

INCORPORATING DATA AND SITNA TOOLS INTO MANAGEMENT: GEO - WORKFLOW IN LIVESTOCK WASTE PRODUCTION AND MANAGEMENT PLANS IN NAVARRE

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Abstract

Since 2000, the Government of Navarra has used a horizontal and corporate organizational element which is known as the "Navarre Territorial Information System," SITNA. Different units from public administration, at regional and local level, integrate and keep the territorial information updated for dissemination to the public and improvement of administrative procedures.

This paper presents an example of how SITNA supported by technical experience from the public company Trabajos Catastrales, S.A., can include data and tools to solve specific management problems. Creating tools that perform the complete process management cycle is not new to public administrations, although less so for tools performing this management by tele-processing. The solution we are presenting goes one step further, incorporating a geographical component into the process, as a key element, allowing citizens to enter and retrieve this information to be able to manage this application more successfully.

Thus, we are trying to demonstrate how alphanumeric and territorial data can work together perfectly in order to facilitate management not only for citizens but also for technicians and how geographical information can be reused for other purposes beyond what its original collection purpose.

Therefore, the challenge for Environmental Administration lies in being able to process environmental authorizations correctly and as quickly as possible, making it easier to draw up these applications, mainly regarding the technical aspect, and essentially with the highest quality controls.

Key Words: Geo-Work_Flow, Geographical Viewer, Spatial Analysis, Territorial Management, SITNA

INTRODUCTION

The article's text will be structured around the following headings: background, aims, contents of the Territorial Plan, technological solution and conclusions.

The standard-based framework for this work comes from the development of Spanish LAW 16/2002, on prevention and control of contamination, in its application for livestock activity. For this, the region of Navarre developed Foral Decree 148/2003, modified by Foral Decree 76/2006, which establishes technical environmental conditions for livestock installations.

This type of installation constitutes one of the activity groups that, potentially, and if corrective measures are not set up, could affect population nuclei and the environment, particularly in terms of water quality.

Later and to articulate processing activity licences, by Foral Order 234/2005, conditions were established which can be applied to the production, storage and management of livestock waste, with a deadline to adapt livestock installations and livestock waste management by 1st October 2008.

In the case of Navarre this standard is to be applied to more than 200 livestock operations with a grouping of applications at the end of the deadline. For that reason, the challenge for the Environmental Administration has been, on the one hand, to be capable of correctly processing the environmental authorisations in as short a time as possible and on the other hand, making it as easy as possible to write up these applications, particularly the more technical part and, all this, with maximum quality controls. On the day of the deadline, more than 1700 cases had been presented.

BACKGROUND

Foral Decree 148/2003, modified by Foral Decree 76/2006, which establishes the technical environmental conditions for livestock installations, states that before 1st October 2008, the holders of the existing livestock installations with a capacity over 20 Livestock Units (LU), will present the corresponding "Livestock Waste Production and Management Plan" to the Department of the Environment. Furthermore, this Plan must be formulated by applying the "Best Available Techniques" at the time.

Type of Farming	No of heads for 20 LU	Type of Farming	No of heads for 20 LU
Breeding pigs	80	Breeding cows	20
Fattening pigs	166	Breeding sheep	133
Laying hens	2.222	Breeding rabbits	2.000
Fattening chickens	5.000	Breeding horses	22

Table 1. No of heads of livestock equivalent to 20 LU according to species and/or type

According to Table 1, the standard should be applied to more than 2000 livestock operations, distributed throughout the whole region.

