MED4EBM - Mediterranean Forum For Applied Ecosystem-Based Management

Work Packages 3 and 4. Technical illustration of the Deliverables 3.2.1, 3.2.2, 3.2.3, 3.2.4.

Release 2, Covering Phase 2 and 3 of Work Packages 3 and 4 implementation course. May 18th, 2021.

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Content

ABOUT THIS DOCUMENT

The present document reports on technical items related to the activities executed and the deliverables produced in the implementation course of Work Packages 3 and 4 of the *Mediterranean Forum For Applied Ecosystem-Based Management* (MED4EBM) partnership project.

This report is conceived and structured as an evolving document, which will be progressively updated and integrated along the execution course of the various phases for the implementation of the said Work Packages 3. When each of these phases is completed, a new release of this document is issued which includes the reporting facts on this very phase.

The current release of this document is updated to include the deployment of Phase 4, which have been executed between May 27th and December 31st, 2021 and constitutes the final version as it describes the full-fledged EB-ICZM-DSSs established by the MED4EBM project.

1 - REPORT ON THE TECHNICAL ILLUSTRATION OF THE DELIVERABLES 3.2.1, 3.2.2, 3.2.3, 3.2.4

The four MED4EBM EB-ICZM-DSSs applications, established by AdT, INSTM, JREDS, and TCNR in close collaboration with the respective stakeholders, were created using the PROGES-ISP software shell following intense training on the job sessions. These four Applications constitute MED4EBM Output 3.2.

1.1 - Thematic Scoping and Key-Stakeholders Mapping Report

First step was focused on the drafting of a *Thematic Scoping and Key-Stakeholders Mapping Report* for each of the four MED4EBM target areas (Deliverables 3.1.5, 3.1.6, 3.1.7 and 3.1.8). They consist of synoptic text tables which, defines the following essential elements to plan and implement EB-ICZM applications:

- main components of key coastal and marine biophysical systems,
- plant Species of interest,
- animal Species of interest,
- coastal infrastructures,
- economic activities,
- available data.

This first step of the EBM Protocol aims at defining the spatial and thematic scopes of the EBM application, as well as at identifying key stakeholders, potential partners and their related roles in the project. This information help assessing the feasibility and the effort needed to execute the project. The *Thematic Scoping and Key-Stakeholders Mapping Report* includes also a brief description of all the components and sub-components there listed, with circumstantial or local information included if available. Key management issues and relevant actors and stakeholders are also associated to each of the above listed elements in the same text tables.

Fundamental support for this step was a specific format prepared and technical instructions provided by PROGES as well as one of the specific features of the PROGES ISP60 software as illustrated in the Fig.2.1 and Fig.2.2.

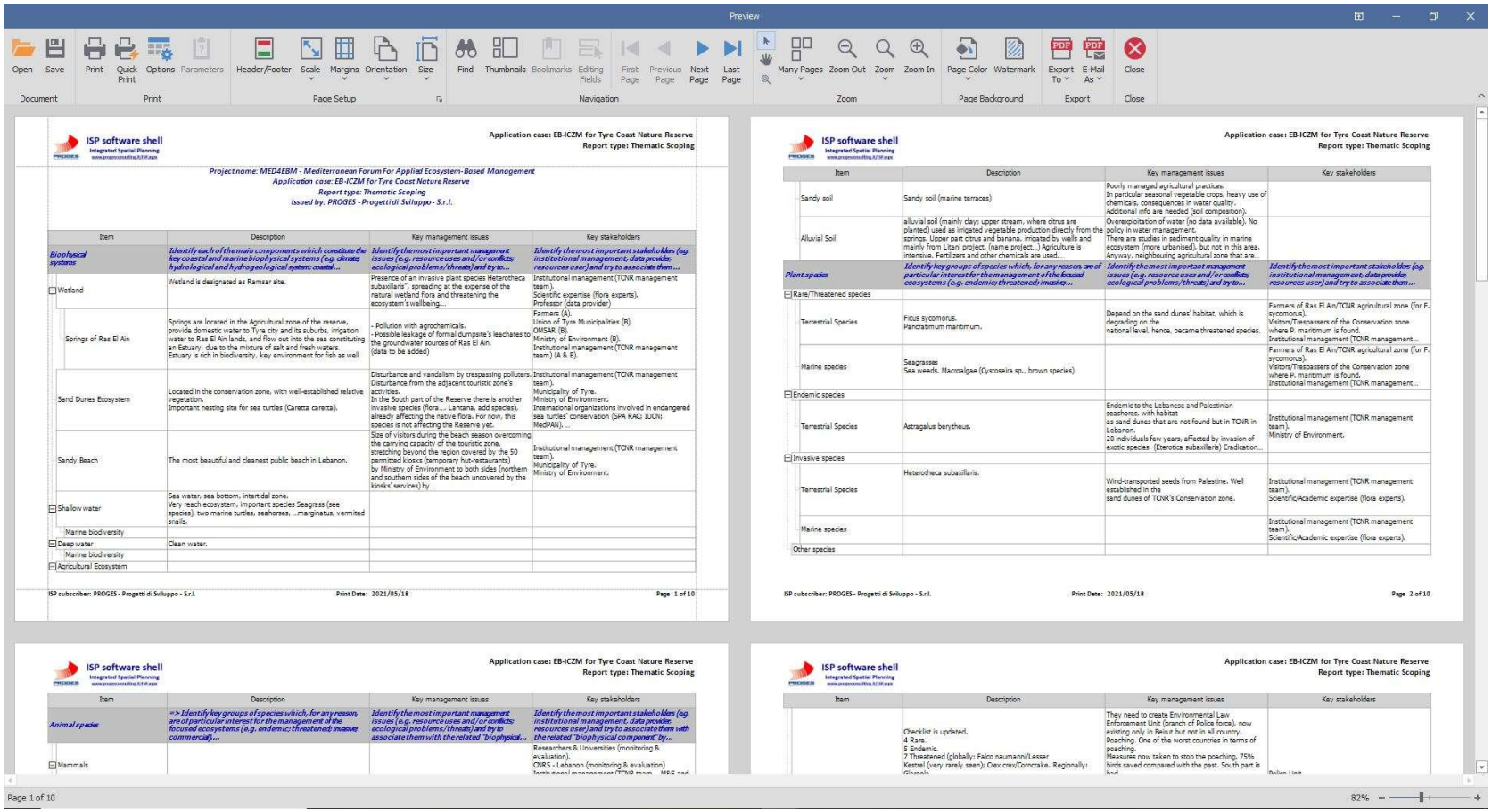

Fig.2.1: Example of *Thematic Scoping and Key-Stakeholders Mapping Report* drafted by TCRN Partner for Tyro Coast Nature Reserve.

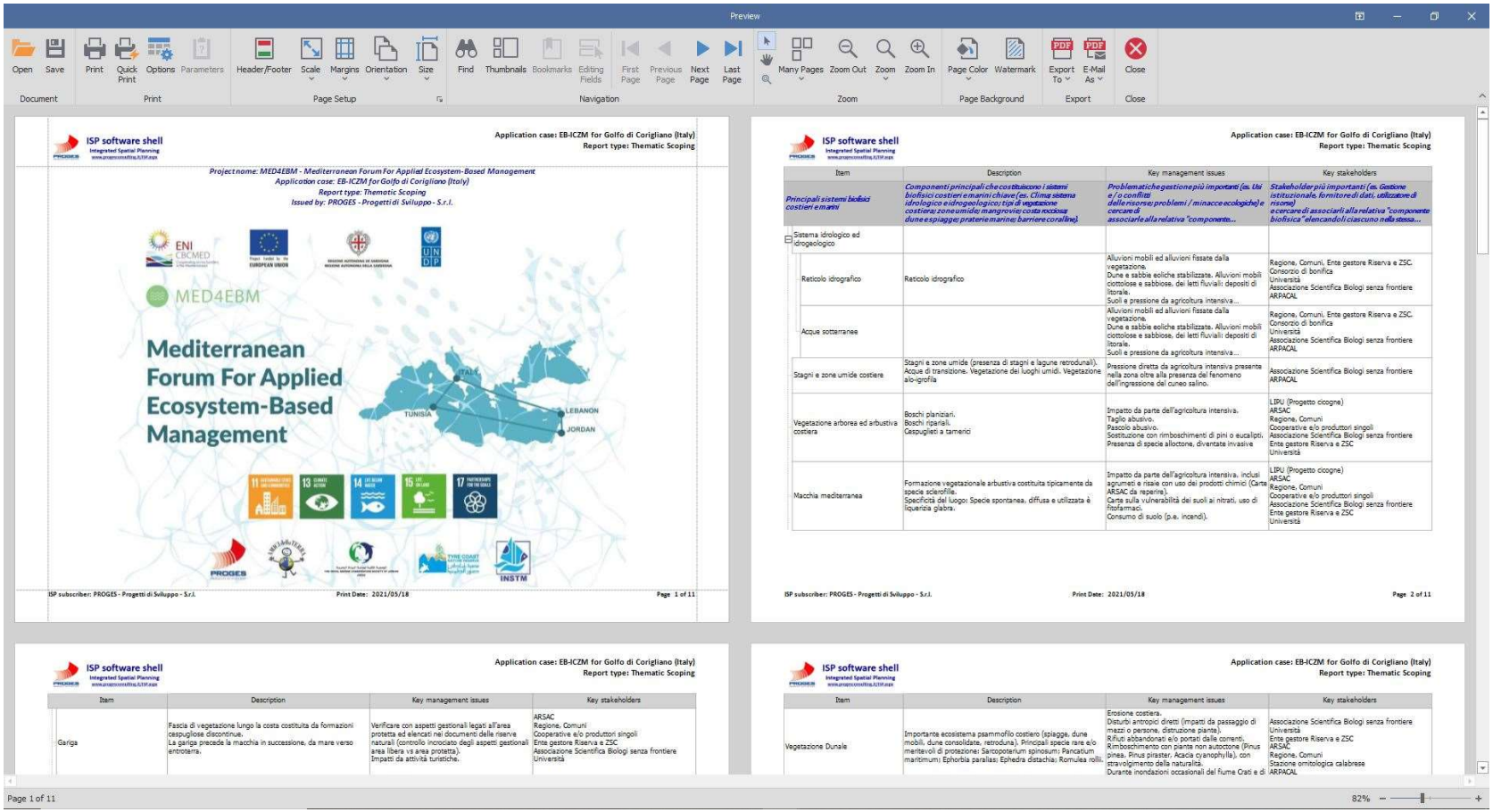

Fig.2.2: Example of *Thematic Scoping and Key-Stakeholders Mapping Report* drafted by ADT Partner for Riserva Naturale del Lago di Tarsia e della Foce del Fiume Crati System Diagram.

1.2 - Ecosystem Context Analysis – System Matrices.

Second step was the *Ecosystem Context Analysis,* procedure with the aim of developing a structural model of the ecosystem components and services, the associated human activities, as well as the interactions between them. It recognizes the key connections within and across the ecological and the human systems spanning over the focused area, so as to provide a manageable framework for understanding how ecosystems, biodiversity and human activities inter-operate in EBM applications.

The *Ecosystem Context Analysis* allows establishing and managing a participatory analytical process which ensures an effective dialogue between all the stakeholders involved. This methodological procedure guided the four working teams from a conceptual representation of the system to be managed to a structural practical one.

This process, started with the identification of the major characteristics of the areas (*Thematic Scoping and Key-Stakeholders Mapping Report),* continued with the transposition of the above mentioned preliminary analysis documents into a *System Matrix;* a text-tables where all the components are listed and illustrated, with components possibly comprising one or more sub-components.

Also for this activity a specifically developed module of the PROGES ISP60 software package was used as illustrated in the Fig.2.3 and Fig.2.4.

System Matrix

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C:\Users\Edoardo\OneDrive\00.LAVORO\000.DSS_PROGES\DSS_TCNR\3.1.8_EB-ICZM-DSS for Tyre Coast Nature Reserve. Thematic Scoping and Key-Stakeholders Mapping Reports.xml

Item	Description	Key management issues	Key stakeholders
Biophysical systems	***Identify each of the main components which constitute the key coastal and marine biophysical systems (e.g. climate; hydrological and hydrogeological system; coastal vegetation types; wetlands; mangroves; rocky coast; dunes and beaches; marine prairies; coral reefs).***	***Identify the most important management issues (e.g. resource uses and/or conflicts; ecological problems/threats) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.***	***Identify the most important stakeholders (e.g. institutional management, data provider, resources user) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.***
Wetland	Wetland is designated as Ramsar site.	Presence of an invasive plant species Heterotheca subaxillaris", spreading at the expense of the natural wetland flora and threatening the ecosystem's wellbeing. (data to be added)	Institutional management (TCNR management team). Scientific expertise (flora experts). Professor (data provider)
Springs of Ras El Ain	Springs are located in the Agricultural zone of the reserve, provide domestic water to Tyre city and its suburbs, irrigation water to Ras El Ain lands, and flow out into the sea constituting an Estuary, due to the mixture of salt and fresh waters. Estuary is rich in biodiversity, key environment for fish as well	- Pollution with agrochemicals. - Possible leakage of formal dumpsite's leachates to the groundwater sources of Ras El Ain. (data to be added)	Farmers (A). Union of Tyre Municipalities (B). OMSAR (B). Ministry of Environment (B). Institutional management (TCNR management team) (A & B).
Sand Dunes Ecosystem	Located in the conservation zone, with well-established relative vegetation. Important nesting site for sea turtles (Caretta caretta).	Disturbance and vandalism by trespassing polluters. Disturbance from the adjacent touristic zone's activities. In the South part of the Reserve there is another invasive species (flora…. Lantana, add species), already affecting the native flora. For now, this species is not affecting the Reserve yet.	Institutional management (TCNR management team). Municipality of Tyre. Ministry of Environment. International organizations involved in endangered sea turtles' conservation (SPA RAC; IUCN; MedPAN).
Sandy Beach	The most beautiful and cleanest public beach in Lebanon.	Size of visitors during the beach season overcoming the carrying capacity of the touristic zone, stretching beyond the region covered by the 50 permitted kiosks (temporary hut-restaurants) by Ministry of Environment to both sides (northern and southern sides of the beach uncovered by the kiosks' services) by independent tourists who do not bide by the eco-rules imposed on the owners of the kiosks exploiting the beach during the summer.	Institutional management (TCNR management team). Municipality of Tyre. Ministry of Environment.
Shallow water	Sea water, sea bottom, intertidal zone. Very reach ecosystem, important species Seagrass (see species), two marine turtles, seahorses, …marginatus, vermited snails.		
Marine biodiversity			
Deep water	Clean water.		
Marine biodiversity			
Agricultural Ecosystem			
Sandy soil	Sandy soil (marine terraces)	Poorly managed agricultural practices. In particular seasonal vegetable crops, heavy use of chemicals, consequences in water quality. Additional info are needed (soil composition).	
Alluvial Soil	alluvial soil (mainly clay; upper stream, where citrus are planted) used as irrigated vegetable production directly from the springs. Upper part citrus and banana, irrigated by wells and mainly from Litani project. (name project…) Agriculture is intensive. Fertilizers and other chemicals are used. Accumulation of nutrients in soil (N) goes to ground water, and finally to springs.	Overexploitation of water (no data available). No policy in water management. There are studies in sediment quality in marine ecosystem (more urbanised), but not in this area. Anyway, neighbouring agricultural zone that are comparable. Here the eutrophication problem is not relevant yet.	
Plant species	***Identify key groups of species which, for any reason, are of particular interest for the management of the focused ecosystems (e.g. endemic; threatened; invasive; commercial. Note that plant communities/habitat may be already included under Vegetation-Types).***	***Identify the most important management issues (e.g. resource uses and/or conflicts; ecological problems/threats) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.***	***Identify the most important stakeholders (e.g. institutional management, data provider, resources user) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.***
Rare/Threatened species			
Terrestrial Species	Ficus sycomorus. Pancratimum maritimum.	Depend on the sand dunes' habitat, which is degrading on the national level, hence, became threatened species.	Farmers of Ras El Ain/TCNR agricultural zone (for F. sycomorus). Visitors/Trespassers of the Conservation zone where P. maritimum is found. Institutional management (TCNR management team). Ministry of Environment.
Marine species	Seagrasses Sea weeds. Macroalgae (Cystoseira sp., brown species)		Farmers of Ras El Ain/TCNR agricultural zone (for F. sycomorus). Visitors/Trespassers of the Conservation zone where P. maritimum is found. Institutional management (TCNR management team). Ministry of Environment.
Endemic species			
Terrestrial Species	Astragalus berytheus.	Endemic to the Lebanese and Palestinian seashores, with habitat as sand dunes that are not found but in TCNR in Lebanon.	Institutional management (TCNR management team). Ministry of Environment.

