Task 5, Identification of key factors in the emergence of anthropozoonoses, along the front of invasion of the black rat and identification of areas shared between the rodent and the disease.

3.2. MANAGEMENT DU PROJET / PROJECT MANAGEMENT

TASK 0: Governance and Organization

This project will be coordinated by P. Handschumacher, health geographer (IRD) involved for over 20 years in multidisciplinary programs, mainly in Senegal.Due to the overlapping of different thematics, he will be assisted in this task by JM Duplantier (IRD), population biologist, deputy director of the CBGP and J. Lombard (IRD) geographer specialized in transports in West Africa. This coordinating group will meet throughout the duration of the program once every six months or more frequently if necessary, to assess progress, each being more specifically in charge of the achievements in its own skills. Task coordinators will also take part in these periodic meeting, if necessary. Meetings via video-conference will take place before the completion of each progress report. Each task leader will be informed of all results produced by his colleagues within the other tasks to ensure the proper nesting of information, its dissemination among the different teams and a good systems analysis. A monitoring committee will be proposed. It will be composed of leading scientists in the different thematics here concerned and/or with a good knowledge of the geographic area , in order to provide critical and constructive remarks. This committee will be a force of proposal and will ensure the proper execution of tasks according to the schedule provided in this project. This committee will be mobilized during the opening meeting of the project and then again after 6 months: this initial phase being crucial for the success of the entire program. They will be invited for a third time to assess the progress and works realized during the first 2 years. At last they will be consulted for the stategy of dissemination and exploitation of results and associated to the organization of the feedback meeting for stakeholders: Public health, Transportation and Development services as well as local non-institutional actors. Following the regulation in France as well as in the countries concerned by our field studies, the relevant ethics committees in Senegal and Mali will be informed by the leader of task 5 and their agreement will be requested before the start of this project work. Finally, a consortium agreement between the four partners will be established to ensure the intellectual property issues and avoid potential conflicts in the context of publications.

3.3. DESCRIPTION DES TRAVAUX PAR TACHE / DESCRIPTION BY TASK

For the record, task 0 governance and project management is described in the above paragraph.

Task 1 : Compilation of data and building a spatial interdisciplinary and multi-scale database

- Objectives and possible indicators of success,

Building a data management system for spatialized and multiscale data by coupling a database and a GIS (Geographic Information System). The system should allow (i) compilation of data (ii) to make available the data for all the participants (iii) combination of data and information collected from the archives/records and from our own field studies.

One indicator of success for this task will be the geographical and statistical developments realized by each partner from data collected at multiple scales of space and time. Papers presented at the final meeting should illustrate this result.

- *Manager and partners involved in this task*

This task will be the responsibility of P. Handschumacher assisted by S. Piry and J. Le Fur with contributions of the other task leaders.

- *Detailed program and technical choices*

• Sub-task 1.1 aims to clarify and formalize the conceptual data system (CDS) necessary for the construction of items identified for each subset of the database. This sub-task will consist mainly in an interdisciplinary meeting at the beginning of the project. It will focus on the inventory, the validation and the structure of the different types of data collected by this project. The expected result will here be the construction of a conceptual data system enabling the realization of the effective computerized data management system. The meeting will allow to discuss and then decide to split or not the system in two parts, in order to take into account the scale duality decade / century (two articulated systems or a single generic system).

• Sub task 1.2 will consist in developing the information system itself, including its formalization and validation, setting up the data set and the GIS, and specifically the linkage between Database and GIS. The one or two georeferenced databases will be built and the linkage between the two time scales will be tested (the goal being to identify the most relevant scales ,R. Brunet [1997] both for the spread of *R. rattus* and for the diffusion of anthropozoonoses). The development of this software will be done with the different task leaders. This sub-task should have a validation step on the ability to extract data on different scales of time and space in order to produce the information needed for the multi scale analysis.

• The third sub-task will continue throughout the program and will consist to provide and adapt the system with data collected by the different teams. The database manager will be in charge to integrate information into the database, in connection with the teams havingcollected these information. Managing and analysing this database will be done in coordination with the activities related to Task 6.

- *Deliverables*

• An interdisciplinary open data system, able to take into account several space and time scales.

• A Geographic Information System linked to the database.

• A written procedure to interrogate the data system.

- *Partners' contributions*

Activities related to this task will be performed by S. Piry, J. Le Fur (CBGP) and P. Handschumacher (UMR 912) which will be in touch with the task leaders in charge of supplying the database. A position of “Volontaire International” (equivalent of a postdoctoral fellowship) will be requested to the IRD : he will provide support for the development of the database and implementation of information during the project.

- *Description of methods and technical options*

The construction of the database will be based on the geo-referencing of data and their chronological position. Thus each piece of information, from the spot level to the area level could be linked with other data and whatever the data set from which it came (biological, health, demographic, geographic, climatic ...). This implies a subdivision of space and time for typing the scene according to different scales.

- *Risk analysis.*

The multi-scale approach that characterizes this project makes the design of an articulated data system, very sensitive. Significant work will be done on specifying units of time and space used when storing data. The launch seminar will allow to provide sets of solutions satisfactory both for the software development and the needs of the different specialists. Ongoing work on the representation of multi-scale field will offer solutions to these problems. In the event of obstacles on the project lenght (eg, degration quality of certain data related to the development of compatible spatial and temporal scales), it will be possible to split the system into two databases dedicated to (i) the centennial dynamics (large spatial extent); (ii) the decadal dynamics (small spatial extent). Another difficulty is to link georeferenced databases to geographic information systems. But our database manager, S. Piry has enough competence and experience in previous similar projects to overcome these difficulties.

Task 2: Dynamical territories and environmental changes, from centennial to decadal scale

- *Objectives and possible indicators of success,*

The objective of this task is to (i) form the corpus of data relating to the environmental determinants of the black rat distribution in the border area between Senegal and Mali, (ii) identify temporal and spatial thresholds for each of them and (iii) build spatial homogeneous subsets based on these determinants. This diachronic approach will lead to a characterization of the changes in the major black rat colonization areas. We especially focus on the evolution of the colonization area located in the East Senegal and West Mali. At the scale of the past century, only the major stages of evolution can be identified and "thresholded". During the last two decades, the increasing availability of data about spatial transformations will require to resize our time and spatial scales.

- The manager and the partners involved

  Manager: J. Lombard (IRD Prodig) assisted by J.-L. Piermay (University of Strasbourg) and Jean Gaudart (LERTIM)

  Partners: O. Ninot (Prodig CNRS); F. Dumont (University of Lille 1, provider for Prodig); P. Sakho (UCAD) and I. Mbaye (University of Ziguinchor), providers for UMR SE4S; CBGP.

- *The detailed program of work*

Three sub-tasks will be developed successively:

Subtask 1: Gathering information from available sources and integrating into multidisciplinary database (with task 1). Extracting maps, sat images and aerial photographs from statistical archives, referenced literature and other data sources. Developing specific information sets over several decades (up to 100 years): climate variability, landscape and land use, demographic evolution, system of cities, communication networks.

Subtask 2: Constitution of original data sets from fieldworks held on the axes Tambacounda - Kidira - Kayes and Tambacounda - Kedougou. Gathering information on homogeneous