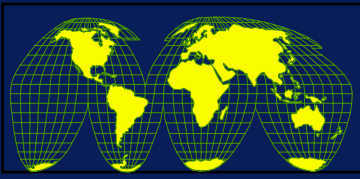
2 The GLCN mapping method imply in this phase (preliminary interpretation) a correct zonation of the image and a consistent, but not necessarily a correct, coding of it.

In other words in this phase is important to perform a correct zonation of the image and a systematic coding of it. Systematic coding means that all the same zonation must have the same coding. If the coding reflect the real situation in the field or not will be verified and eventually corrected in the next phases of the GLCN production chain.

IN THIS PHASE THEN THE EFFORT ARE TWO:

- *PRODUCE A CORRECT ZONATION*
- *MAKE A SYSTEMATIC CODIFICATION*

Even if this greatly simplify the work of the mapping team very detailed calibration procedures must be set up in order to achieve consistency of the interpretation inside different areas of the same images and between different photointerpreters.



3 Definition of the preliminary legend:

The conclusion of the preliminary mapping activity will produce the “preliminary legend” All the single thematic classes present in the preliminar data bases are the classes forming the legend. This legend not necessarily is the same of the legend produced at the beginning of the GLCN production chain (teoretical legend). Some classes will be added other classes will not be present.

FIELD SAMPLES:

This activity (and the relative forms) will be described in another section of this course.

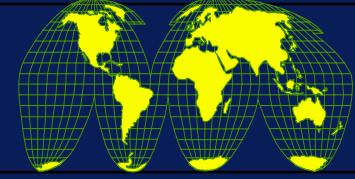
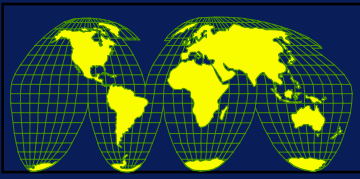
The goal of this activity is to conduct a field verification to generate later a so called “Intermediate Accuracy” of the preliminary interpretation.

The accuracy must be done by single class and for broad geographic areas.

The results must allow the GLCN group to evaluate if the thematic content of the data base (as come after the preliminary interpretation) is adequate.

You can find differet situations:

- Some class due to is poor accuracy must be eliminated (or aggregated)
- The definition (number of classifiers) of a class must be modified (increased or decreased)
- Some new class can be created



FIELD SAMPLES:

This activity (and the relative forms) will be described in another section of this course.

The goal of this activity is to conduct a field verification to generate later a so called “Intermediate Accuracy” of the preliminary interpretation.

The accuracy must be done by single class and for broad geographic areas.

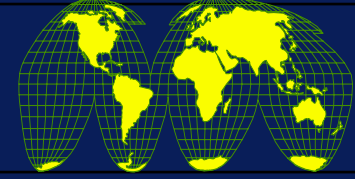
The results must allow the GLCN group to evaluate if the thematic content of the data base (as come after the preliminary interpretation) is adequate.

You can find different situations:

- Some class due to its poor accuracy must be eliminated (or aggregated)
- The definition (number of classifiers) of a class must be modified (increased or decreased)
- Some new class can be created

A final evaluation of all this information must allow the group:

- To understand the problems occurred in the preliminary interpretation
- To generate a first attempt of the “Final Legend”

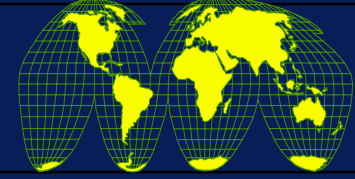
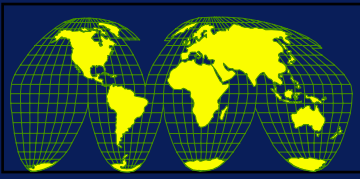


FINAL INTERPRETATION

It is the phase where on the base of the results of the field verification using the first attempt of the “Final Legend” the whole preliminary interpretation is correct/finalize.

In addition to the work of finalization of the interpretation two additional “thematic” controls must be considered:

- **HOMOGENEITY**, a cross check must be done between photointerpreters having adjacent scenes (the photointerpreters should exchange the images and perform a control)
- **FINAL QUALITY** control. It must be done by a specific unit (composed by some of the photointerpreters). The overall quality of each scene must be controlled to assure a good consistency of both thematic coding and level of details mapped.