Fig.2.3: Example of *System Matrix* for the Tyro Coast Nature Reserve area (TCNR Partner)

System Matrix

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Item	Description	Key management issues	Key stakeholders
Principali sistemi biofisici costieri e marini	***Componenti principali che costituiscono i sistemi biofisici costieri e marini chiave (es. Clima; sistema idrologico e idrogeologico; tipi di vegetazione costiera; zone umide; mangrovie; costa rocciosa; dune e spiagge; praterie marine; barriere coralline).***	***Problematiche gestione più importanti (es. Usi e / o conflitti delle risorse; problemi / minacce ecologiche) e cercare di associarle alla relativa "componente biofisica" elencandole ciascuna nella stessa riga di quella della relativa componente.***	***Stakeholder più importanti (es. Gestione istituzionale, fornitore di dati, utilizzatore di risorse) e cercare di associarli alla relativa "componente biofisica" elencandoli ciascuno nella stessa riga di quella della relativa componente.***
Sistema idrologico ed idrogeologico			
Reticolo idrografico	Reticolo idrografico	Alluvioni mobili ed alluvioni fissate dalla vegetazione. Dune e sabbie eoliche stabilizzate. Alluvioni mobili ciottolose e sabbiose, dei letti fluviali: depositi di litorale. Suoli e pressione da agricoltura intensiva presente nei luoghi.	Regione, Comuni, Ente gestore Riserva e ZSC. Consorzio di bonifica Università Associazione Scientifica Biologi senza frontiere ARPACAL
Acque sotterranee		Alluvioni mobili ed alluvioni fissate dalla vegetazione. Dune e sabbie eoliche stabilizzate. Alluvioni mobili ciottolose e sabbiose, dei letti fluviali: depositi di litorale. Suoli e pressione da agricoltura intensiva presente nei luoghi.	Regione, Comuni, Ente gestore Riserva e ZSC. Consorzio di bonifica Università Associazione Scientifica Biologi senza frontiere ARPACAL
Stagni e zone umide costiere	Stagni e zone umide (presenza di stagni e lagune retrodunali). Acque di transizione. Vegetazione dei luoghi umidi. Vegetazione alo-igrofila	Pressione diretta da agricoltura intensiva presente nella zona oltre alla presenza del fenomeno dell'ingressione del cuneo salino.	Associazione Scientifica Biologi senza frontiere ARPACAL
Vegetazione arborea ed arbustiva costiera	Boschi planiziari. Boschi ripariali. Cespuglieti a tamerici	Impatto da parte dell'agricoltura intensiva. Taglio abusivo. Pascolo abusivo. Sostituzione con rimboschimenti di pini o eucalipti. Presenza di specie alloctone, diventate invasive	LIPU (Progetto cicogne) ARSAC Regione, Comuni Cooperative e/o produttori singoli Associazione Scientifica Biologi senza frontiere Ente gestore Riserva e ZSC Università
Macchia mediterranea	Formazione vegetazionale arbustiva costituita tipicamente da specie sclerofille. Specificità del luogo: Specie spontanea, diffusa e utilizzata è liquerizia glabra.	Impatto da parte dell'agricoltura intensiva, inclusi agrumeti e risaie con uso dei prodotti chimici (Carte ARSAC da reperire). Carte sulla vulnerabilità dei suoli ai nitrati, uso di fitofarmaci. Consumo di suolo (p.e. incendi).	LIPU (Progetto cicogne) ARSAC Regione, Comuni Cooperative e/o produttori singoli Associazione Scientifica Biologi senza frontiere Ente gestore Riserva e ZSC Università
Gariga	Fascia di vegetazione lungo la costa costituita da formazioni cespugliose discontinue. La gariga precede la macchia in successione, da mare verso entroterra.	Verificare con aspetti gestionali legati all'area protetta ed elencati nei documenti delle riserve naturali (controllo incrociato degli aspetti gestionali area libera vs area protetta). Impatti da attività turistiche.	ARSAC Regione, Comuni Cooperative e/o produttori singoli Ente gestore Riserva e ZSC Associazione Scientifica Biologi senza frontiere Università
Fascia dunale e spiaggia	Presenza di un importante sistema dunale con habitat di interesse comunitario.	Erosione costiera. Disturbi antropici diretti (impatti da passaggio di mezzi o persone, distruzione di uova di tartaruga -occasionale-, avifauna, piante). Rifiuti abbandonati e/o portati dalle correnti. Rimboschimento con piante non autoctone, con stravolgimento della naturalità. Durante inondazioni occasionali del fiume, riporto di rifiuti nella spiaggia. Uso turistico della spiaggia, stabilimenti balneari	WWF (Progetto sulla tartaruga chiamato Tartacare Calabria) Caretta Calabria Conservation Centro recupero tartarughe di Brancaleone Associazione Scientifica Biologi senza frontiere Università Ente gestore Riserva e ZSC ARSAC Regione, Comuni Stazione ornitologica calabrese ARPACAL
Sistema pelagico	Considerare entro 12 miglia Banchi profondi (controllare) Controllare mammiferi passaggi e presenza Stenelle e Tursiopi Squali (pesce martello, mako, verdesca, grigio, e altre possibilmente)	Diretti: navigazione, pesca, subacquei (numero e comportamento), Indiretti: cambiamento climatico, come variazioni temperatura delle acque. Progetto di estrazione di gas, in attesa delle autorizzazioni.	Regione Operatori nel contesto del turismo subacqueo. Associazioni pescatori. Lega navale Stazione zoologica A. Dohrn di Amendolara Capitaneria di porto Università
Acque marino costiere	A seconda delle profondità: comunità con coralli, Posidonia.	Impatti antropici diretti (reti fantasma, reti a strascico dei pescherecci senza rispettare le	ARPACAL

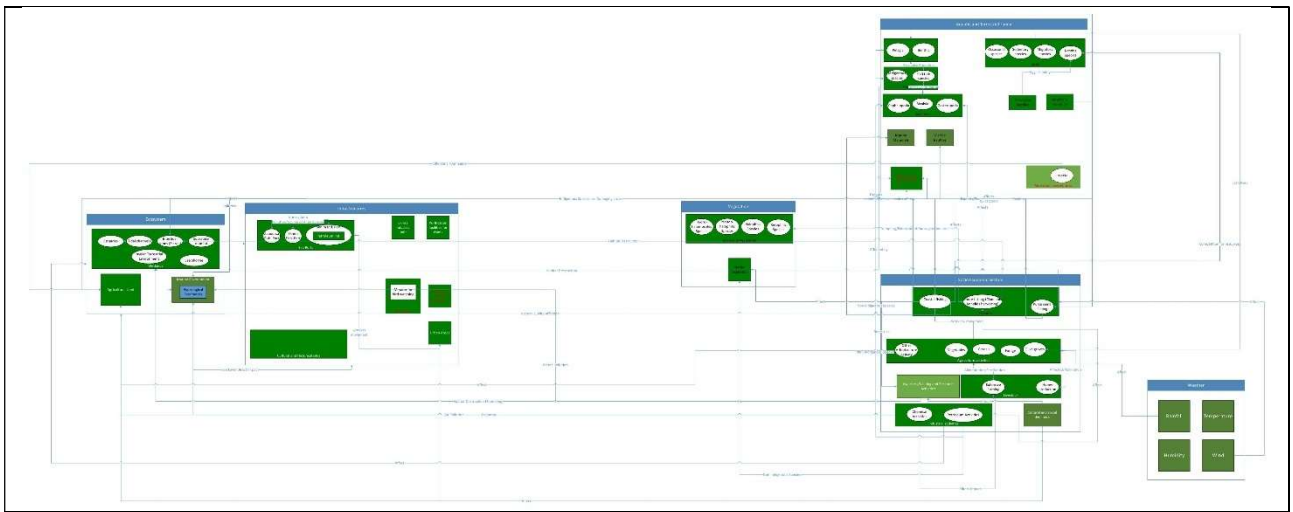
Fig.2.4: Example of *System Matrix* for the Riserva Naturale del Lago di Tarsia e della Foce del Fiume Crati area (ADT Partner)

1.2 - Ecosystem Context Analysis – System Diagrams.

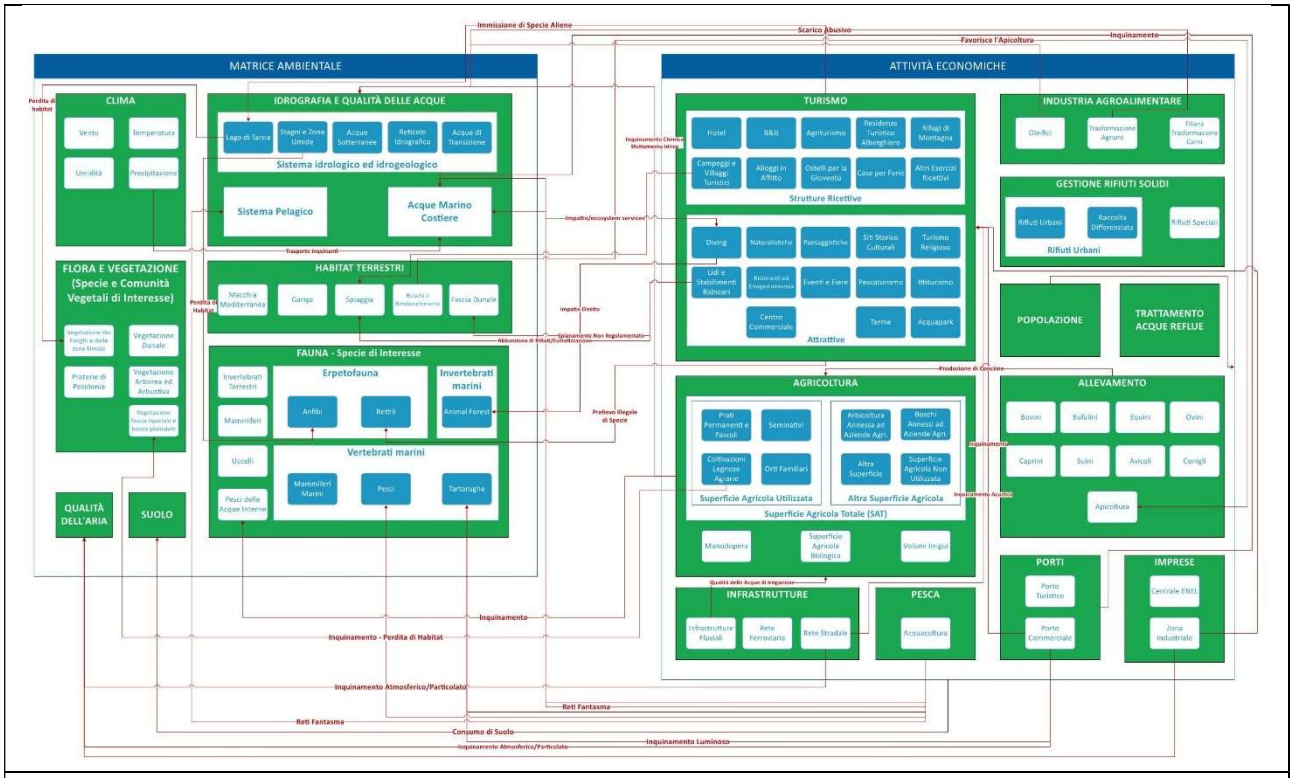
The following step accomplished of the *Ecosystem Context Analysis* was the of the transposition of the described *System Matrices* into *System Diagrams* were all the components and sub-components defined in each of the matrices are drawn in a system diagram as box items. Once all components and sub components of the matrix have been drawn in the system diagram, the information reported in the matrices to describe the interactions between the components and sub-components are used to draw the initial set of links (arrows) between relevant components (boxes) of the diagrams.

Also for this action, the PROGES ISP60 software provides a specific feature for transforming the system matrices directly into diagrams, having only to refine the shape, the arrangement, the description of all the components and the related interconnections.

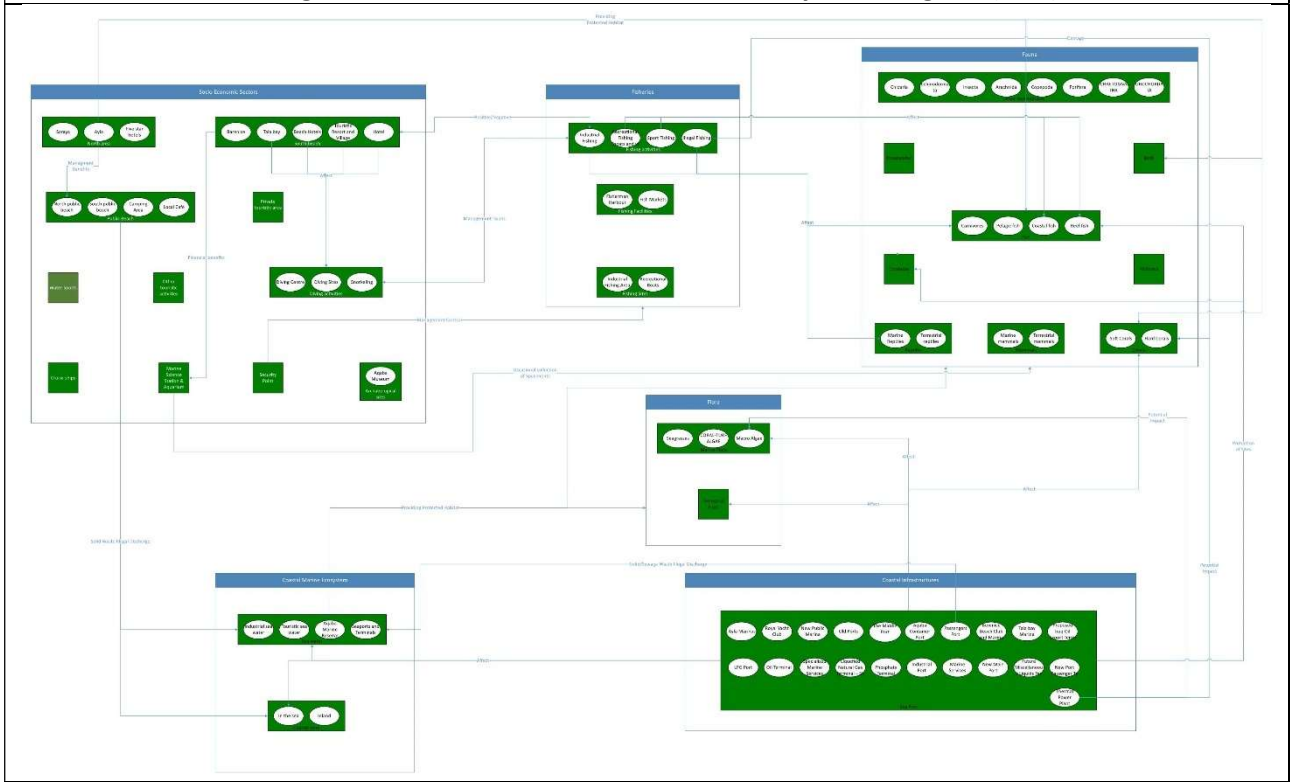
This new diagrammatic representation of the same information can help to identify possible inconsistencies and/or incompleteness of the model, either in the definition of components and sub-components in their interconnections. The four System Diagrams are reported table here below.