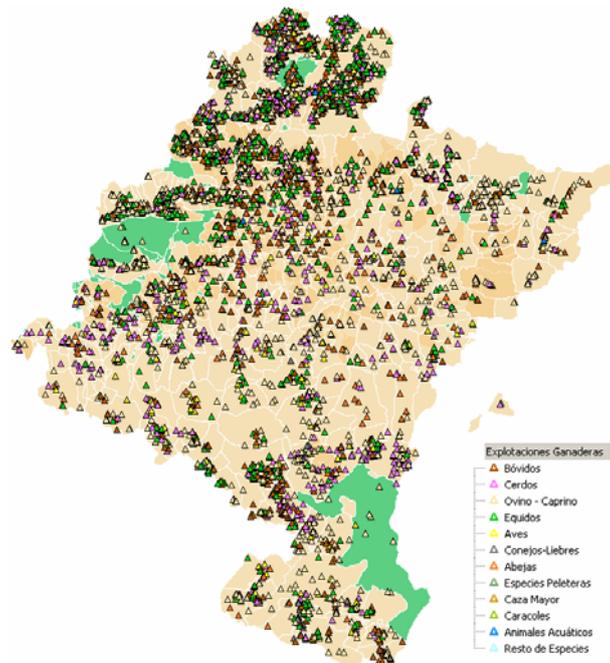


Figure 1. Geographic distribution of livestock installations in Navarre.

AIMS

The following aims were formulated in the light of the opportunity created by presenting authorisation applications, to incorporate modern environmental criteria, to deal with the numerous complaints or claims which certain activities had generated due to their proximity to expanding towns and in accordance with the professional and trade union organisations in the sector:

- Updating the plans included in the Activity Licence projects
- Creating a record of parcels receiving livestock waste.
- The new plans should include the situation of each installation produced as simply and dynamically as possible.
- Standardising the criteria and parameters to be used

A brief summary of the methodology followed is presented below looking particularly at the technological solution explanation and the spatial analysis carried out.

CONTENTS OF THE TERRITORIAL PLAN

The basic elements that are found within a livestock waste Production and Management Plan are:

- General data on the promoter
- Emissions plan
- Territorial plan for distribution of livestock waste
- Management Record Book

In order to standardise the technical criteria to operate the exploitation and its repercussion on the generation of waste, we consulted technicians from the Instituto Técnico Ganadero (Livestock Technical Institute), who generated a series of equations for the correspondence between the food, the housing regime, etc. and the quantity and chemical characteristics of the waste that is generated. Key elements for the correct formulation of the storage capacity in the installations and for the territorial distribution plan.

On the support that this work represents, this aimed to make room alongside the livestock installation promoter and the technician drawing up the application, for the possible existence of a waste manager, when this is not the farmer himself in his double role of agriculturalist and stockbreeder and, finally, the technicians from the Environmental Administration who should promote their approval.

The Plans must be drawn up by competent technicians and guarantee that:

- The livestock waste applied is adapted to the agronomic requirements of the crops.
- A minimum storage capacity is guaranteed for the waste for the periods when it is not possible to eliminate them on the land.

The Frequency of presenting the Plan is variable, from annual to once every 4 years, depending on the species which is being bred and the storage capacity.

TECHNOLOGICAL SOLUTION

With the experience acquired previously, by the Environmental Administration, in managing projects that include computer processing of administrative files and handling and

generating geographic information which goes back to 1991; with the information support, also geographic, for the rest of the administrative units of the Government of Navarre and other institutions, via the Navarre Territorial Information System (SITNA) and with the technical and technological support of the company Trabajos Catastrales, S.A. it seems to be feasible to tackle this situation by building up a collection of computer tools grouped together in three technological solutions:

1. SQL-Server database accessible over the Internet to enter/maintain basically alpha-numerical information for the plans by the promoter or the technician drawing up the application with:

- Automatic calculations (based on the correspondence equations).
- Possibility of running simulations.
- With easy response to the Environment requirements.
- With a GIS component to maintain the territorial distribution plan records.

2. Geographic capacity layer for the distribution plan (meeting the requirements of annex V of Foral Decree 148/2003)

3. Client-Server Geographical Viewer for Environment technicians to access the dossiers.

1. Website

The Main menu for the web application (<https://planesganaderos.navarra.es/>) does the following tasks:

- Standardising criteria and methods.
- Assessment of all the factors involved (defined in art. 3.5. of Foral Order 234/2005)
- Easy access to the useful information to draw up the plan.
- Automatic calculation of emissions, surface areas, doses applied, etc.
- Facilities for the technician drawing up the application:
 - Access to grants on species (food, handling, production of dung...)
 - Automatic calculation of emissions (livestock waste and mineral elements)
 - Data Introduction
 - Automatic calculation of the available surface area useful for the application of livestock waste based on cadastral parcel divisions within the “geographic capacity layer for the distribution plan.”
 - Distribution plan. Access to grants for crop needs, application periods, agro-climatic areas
 - Information per crop. The technician can check that his distribution plan is adapted to the crops’ needs.