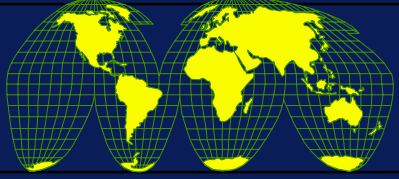


FINAL CONTROL OF THE GIS UNIT:

Before to start the work of built up the data base in the GLCN format, the GIS unit must perform three additional semi-automatic control on the interpretation:

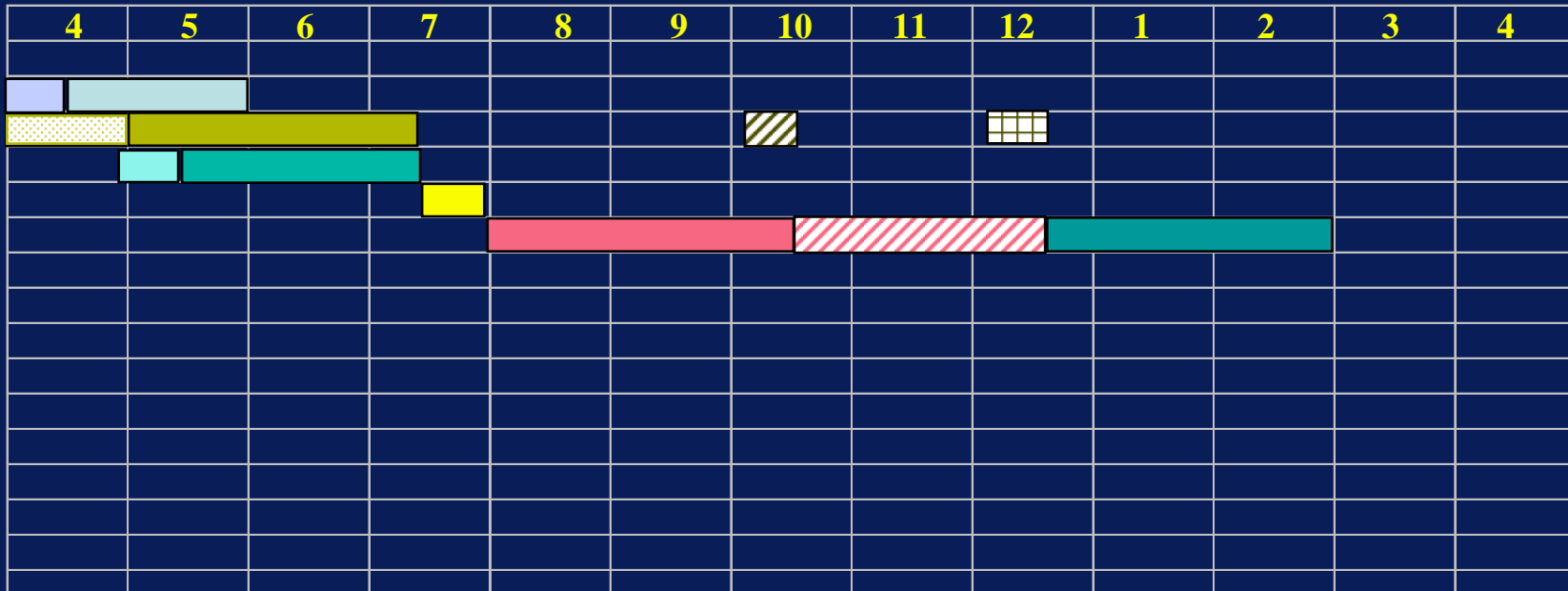
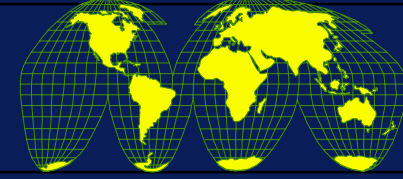
- *GIS topological control*: control of adjacent polygons with the same label, polygons with no label etc.
- *Automatic control of detectable wrong coding*: it is a control on specific types of L.C. features that have particular characteristics (a mangrove polygon found in the interior of the country or in a plateau or mountaneous region is obviously a mistake in polygon coding)
- *Check of the frequency of L.C. Classes or mixed coding* (some class or mixed Unit, even if present in the data base can have a very low frequency, in this case It is important that the photointerpreters review the polygon/s to decide if this class can be removed or it must be maintained).

AFTER THESE LAST THREE CONTROLS AND AFTER THE GIS WORK THE DATA BASE IS READY TOGETHER WITH THE FINAL LEGEND



FAO – UNEP GLCN WORKSHOP

Beijing, 24 - 29 Apr 2005



INTERPRETATION PRODUCTION CHAIN ACTIVITIES