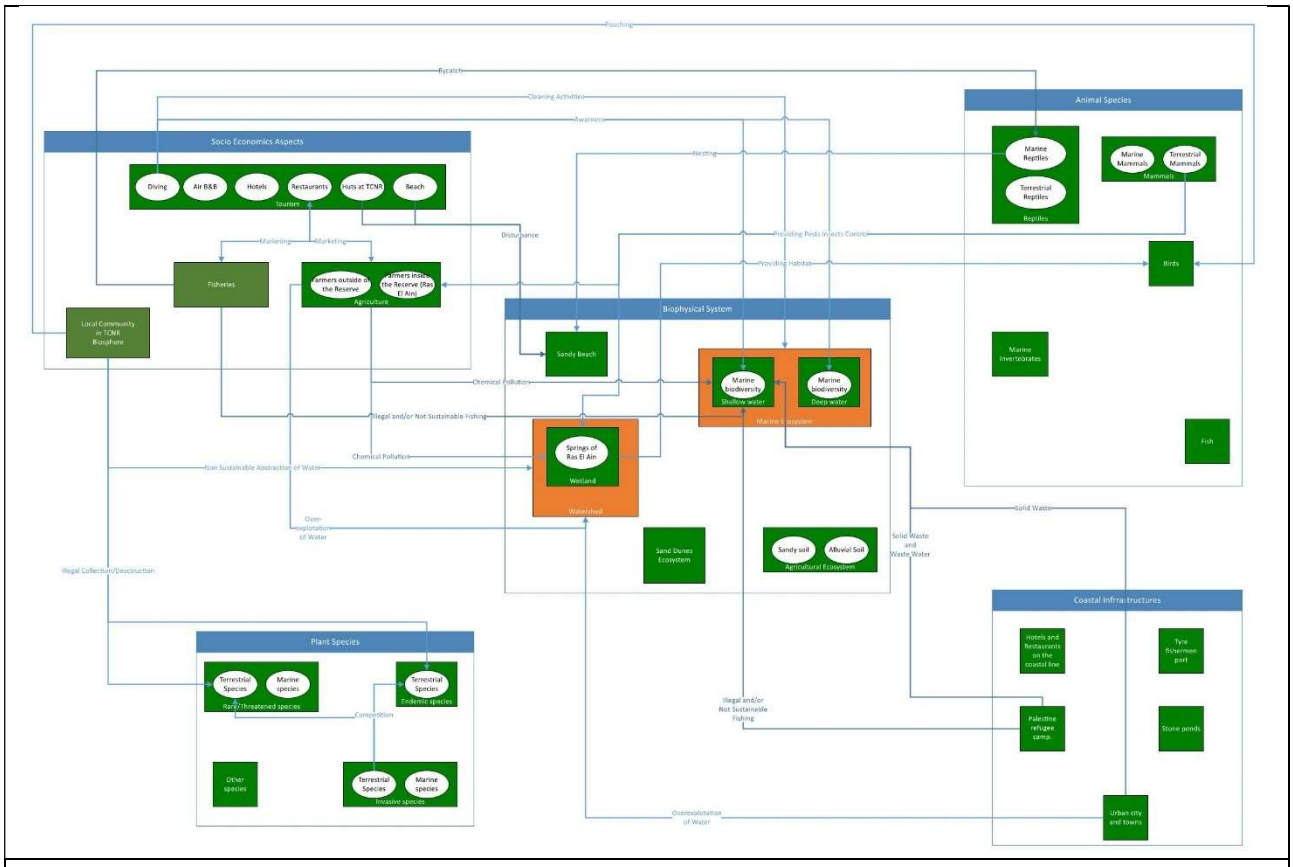
KNEISS ISLAND System Diagram (INSTM)



Riserva Naturale del Lago di Tarsia e della Foce del Fiume Crati System Diagram (ADT)



Royal Marine Conservation Society of Jordan System Diagram (JREDS)



Tyre Coast Nature Reserve System Diagram (TCNR)

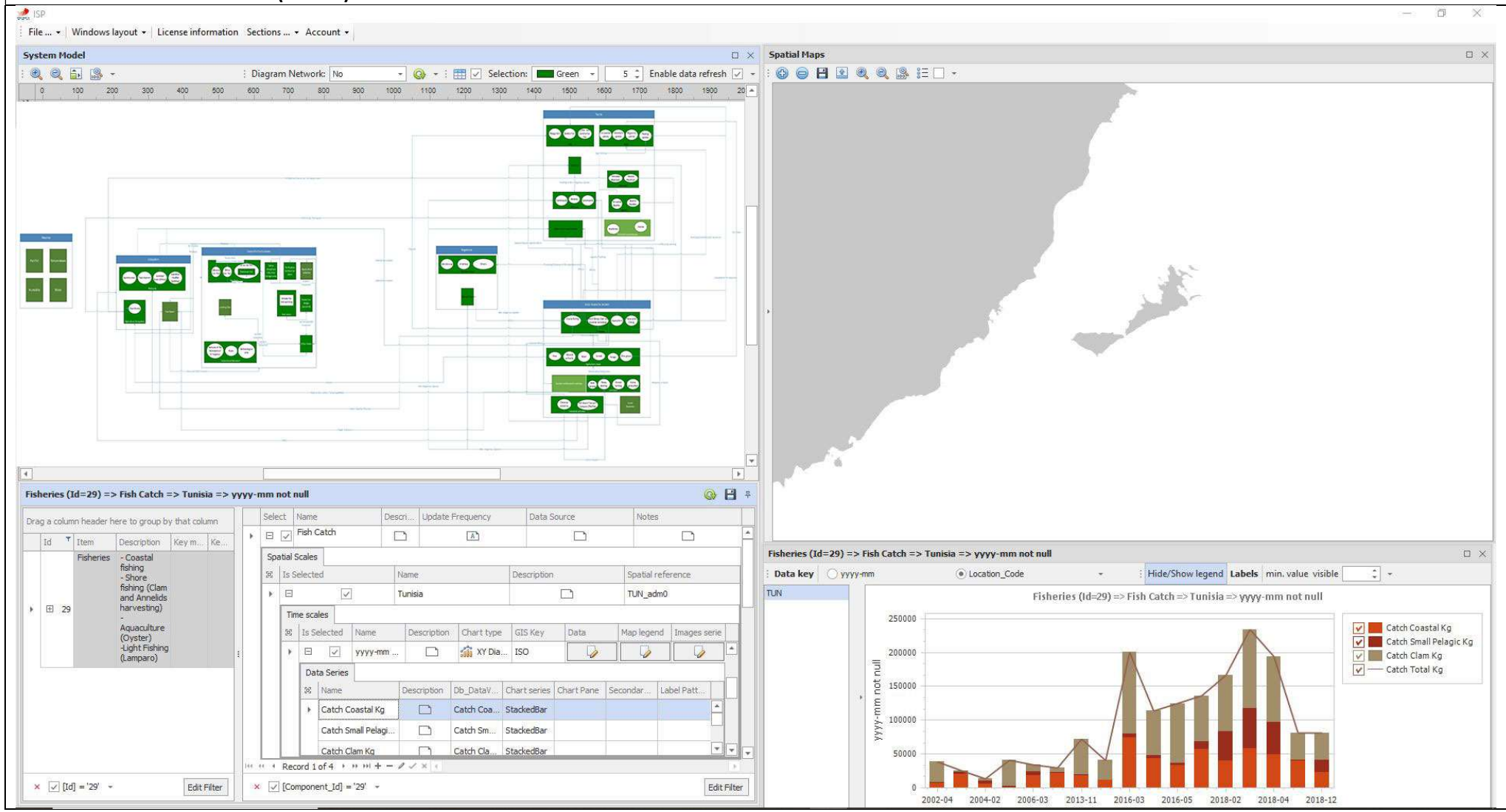
Integrating the above-mentioned *Thematic Scoping and Key-Stakeholders Mapping Reports* and the *System Matrices* it was possible to realise the four *System Boxes-and-Arrows diagrams* constituting the backbone of the EB-ICZM reference models (as described in Deliverable WP3.1, Section 2.2.2). The four Applications developed contain data linked to the various components drawn. Remarkable milestone considering that every single activity described was implemented remotely.

1.4 - Deliverables produced.

The ISP60 software package can be downloaded and installed via the Microsoft ClickOnce software distribution technology; credentials for downloading, installing and accessing the EB-ICZM-DSS Applications have been given to the four Partner's Focal Point. The use of the Microsoft ClickOnce online software publishing system allows to have a resident software installed on the local computer of the user, while at the same time being also able to benefit from a permanent online support so as to obtain any software update the PROGES will release in the future.

The current status of any individual EB-ICZM-DSS projects developed is shown here below.

KNEISS ISLAND EB-ICZM-DSS (INSTM)



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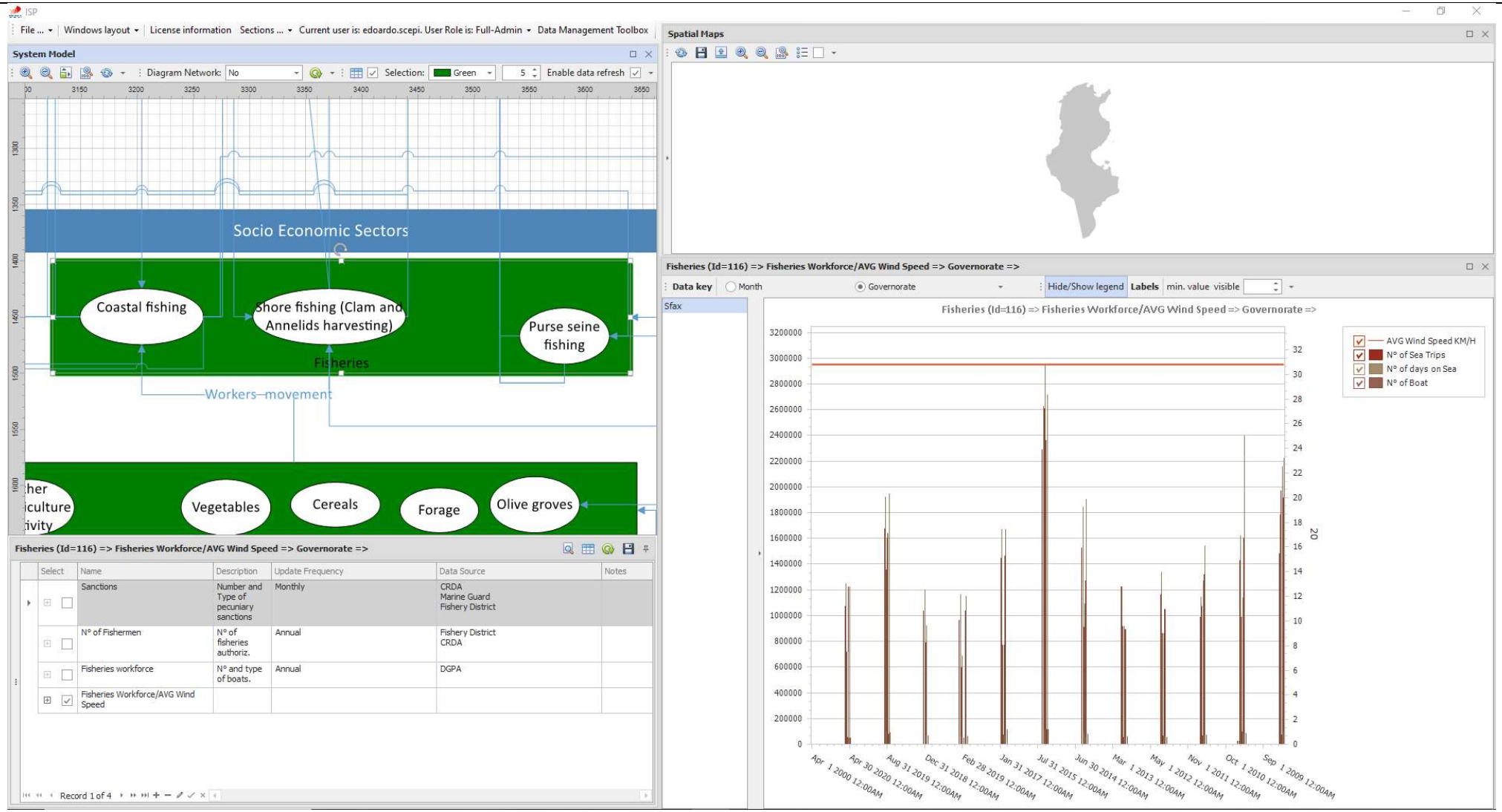

Data on Fisheries Workforce related to the Average Wind Speed

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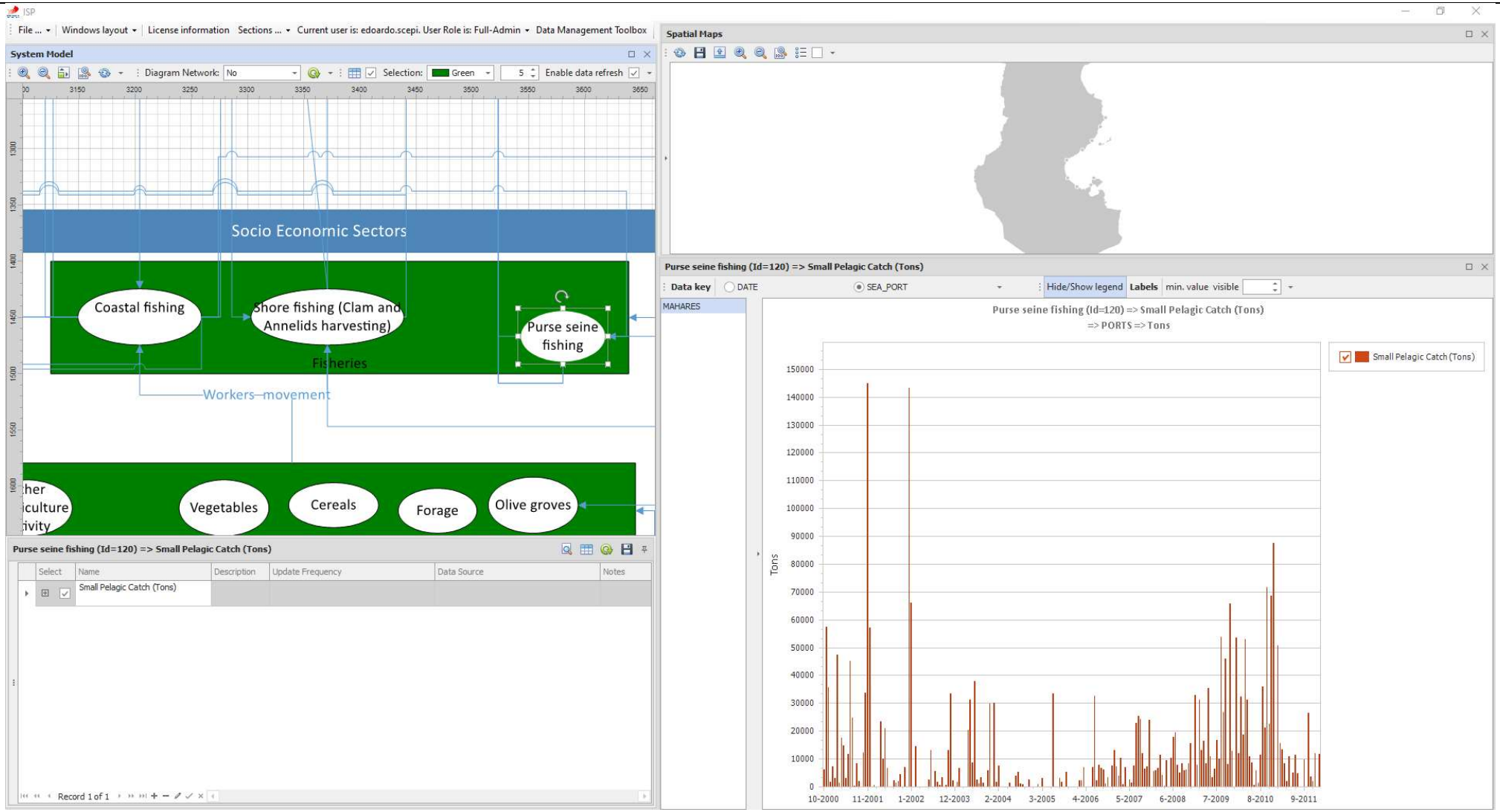

Data on Small Pelagic Fish Catch (Tons)

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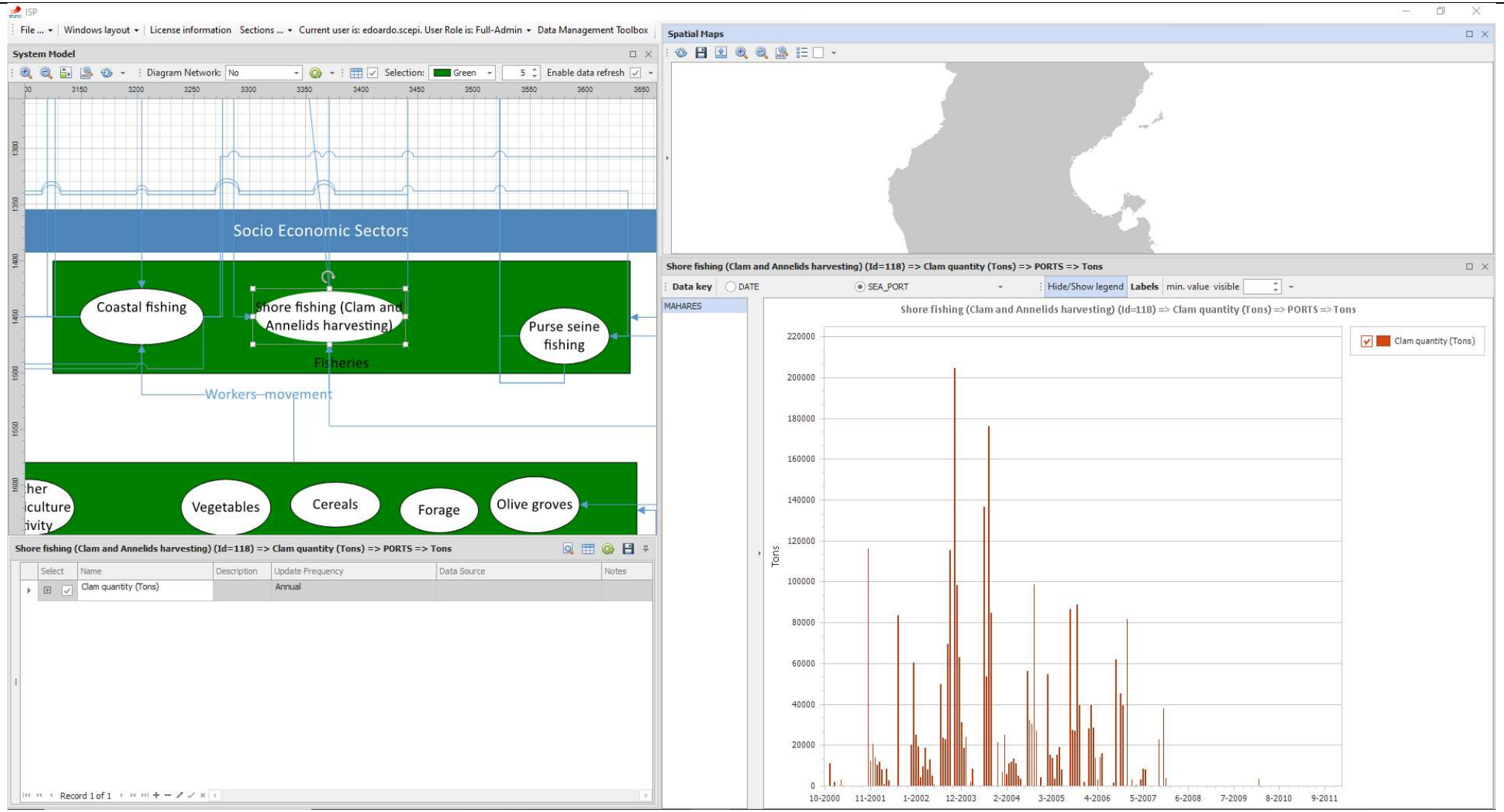