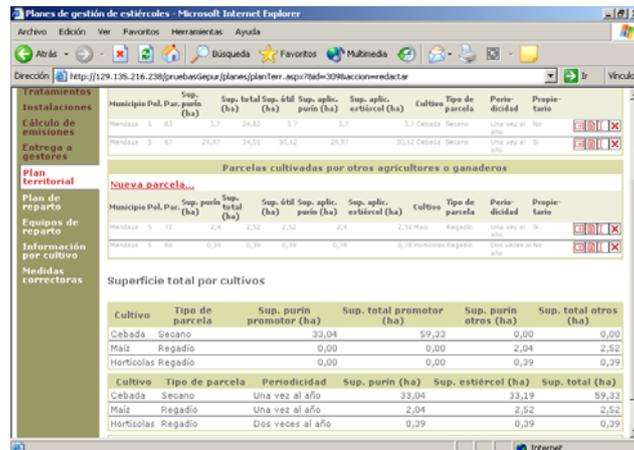


Figure 2. What the Territorial Distribution Plan does with the livestock waste

In order to compile this Territorial Plan the web application was equipped with a geographic window which was easily accessible from the page shown in figure 2. The parcels to be included can be selected by means of entering the cadastral data, when this is known, or by means of the browsing utilities.

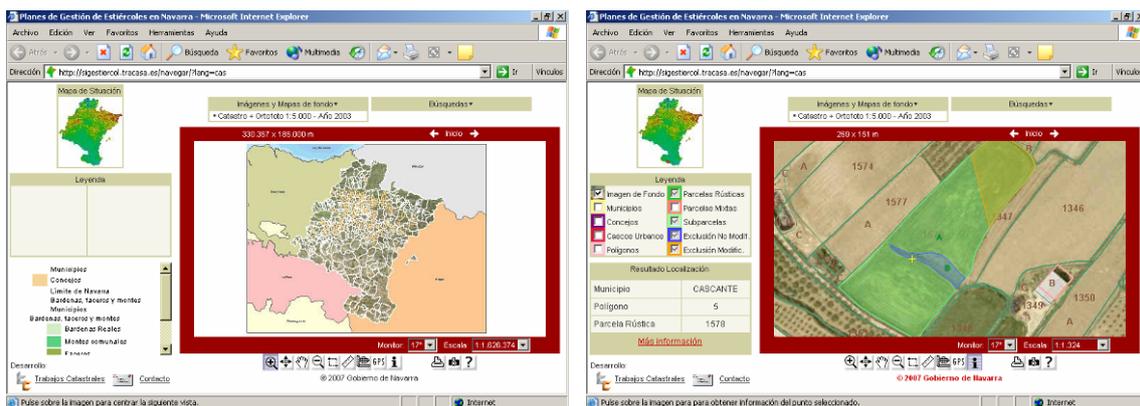


Figure 3. Geographic viewer on the internet to assign parcels to the Territorial Plan

The different colours in the key for the layers and the utilities which are offered by the Geographical Viewer, directly exchanging surface area data with the web application, are used to show the limitation of agricultural irrigation using liquid livestock waste at the distances which are defined in the Foral Decree. This annexe establishes the distances for using liquid livestock waste:

Elements	Distance to follow (metres)
1. Roads	15
2. Population nuclei under 300 inhabitants	100 in general, 200 for pigs
3. Population nuclei over 300 inhabitants	200
4. Water courses, lakes and reservoirs.	35 on flat ground, 50 if the slope is >10%
5. Wells, springs and reservoirs for public water supplies	250 (or the protection perimeter if this exists)
6. Water duct pipes and deposits for public supplies	15
7. Traditional bathing areas	200

Table 2. Distance limitations for elements from annexe V of Foral Decree 148/2003

In all cases this excludes areas on a gradient of over 20% and the application of liquid livestock waste is limited to parcels with agricultural use only.

Furthermore, the application and the Geographical Viewer allow the technician drawing up the application, when justified, using some of the previously excluded areas.

2. Multi exclusion layer

As we saw in the previous point, the Geographical Viewer operates with the cadastral parcels based on a series of criteria, including many based on distances. This is precisely one of the greatest potential features of Geographic Information Systems.