Data on Clam Harvesting Quantity (Tons)

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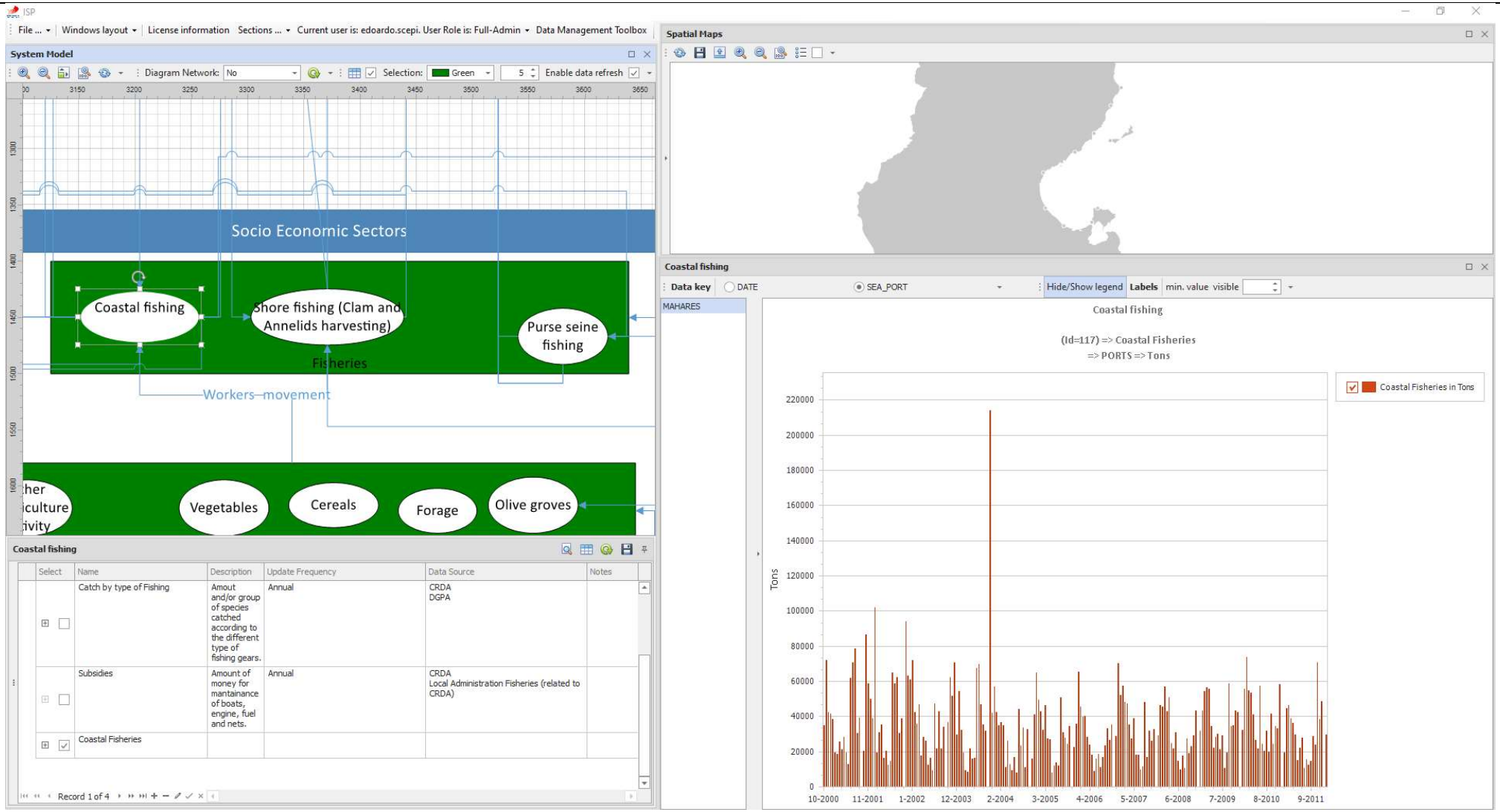

Data on Coastal Fishing Catch (Tons)

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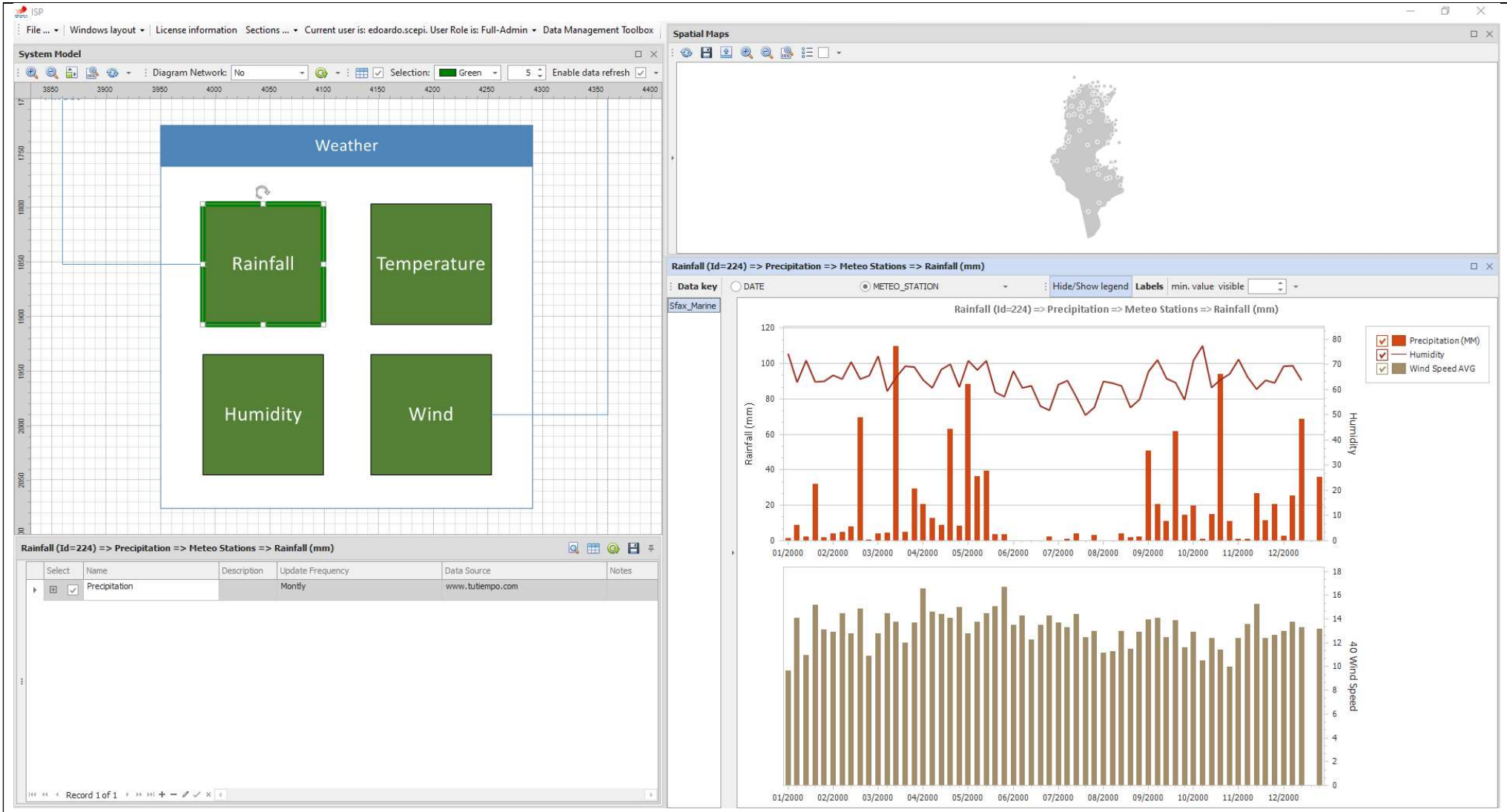

Data on Precipitation (mm) related to Humidity and Average Wind Speed

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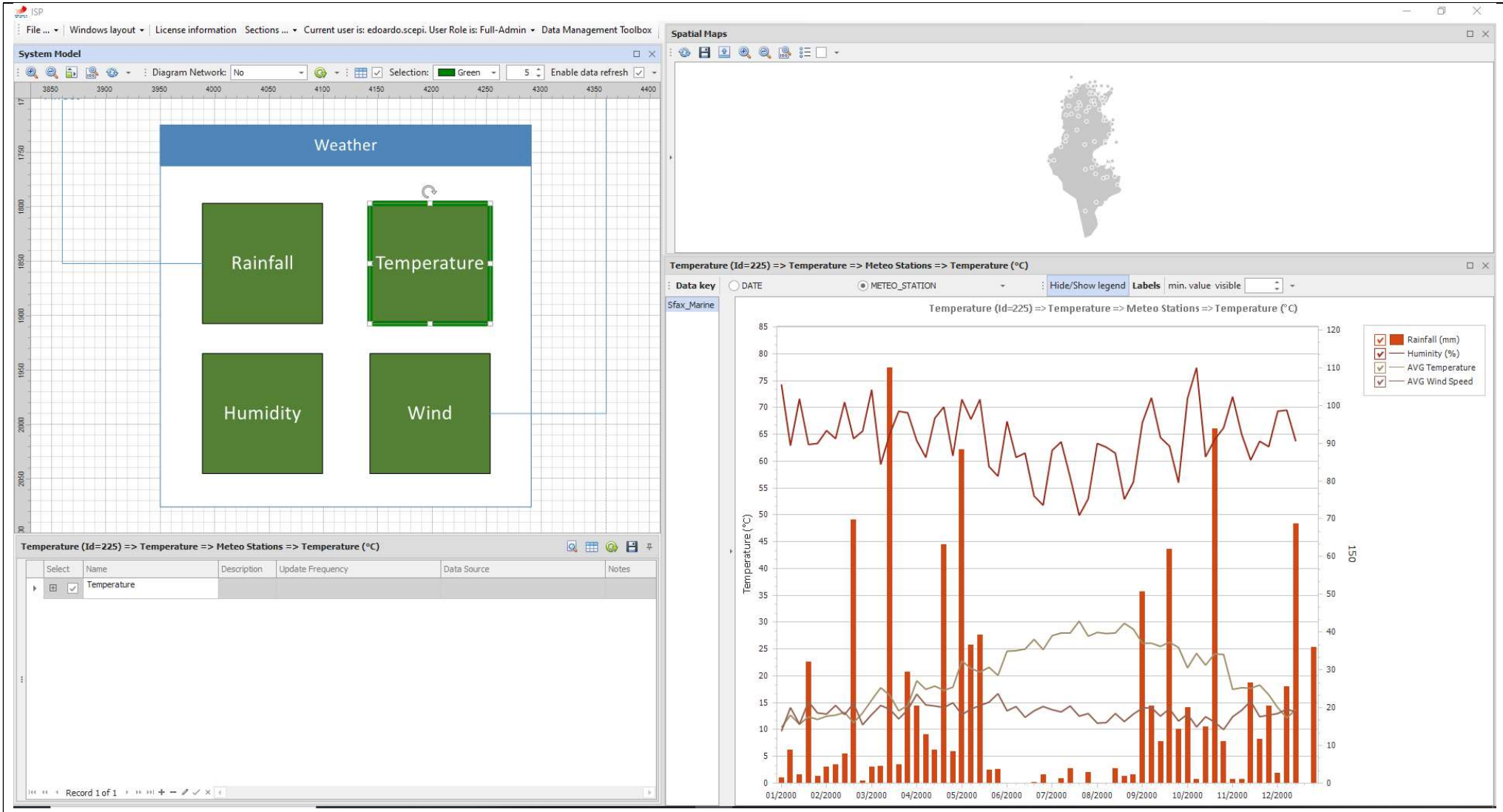

Data on Average Temperature (°C) related to Rainfall, Humidity in % and Average Wind Speed

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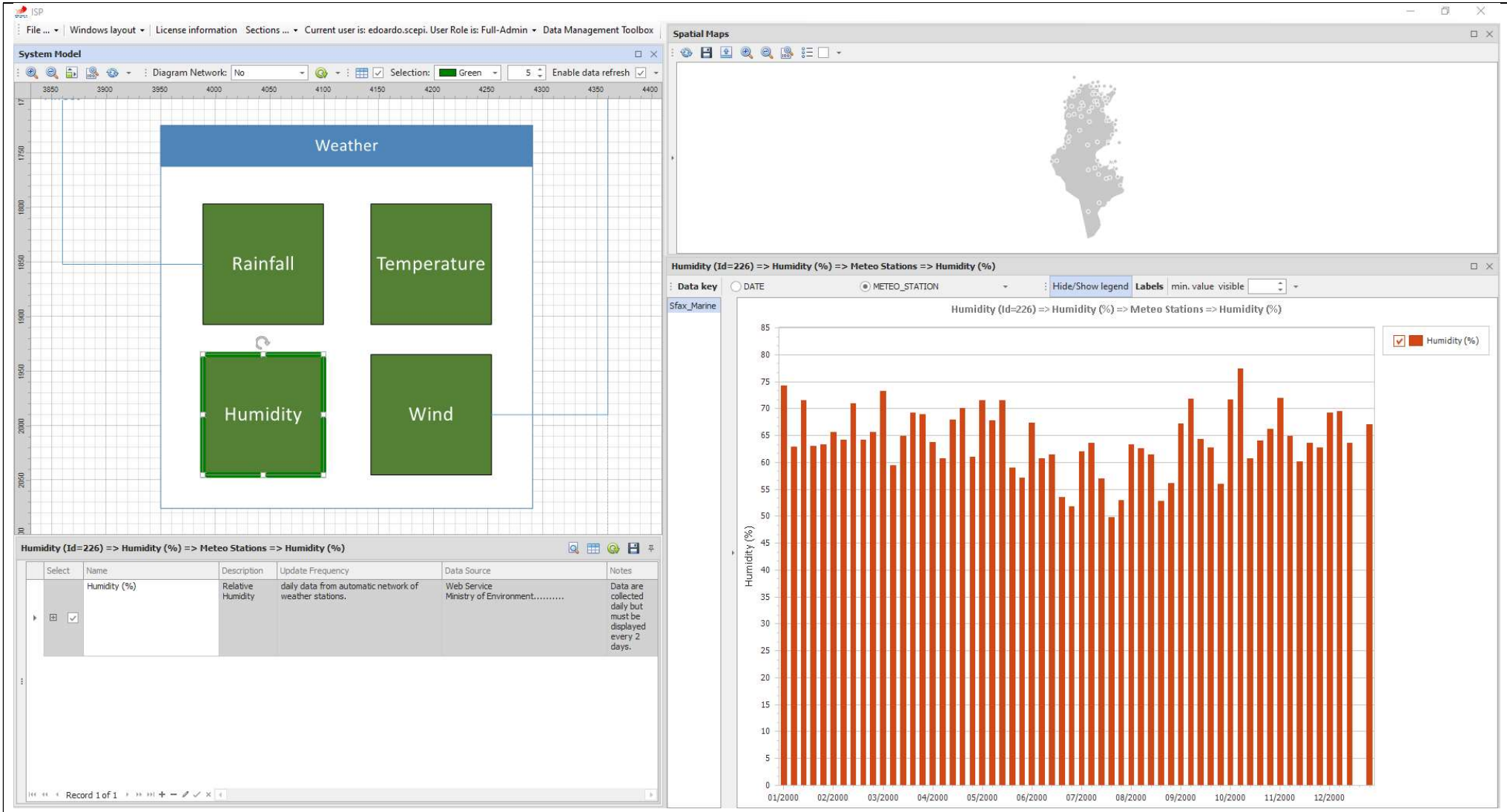

Data on Humidity in %

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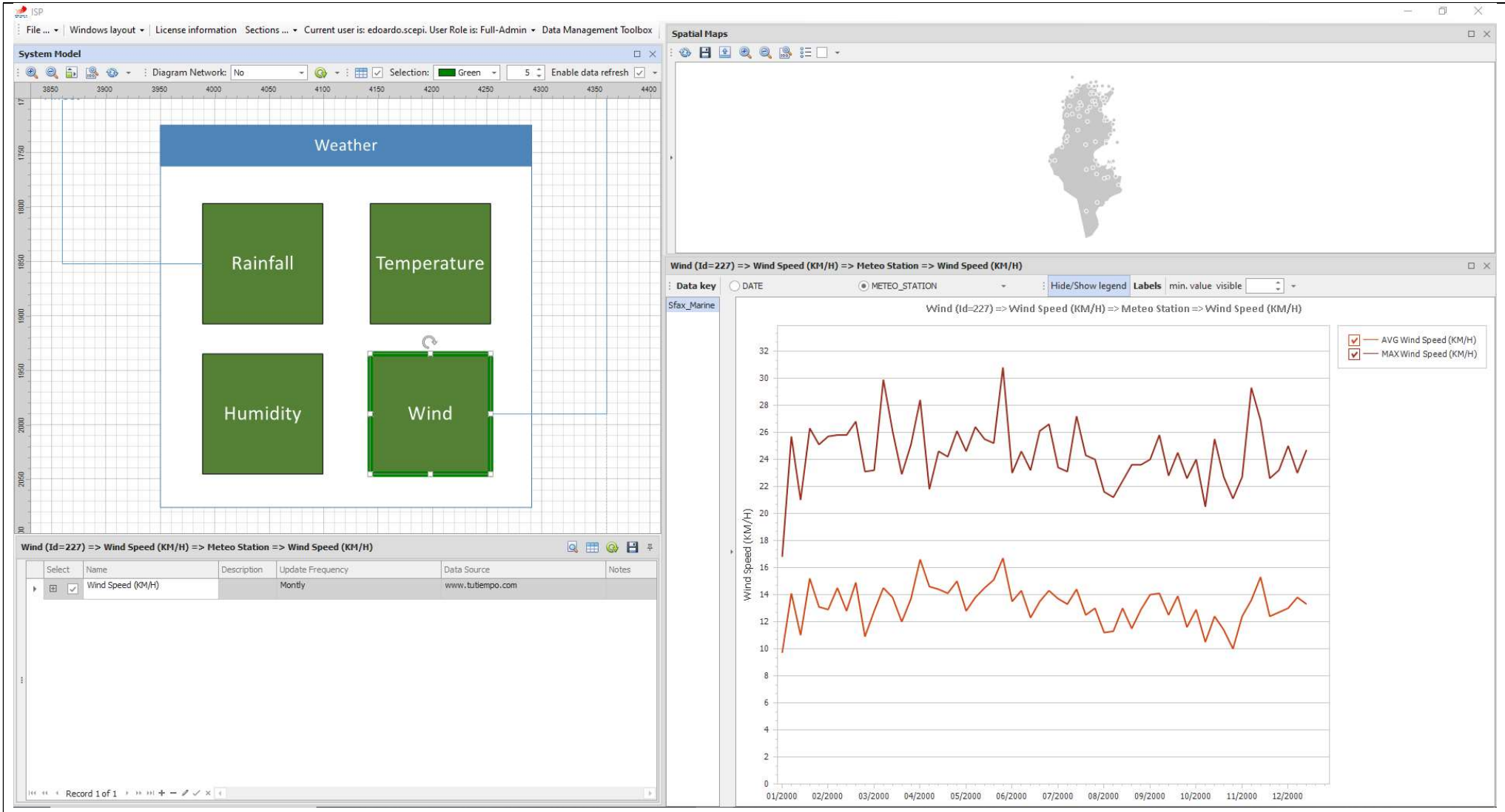

Data on Average and Max Wind Speed (KM/H)

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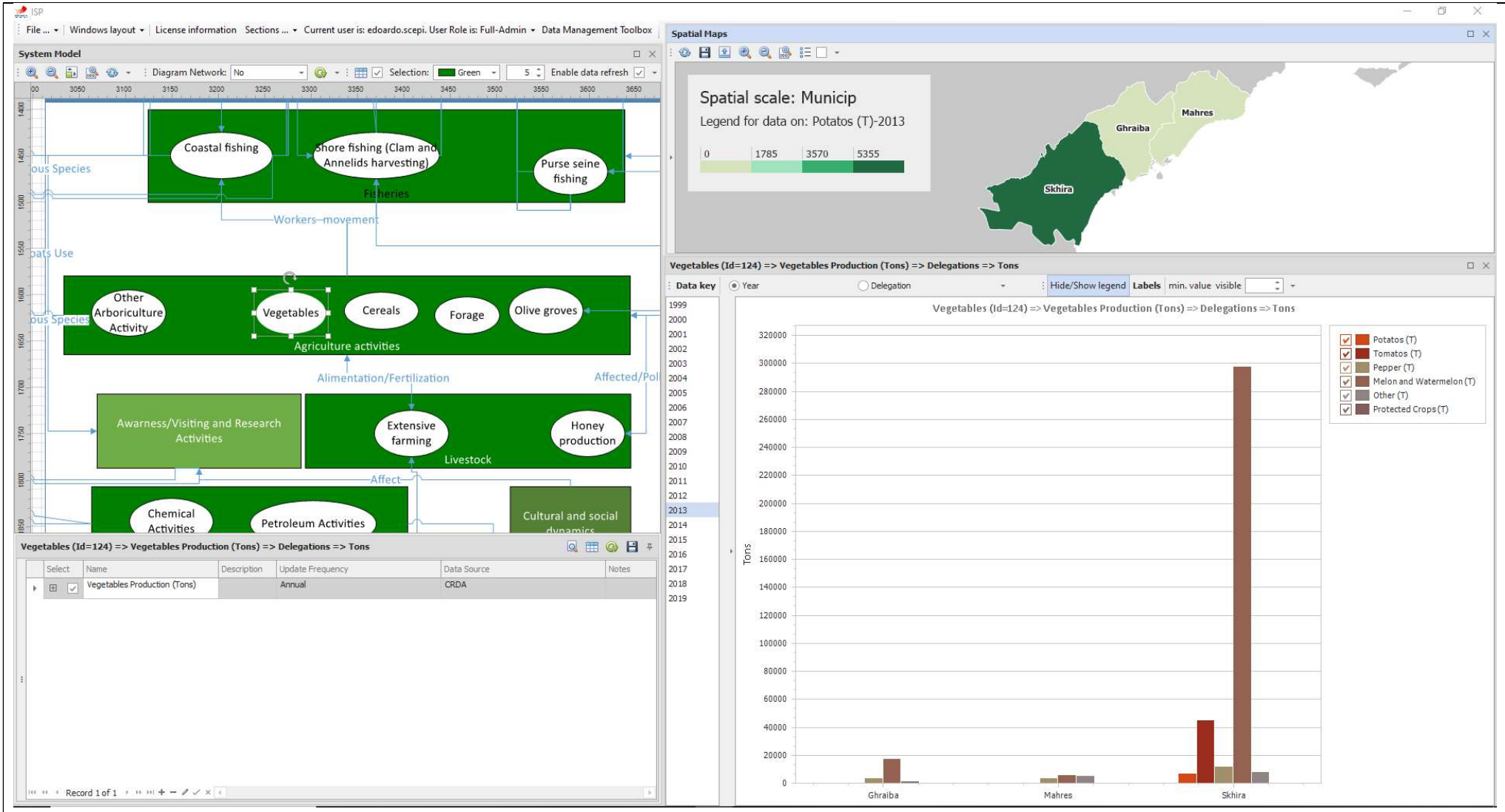

Data on Annual Vegetables Productions (Tons)

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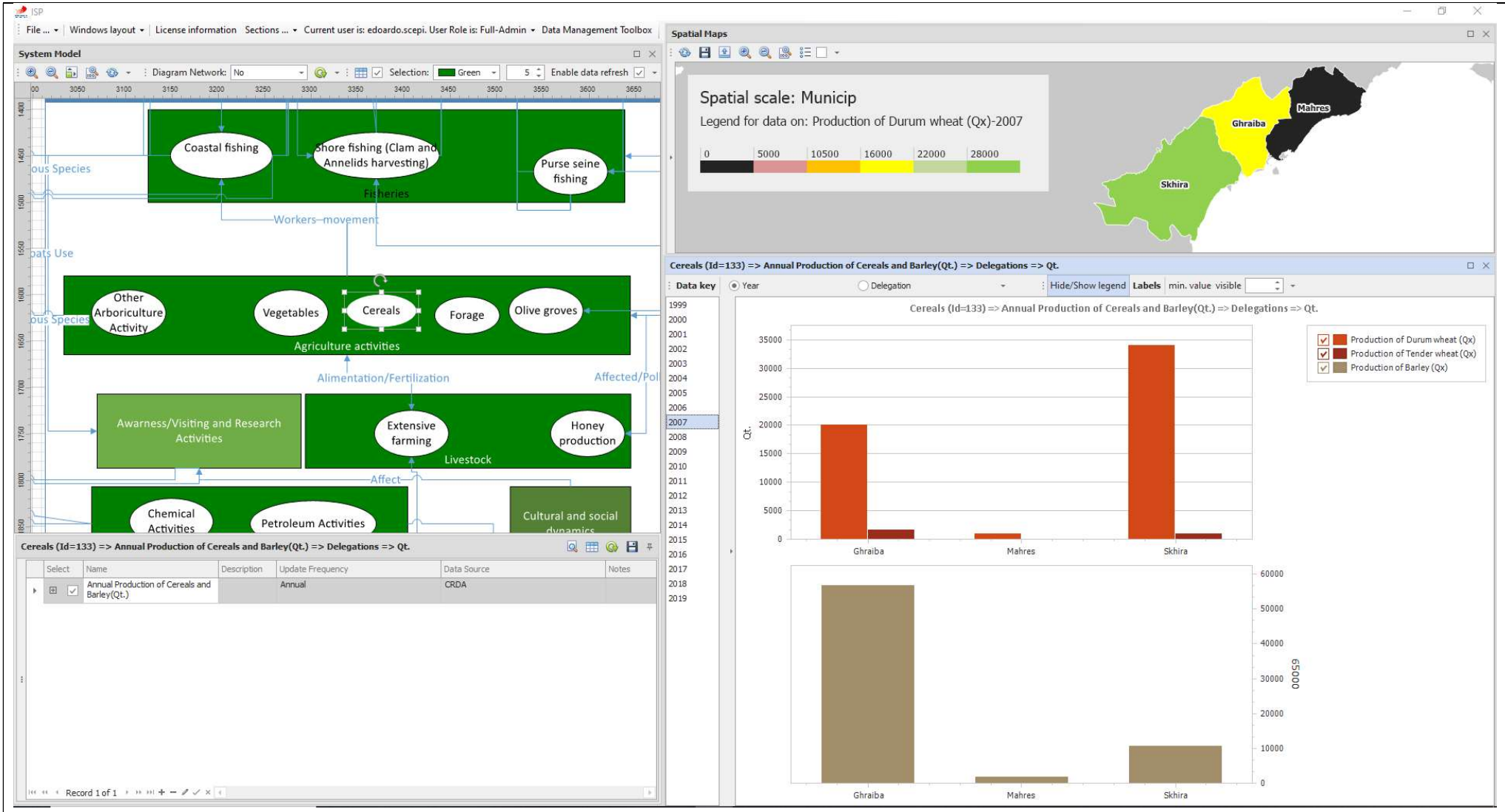

Data on Annual Production of Cereals and Barley (Qt.)

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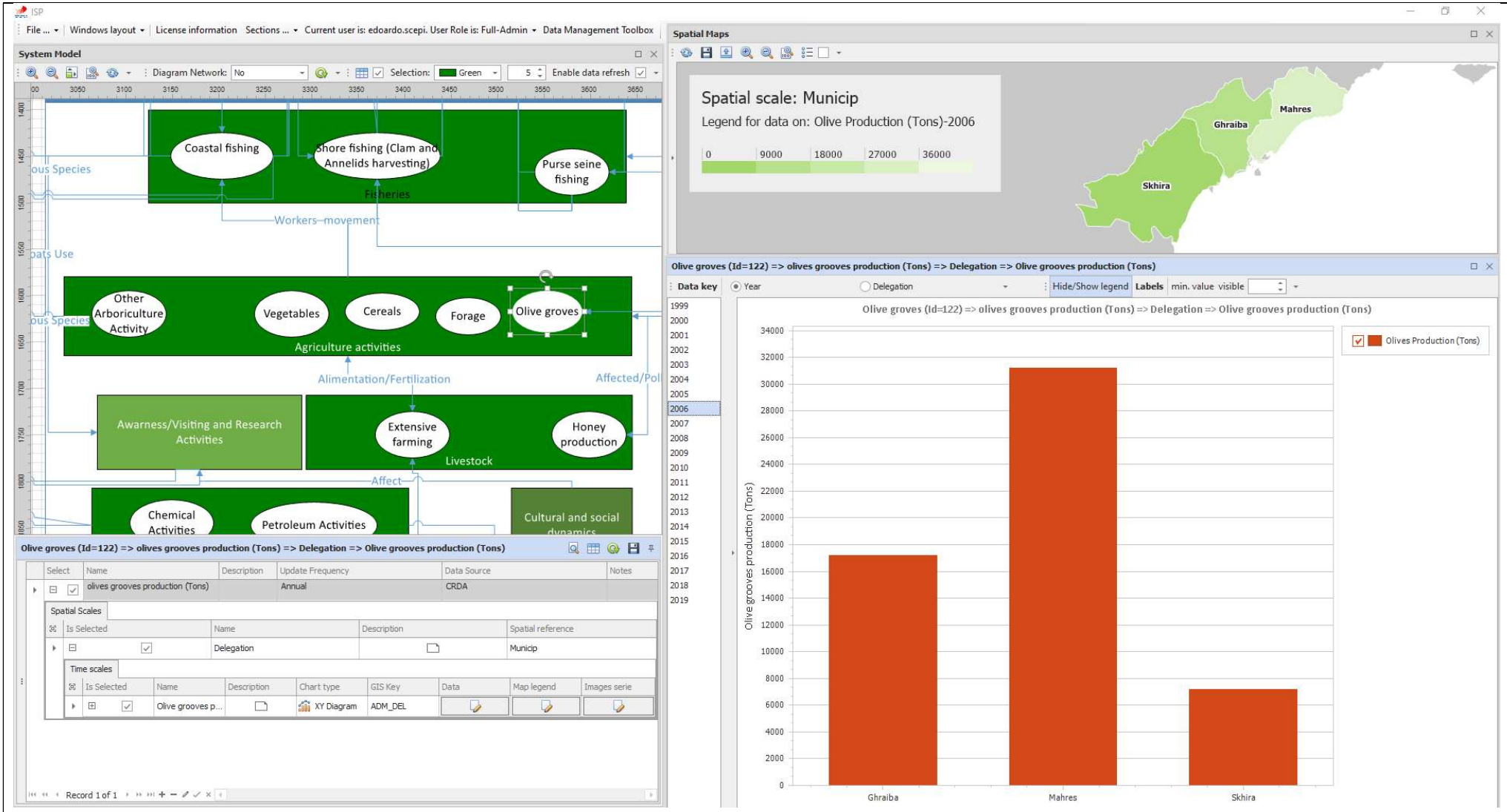

Data on Annual Olives Grooves Production (Tons)

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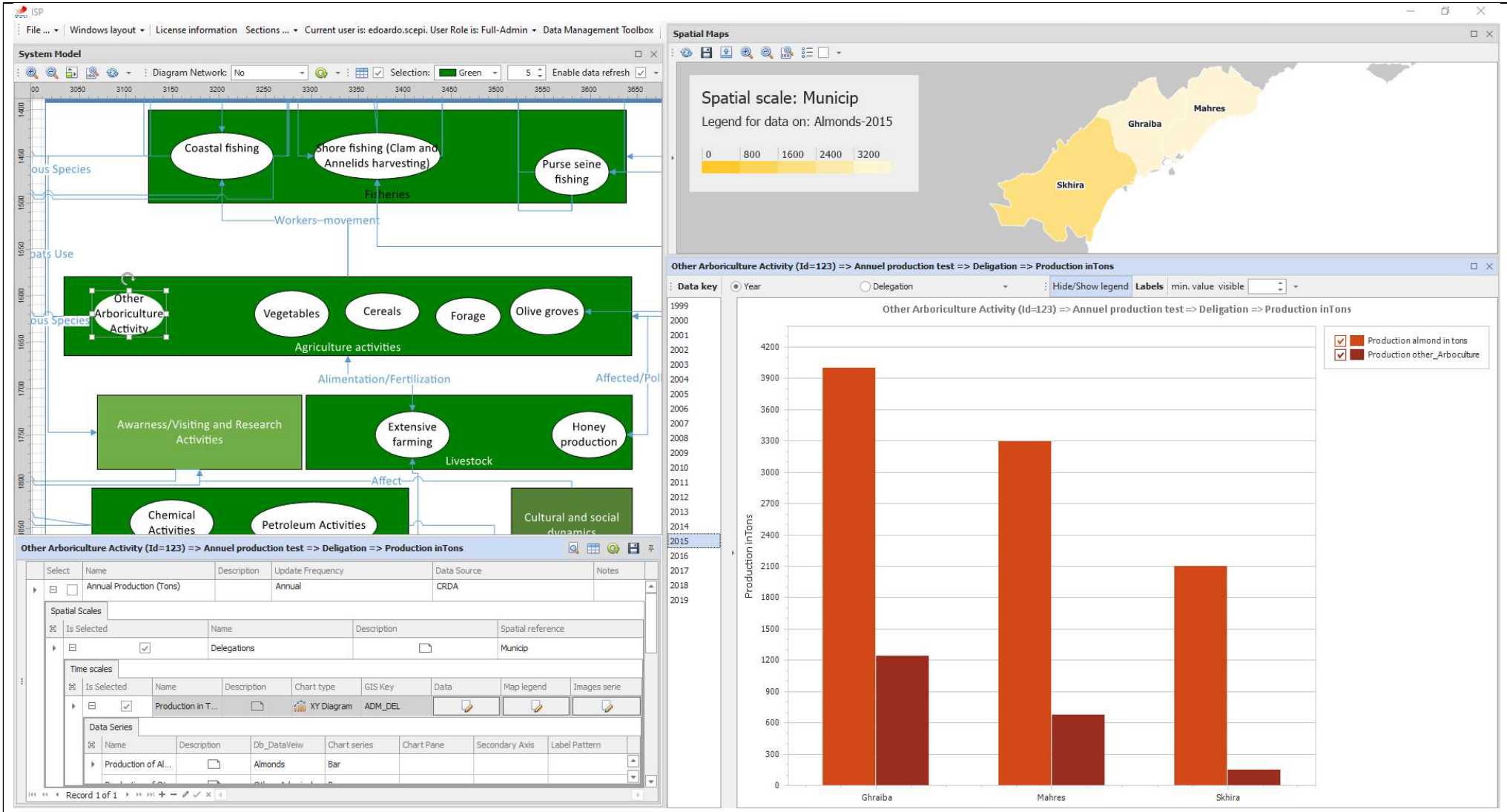