This is why the data sources were compiled. They were all accessible and documented within the Navarre Territorial Information System (SITNA), so that the production task for this collection of exclusion layers could be done quickly and at the same time as the web application. The sources used and the criteria applied are as follows:

1. To define the agricultural areas, the 2006 version of the SIGPAC crop layer was used (acronym of polygon cover at a scale of 1:5.000 which is used to manage European Union agricultural grants). Some categories involved enter directly into the exclusion category: water surface area, buildings, forest land, etc.

2. Slopes: Digital Land Model with 5 m mesh.

- Under 10%: areas which are not excluded for the application of liquid livestock waste.
- Between 10 and 20%: areas are excluded which are less than 50 m from a water course
- Over 20%: these areas are excluded for the application of liquid livestock waste.

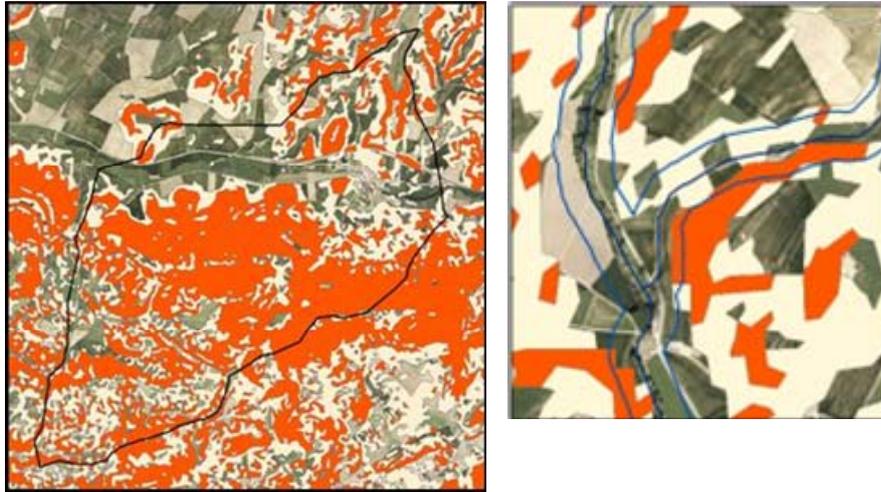


Figure 4. Example in the town of Enériz of areas excluded due to their gradient being $> 20\%$ (orange) also marking areas between 10-20% gradient in cream. In the picture on the right, detail of areas in cream with more than 10% gradient and a distance under 50m to a water course which will also be excluded.

3. Roads: distance of 15 metres, except in the case of localised distribution systems which prevent the contribution of waste to the path and its ditches. Creating this exclusion layer resorted to updated and revised mapping at a scale of 1:5000 with road axes categorised according to current rules.

In the source, these infrastructures are represented as road axes in all types of roadways and with double axis (one for each direction) in the case of motorways and dual carriageways. As these are central axes, average widths have been measured for the different categories of roads taking as a reference the most current orthophotographs and thereby giving each type of element a width: Motorway: 19 m width in each direction, dual carriageway: 16 m, general interest: 9.5 m, regional interest: 7.5 m, district interest: 7 m and local network: 6 m wide.

4. Population nuclei: 200m for all the population nuclei in the South of Navarre, 200m for population nuclei in the North with over 300 inhabitants and 100m for population nuclei in the North of Navarre with less than 300 inhabitants.

Taking these distances as a reference and using the mapping information (boundaries of cadastre town centres), these areas of influence have been applied to generate the exclusion layer per population nuclei. The population data comes from the Navarre Statistics Institute

5. Water courses, lakes and reservoirs:

- Main rivers: Information from SIGPAC with edition, adjustment and incorporation of frames at the head

- Secondary rivers: SITNA Hydrographical network. The axes have been transformed into corridors according to categories: from 4 m (streams) to 15 m (main affluent)
- Reservoirs: Water masses from SITNA.
- Wells, springs and reservoirs for supplies. This highlights 338 protected areas for supplies to populations with more than 50 inhabitants or that capture more than 10 m³/day.
- Traditional bathing areas: 200m exclusion. This was produced using a list of coordinates available from the Environment Department, identifying the masses of water and applying the corridor.