Data on Annual Production of Almonds and Other Arboriculture Activity (Tons)

Prepared by: E. Scepi.
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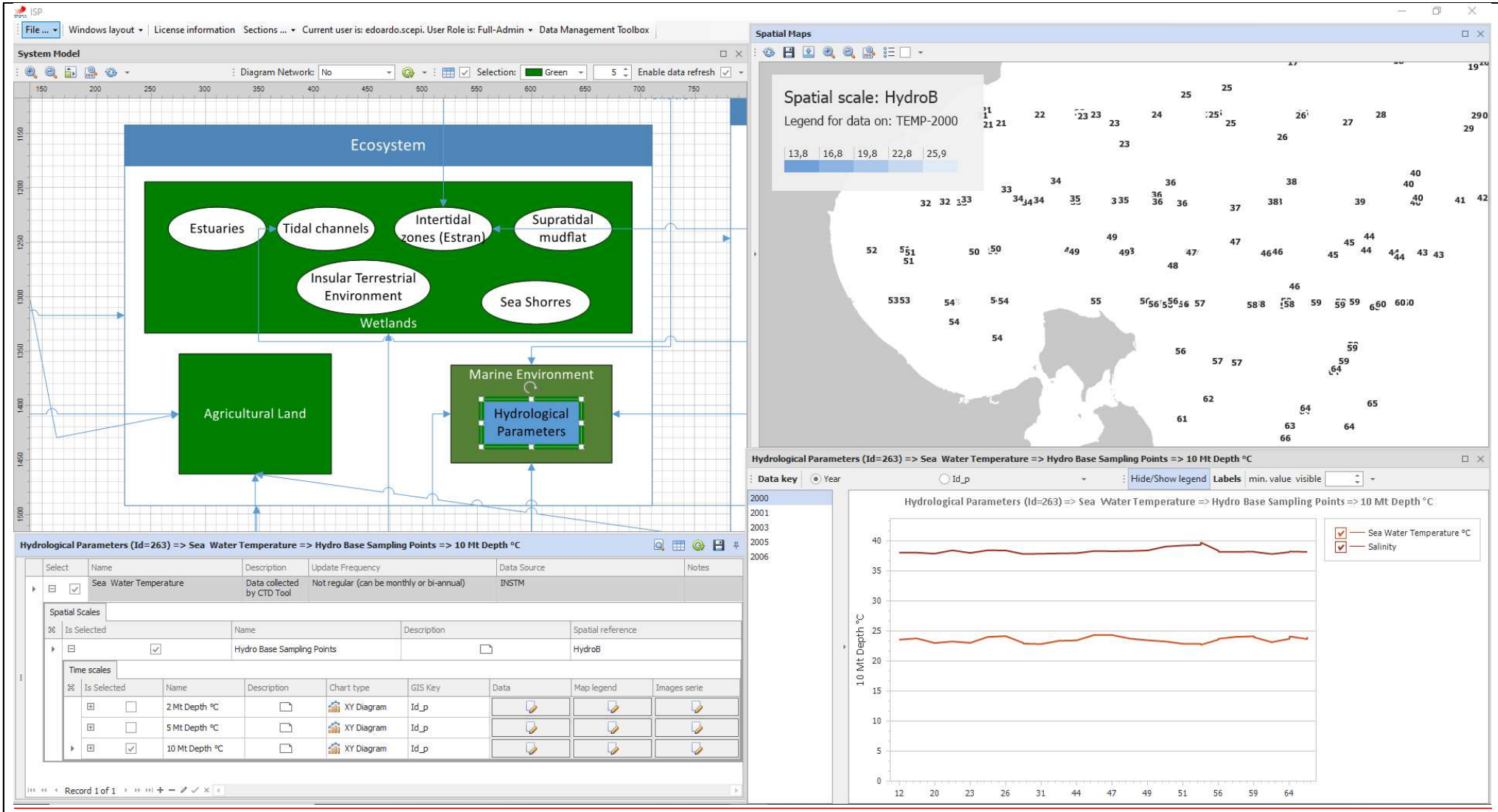
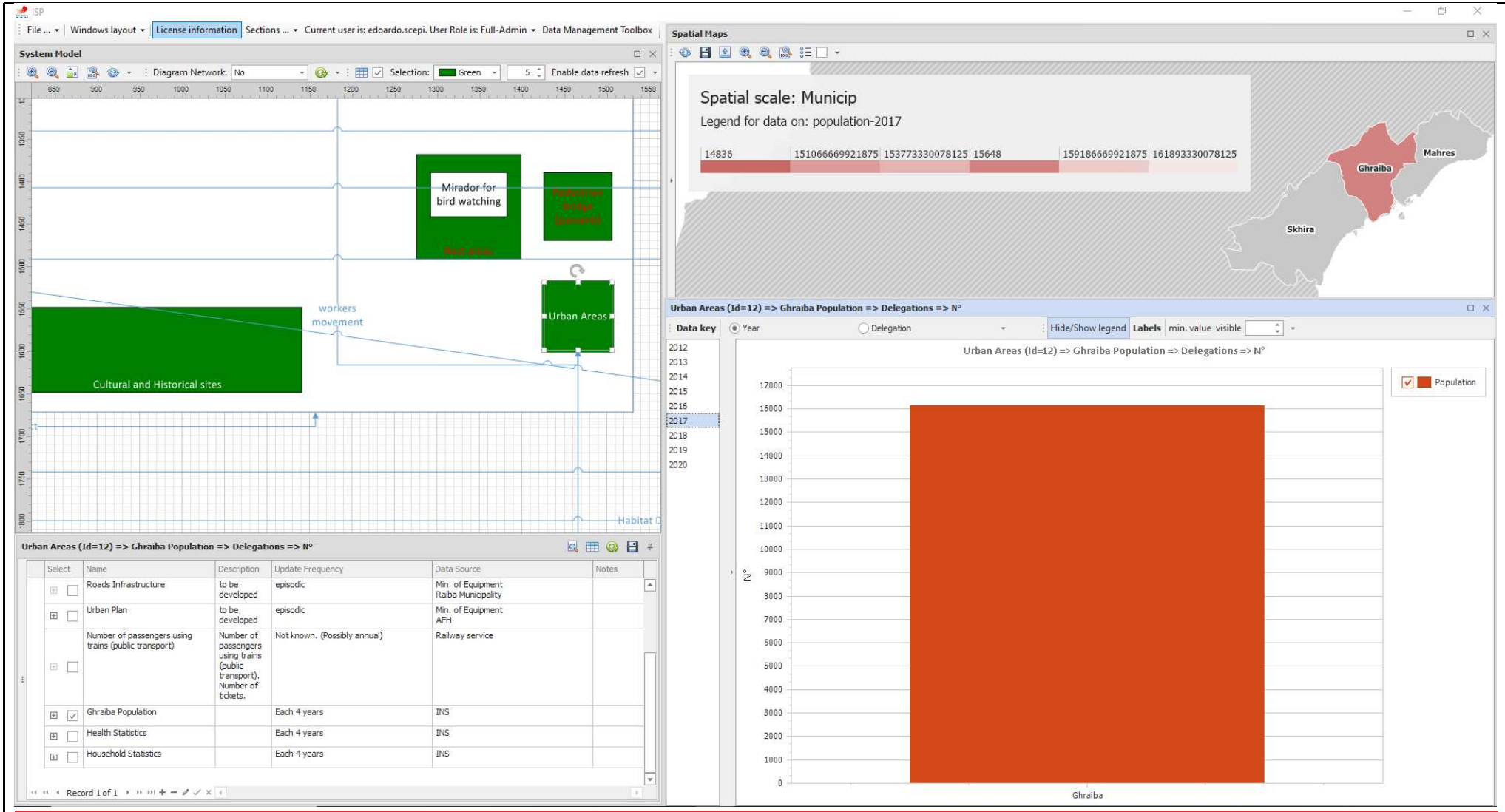


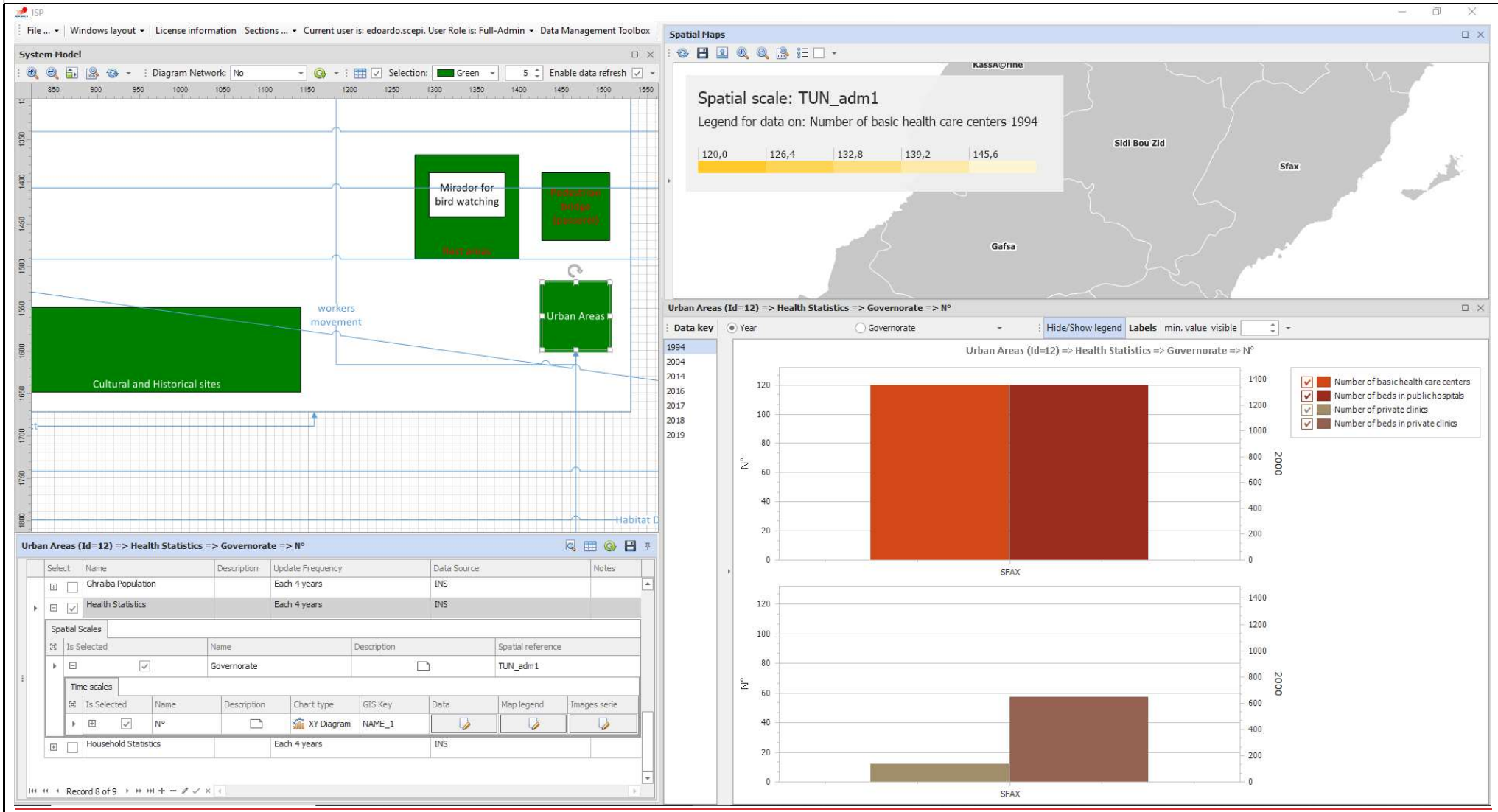
Data on Sea Water Temperature (°C) related to Salinity at 10 mt depth

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



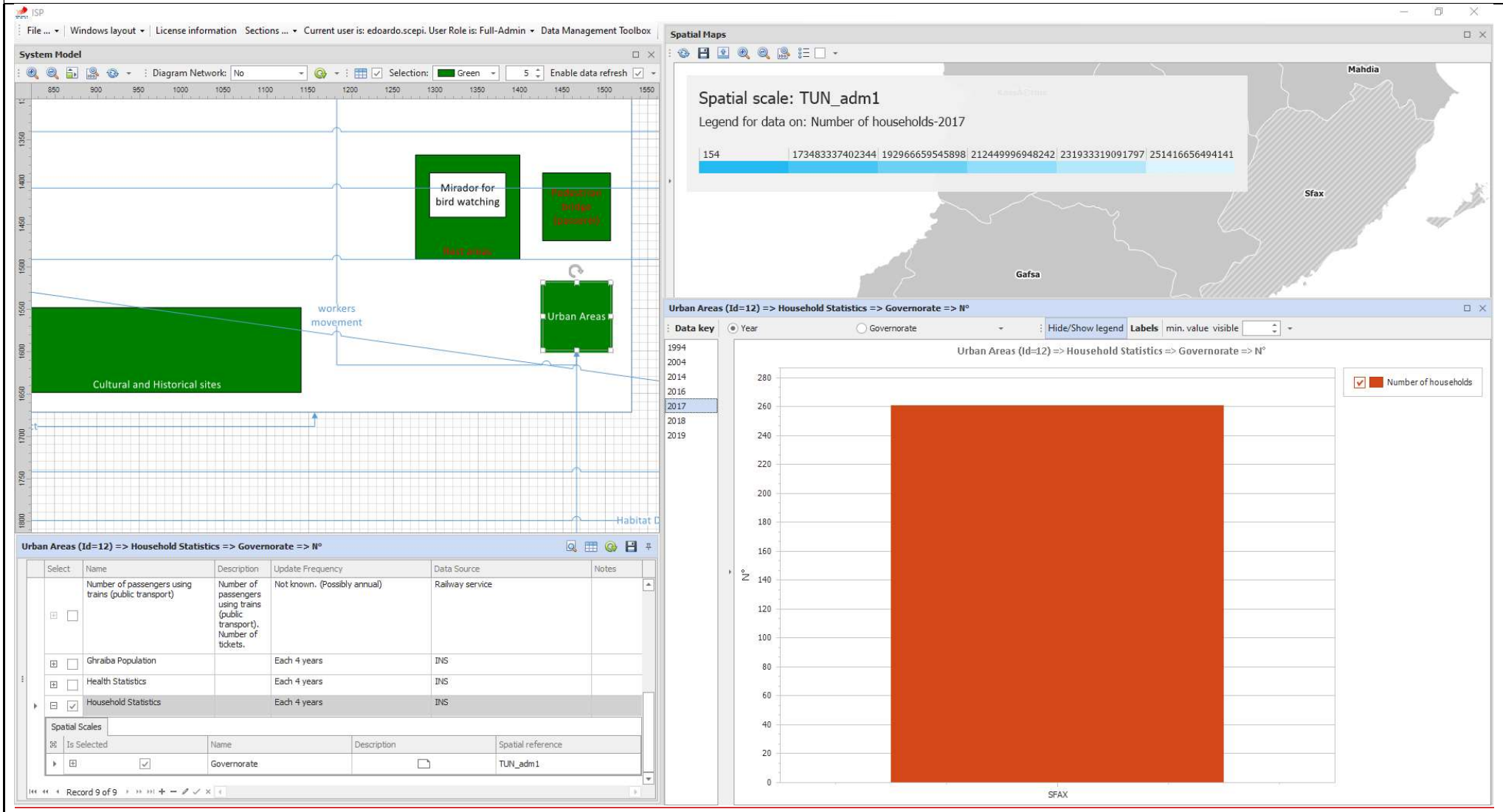
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

Data on Population Statistics



Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

Data on Health Statistics

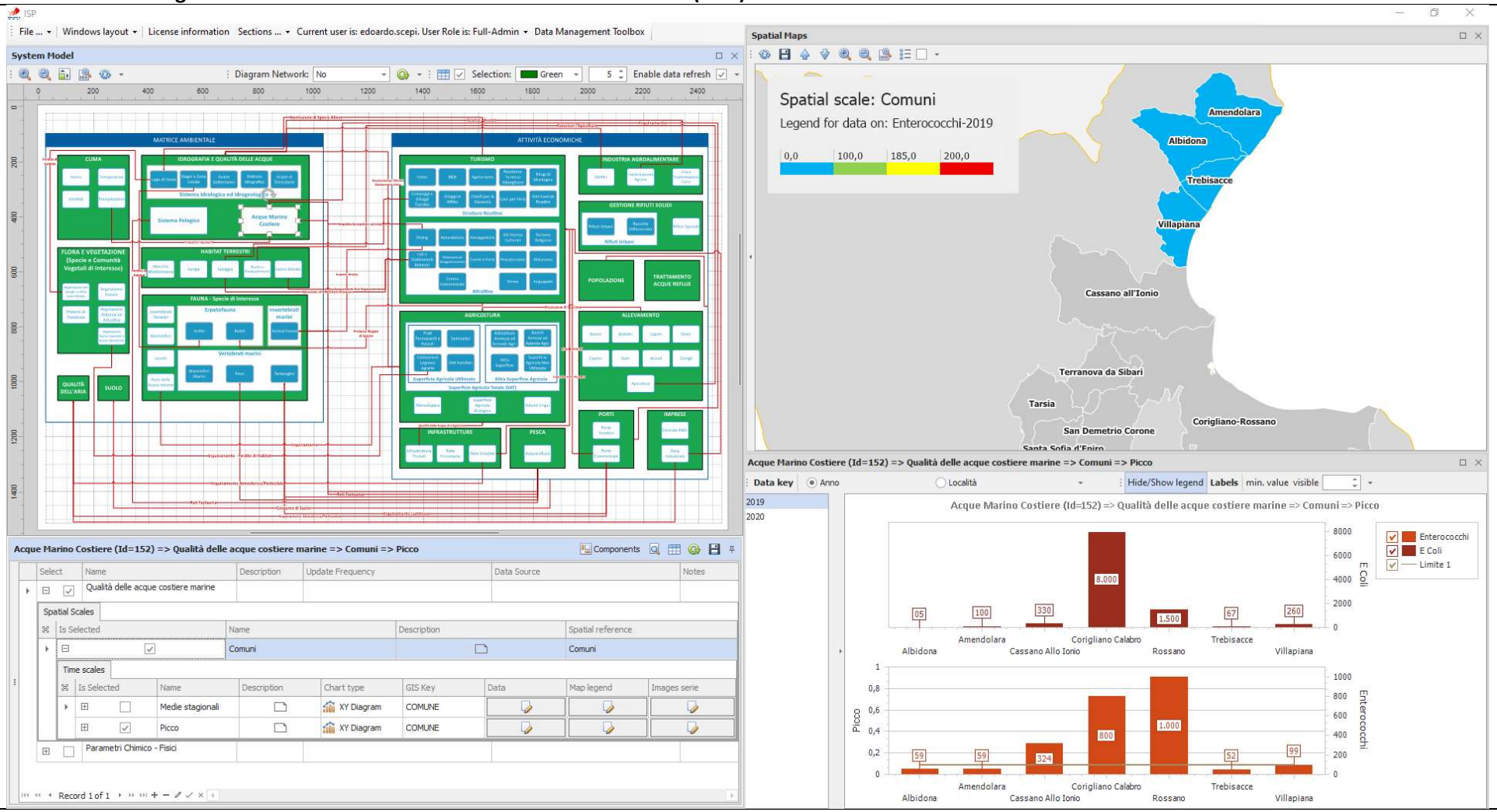


Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

MED4EBM

Data on Household Statistics

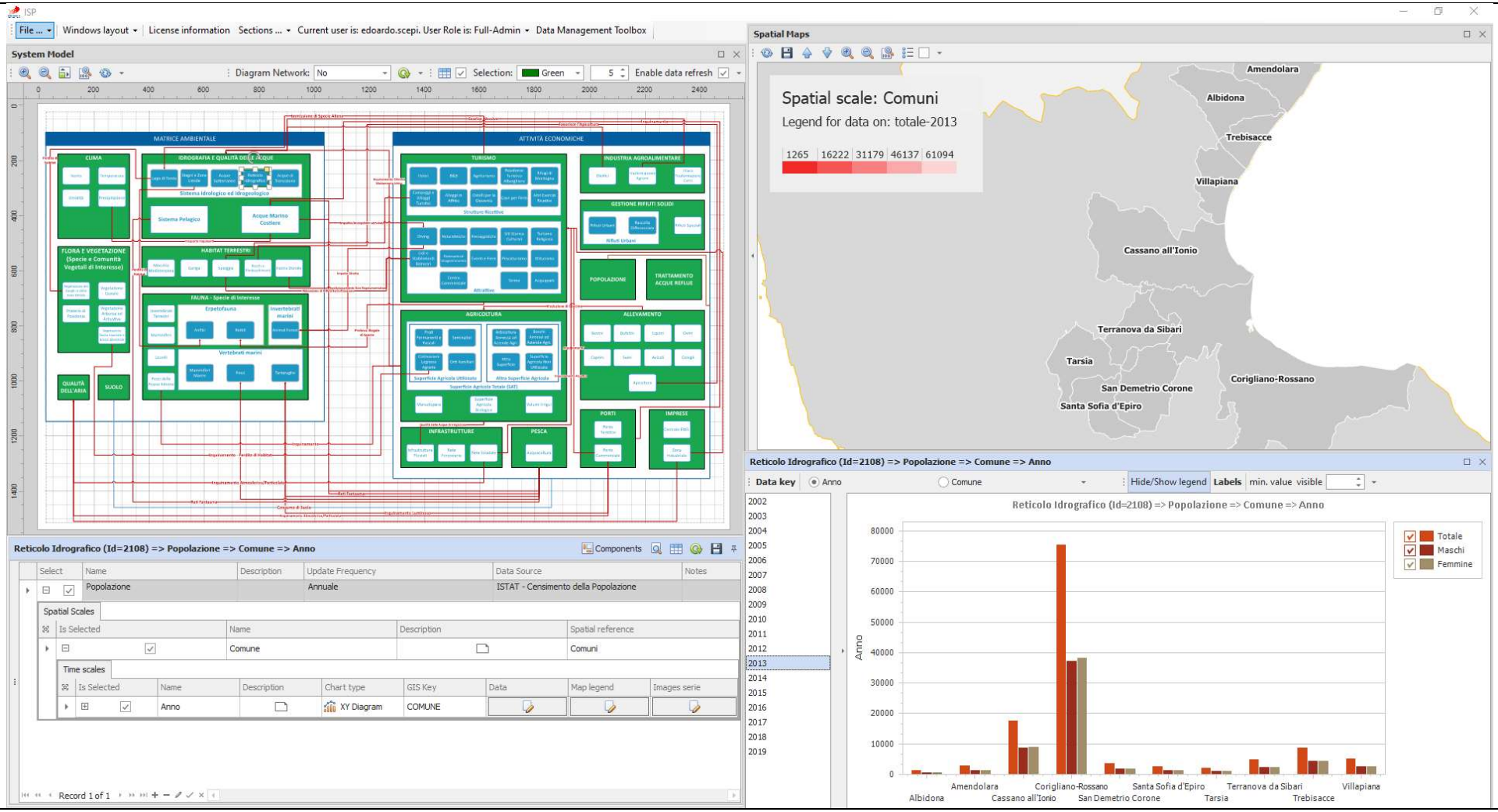
Riserva Naturale del Lago di Tarsia e della Foce del Fiume Crati EB-ICZM-DSSS (ADT)



Data on Coastal Sea Water Quality

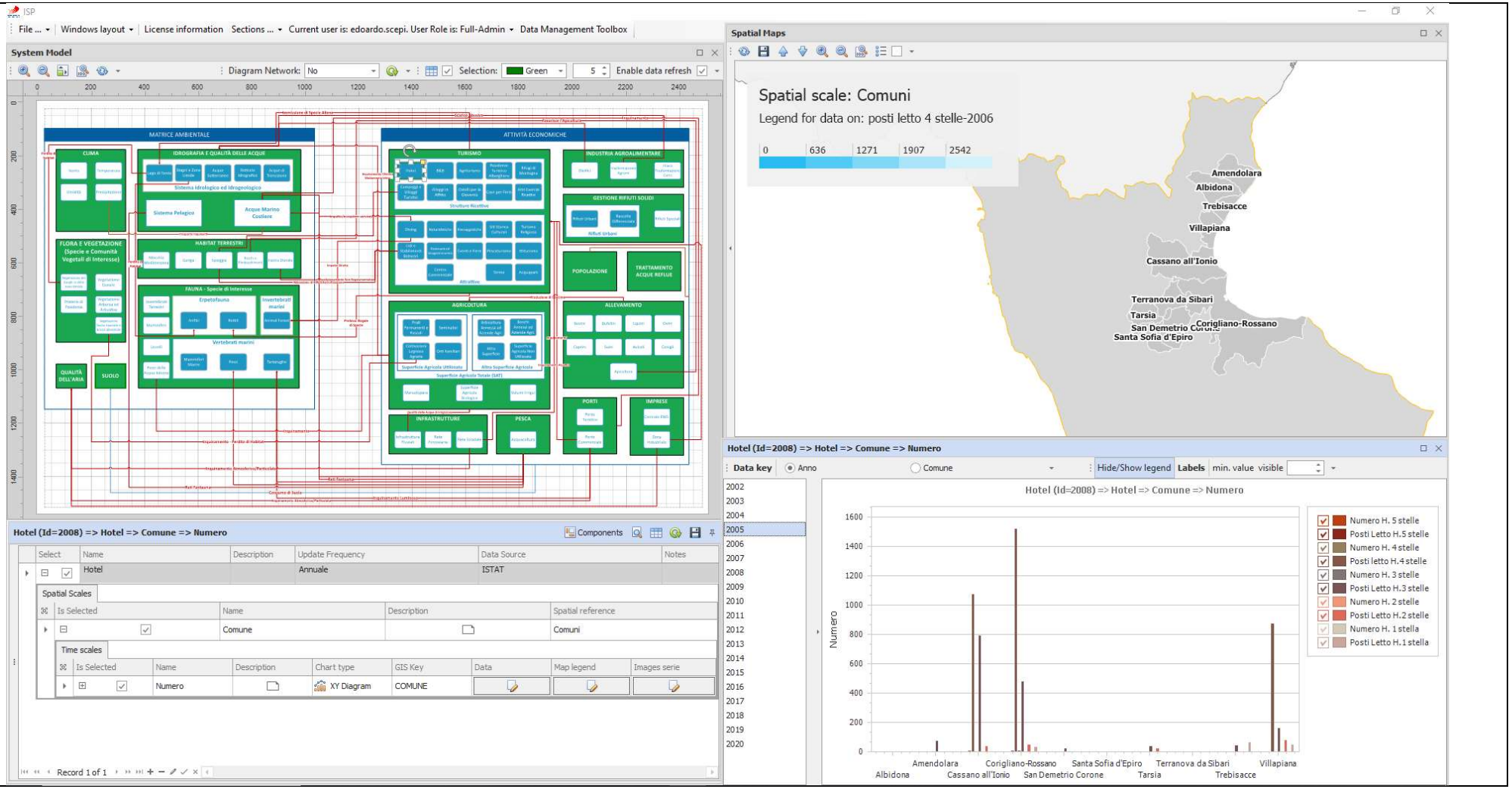
Prepared by: E. Scepi.

Amici Della Terra - ONLUS - www.amicidellaterra.it/

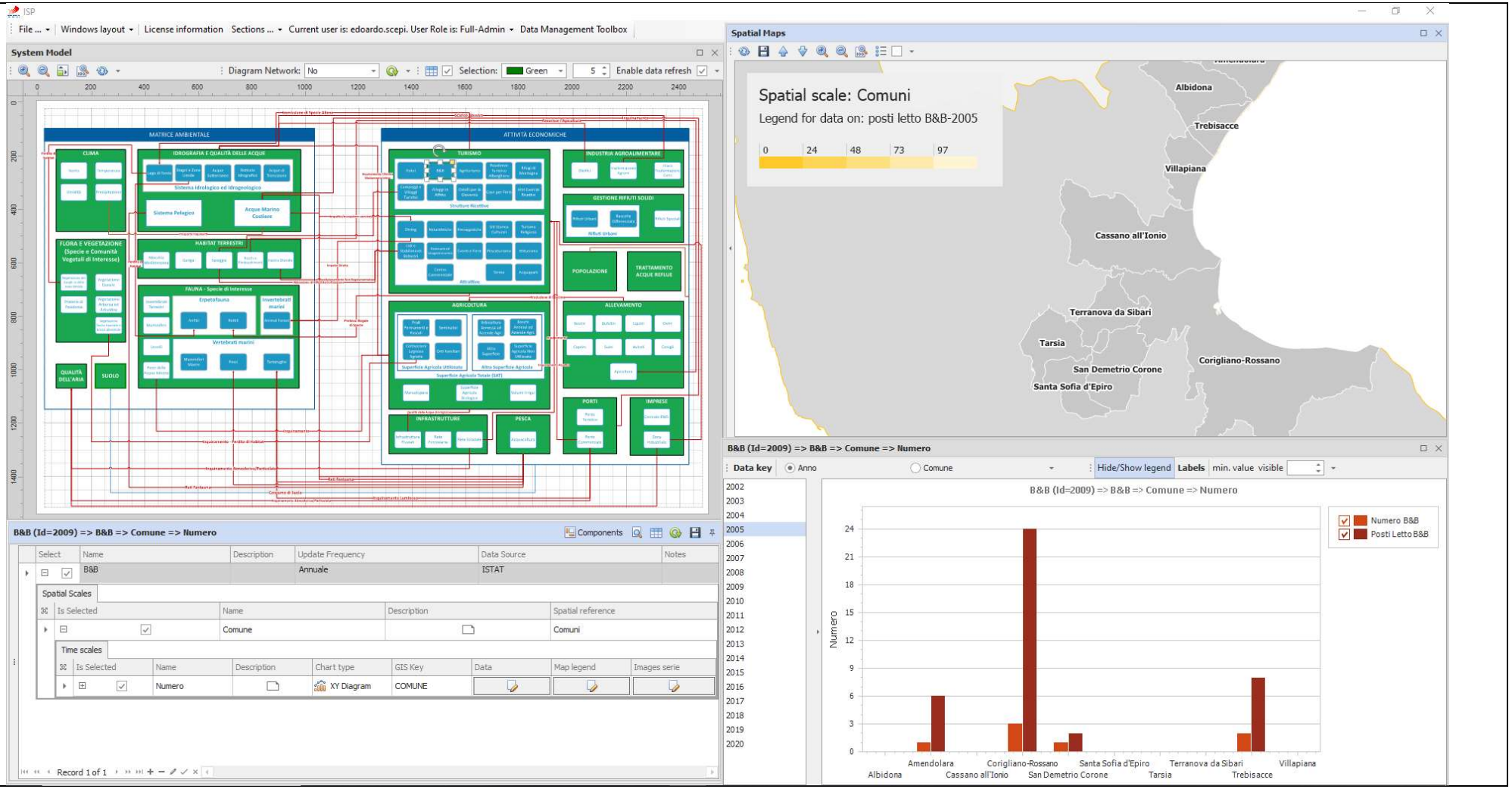


Data on Population Statistics

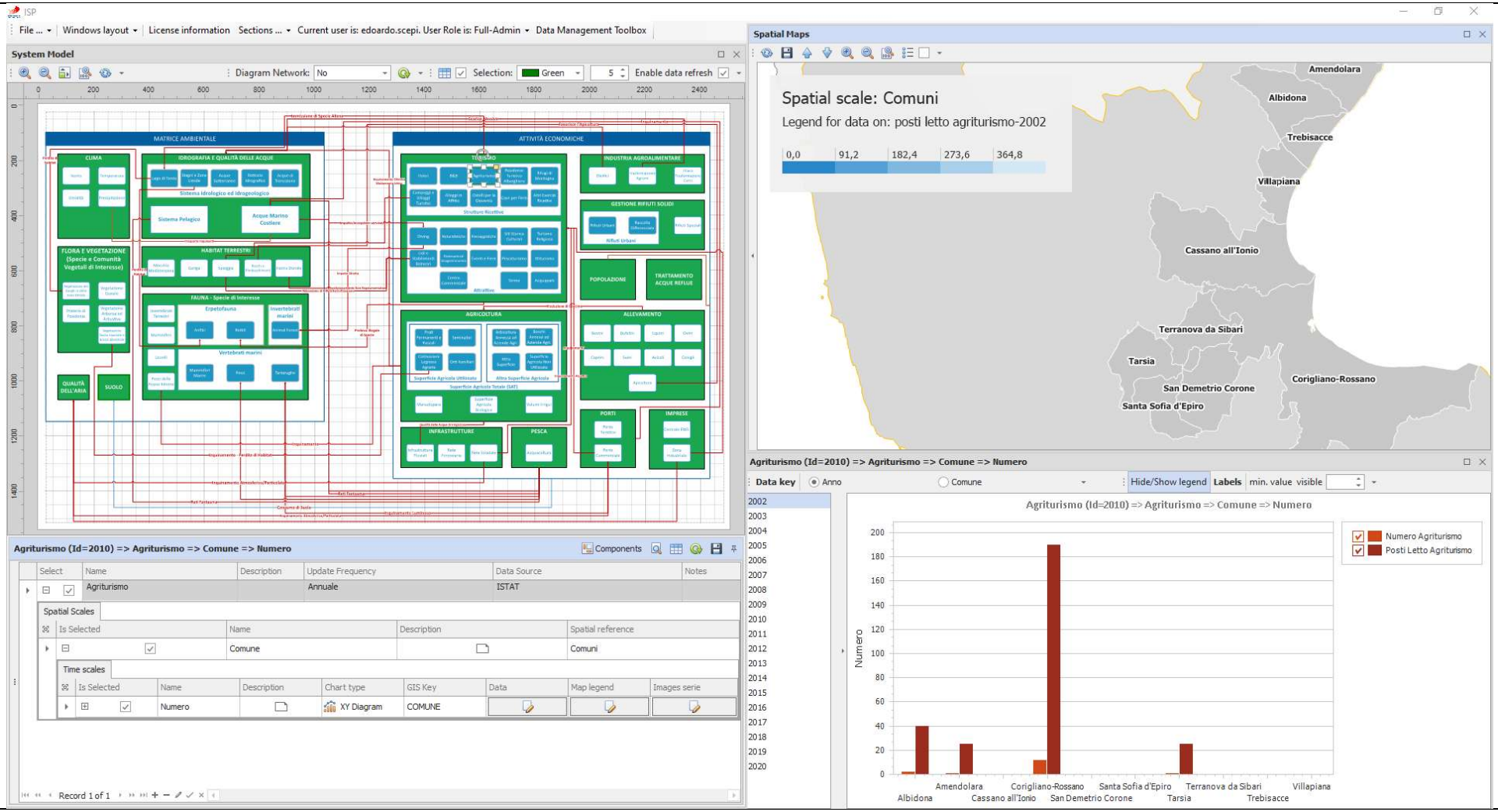
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