The final result of grouping the layers gave a multi-layer in which each layer kept the reason for the exclusion which could be unique (for example due to a slope) or multiple (for example due to a slope and distance from a mass of water).

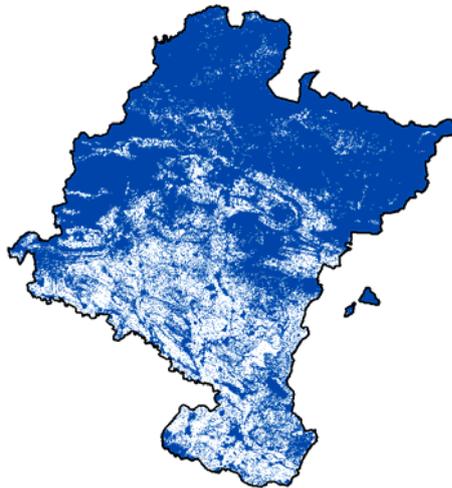


Figure 5. Multi-layer for exclusion to be applied for generated liquid livestock waste. Once implemented in the Geographical Viewer, additional information could be provided per parcel:

Resultado Localización		Resultado Localización	
Tipo	■ Exclusión No Modif.	Tipo	■ Exclusión Modific.
Superficie	12.861,44 m ²	Superficie	1.364,84 m ²
Proximidad a cauce de agua o lago		Proximidad a carretera	

Figure 6. Additional information. Reason for exclusion and access to the modifiable exclusion.

As we can see in figure 6, the “Location Result” window indicates the type of information which the “Non modifiable Exclusion” belongs to, its surface area and the reasons why it is excluded:

- Non agricultural use,
- Close to water, lakes or reservoirs.
- Proximity to wells or reservoirs,
- Proximity to public supply,
- Proximity to traditional bathing area
- Proximity to water course and slope over 10%.

In the same way, in the “Modifiable Exclusion” category with the reasons why it is excluded:

- slope over 20%,
- proximity to the roadway,
- proximity to population nucleus.

The complete inter-relation between the geographic application and the database through Internet solutions permit the technician drawing up the application to make adjustments between the volume of waste and the surface area required for its elimination through the Territorial Plan.

3. Client-Server application

The last element consists of a Work-Flow tool developed in .NET which works in “Client-Server” environments by accessing the data in real time. Access to the geo-referenced data is made by means of the Desktop Geographical Viewer for professional use that SITNA provides with a specific adaptation for processing this information. The aim of this tool is to:

- be the environment to validate the plans,
- facilitate carrying out requirements for the technician drawing up the application or the promoter by email.
- simply control the suitability of the parcels receiving livestock waste.
- control the values included in the dossier with parameter which are not predetermined, particularly justifying the reasons for using “modifiable” excluded surface areas.
- monitor the record books,
- monitor the status of processing the plans by each Environment technician and according to its status: being written, written, provisionally approved, definitively approved or rejected with unfavourable report.

CONCLUSIONS

Several sessions held throughout the region allowed us to explain in great detail the most technical questions arising from the legislation, the best techniques available, both in management of livestock farming and the best elimination of waste and presenting how the tool works to the technicians drawing up applications, the farmers and the waste managers. All this work has been well received so that on completion of the deadline,

85% of the more than 2000 farms that needed to update their Environmental authorisation had done so.

Implementing such a complex system was possible due to the work of a set of multidisciplinary technicians and the decided support from several regional Administration bodies. This has been completed to such an extent that the next steps are already being planned with a view to creating the next version with new services:

- Telematic record book. If the promoter runs the book on the Internet, monitoring on his application of the Territorial Plan for distribution can be done in an instant, without having to physically hand over the book to an administrative registry.
- Storing a history of Livestock Plans, compiling the different versions presented, monitoring the dates that the dossiers spend in each status of processing and the existence or not of requirements in each status, in order to improve Environmental Administration management itself as far as possible.

And to finish, the final conclusion concerns what the project has represented in the process of Modernising the Administration, finding an answer to the lack of available Human Resources and the little time that exists to process a large number of plans, without forgetting that the work has been particularly facilitated by the prior existence of a large volume of geographic information in the Navarre Territorial Information System (SITNA).