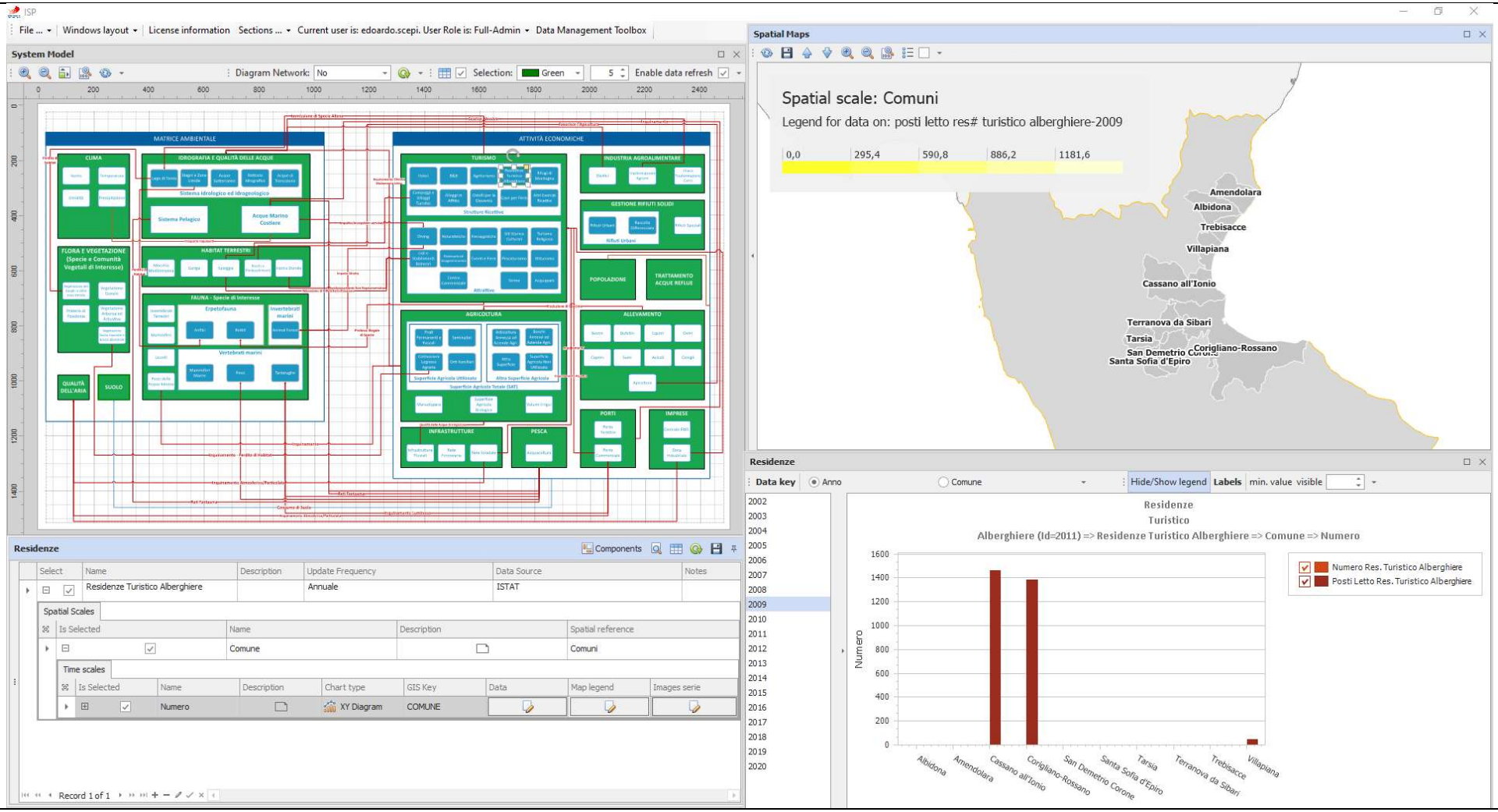
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

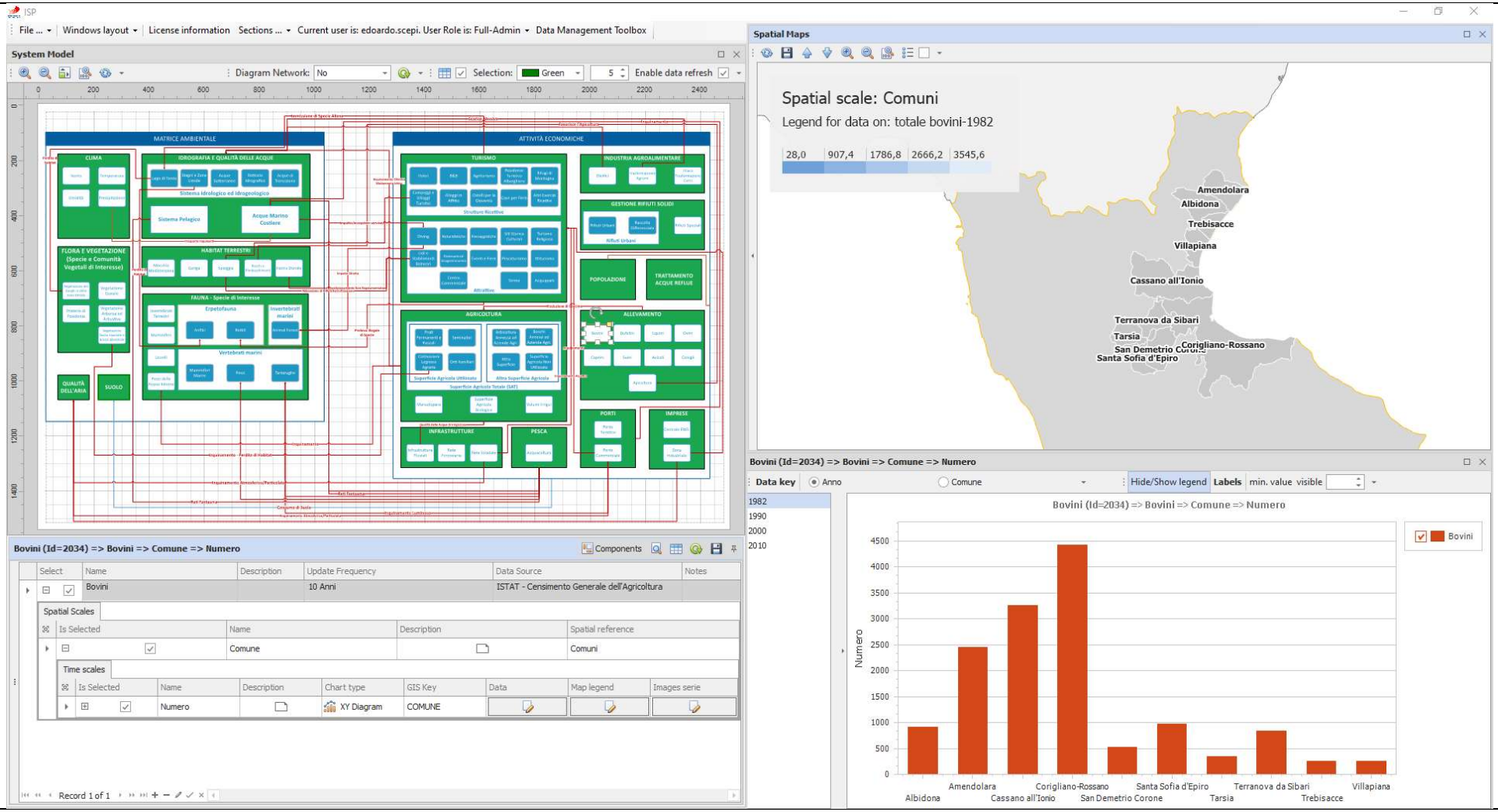


Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

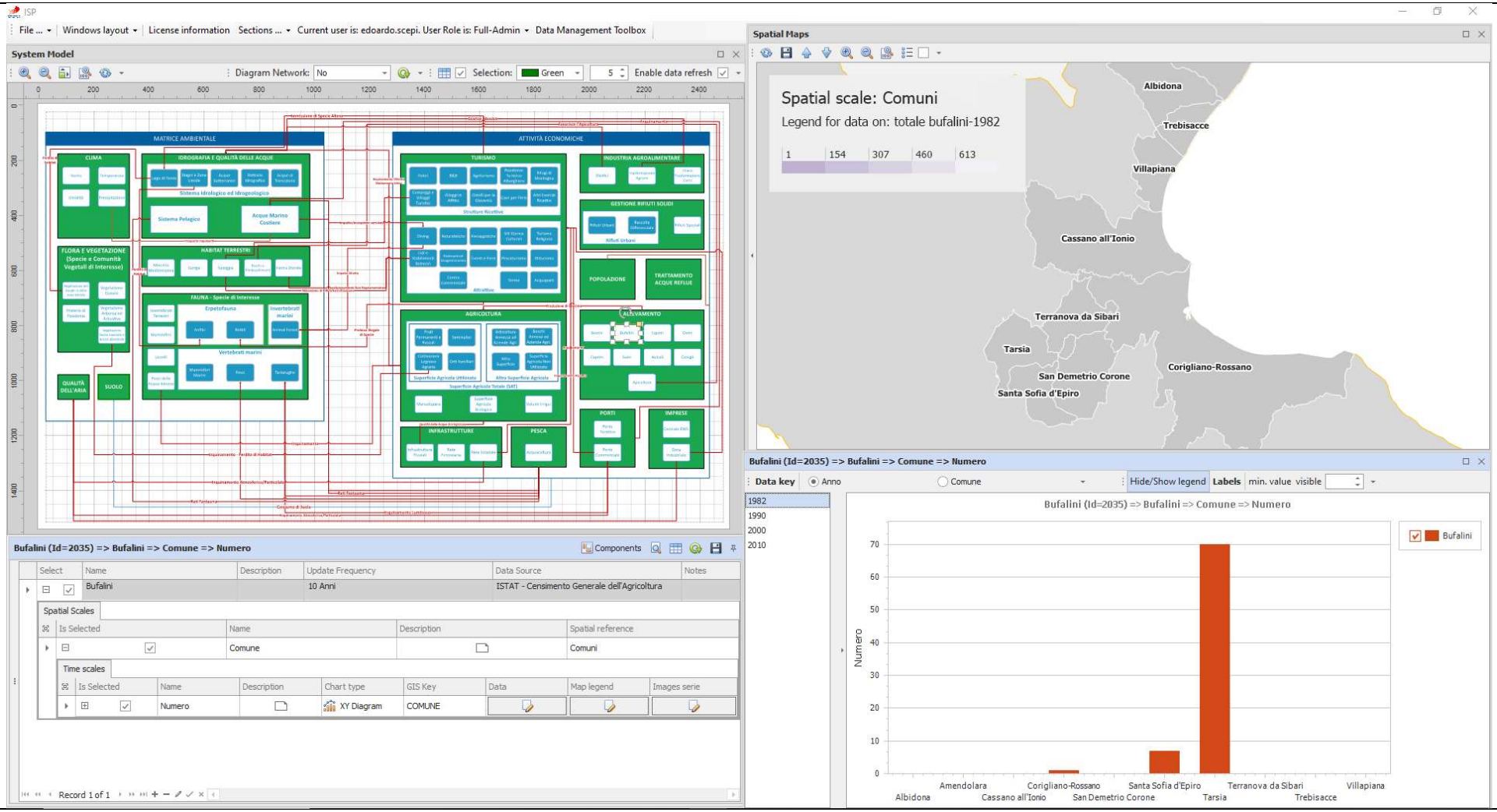


Data on Touristic Statistics

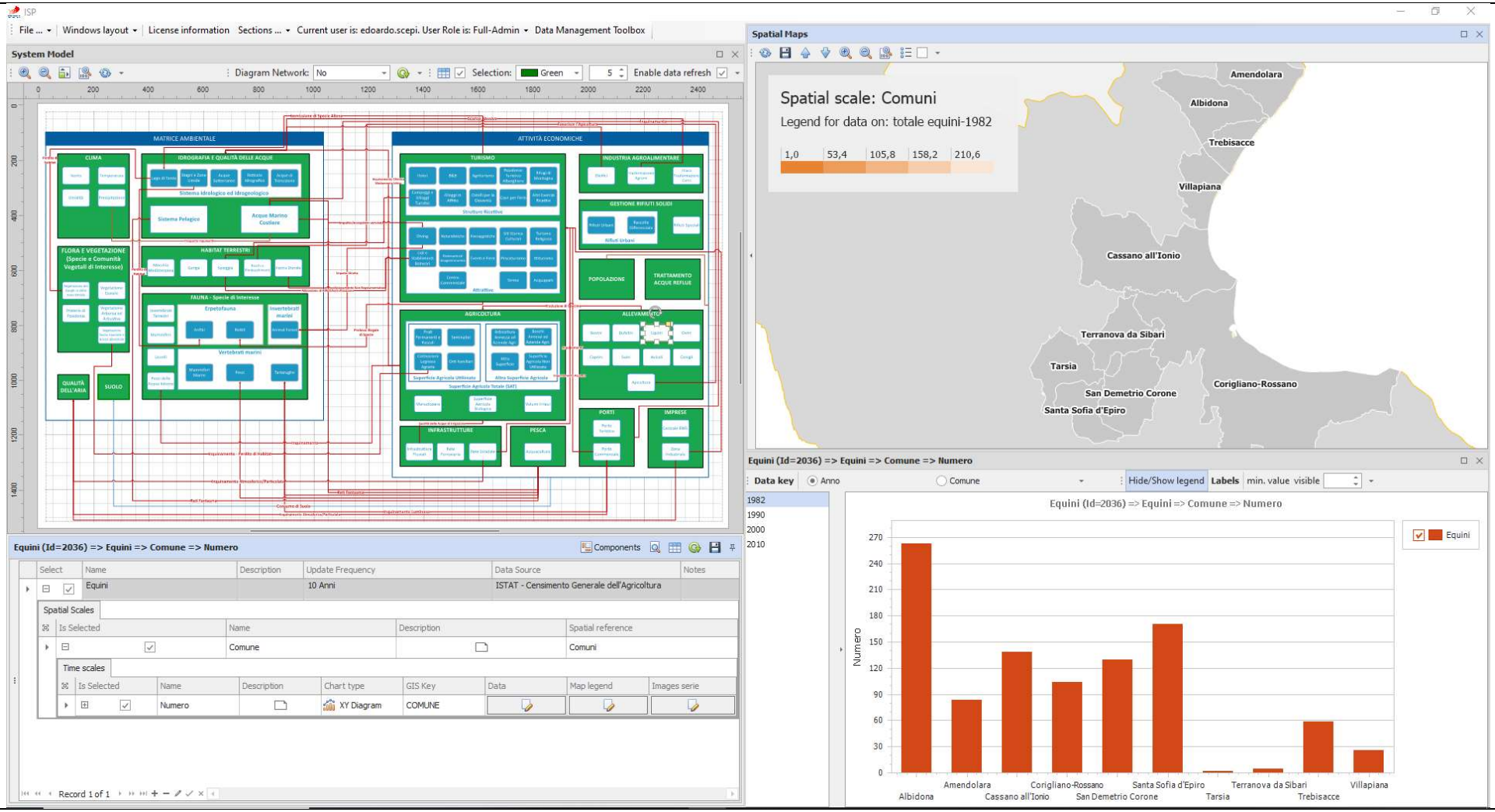
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



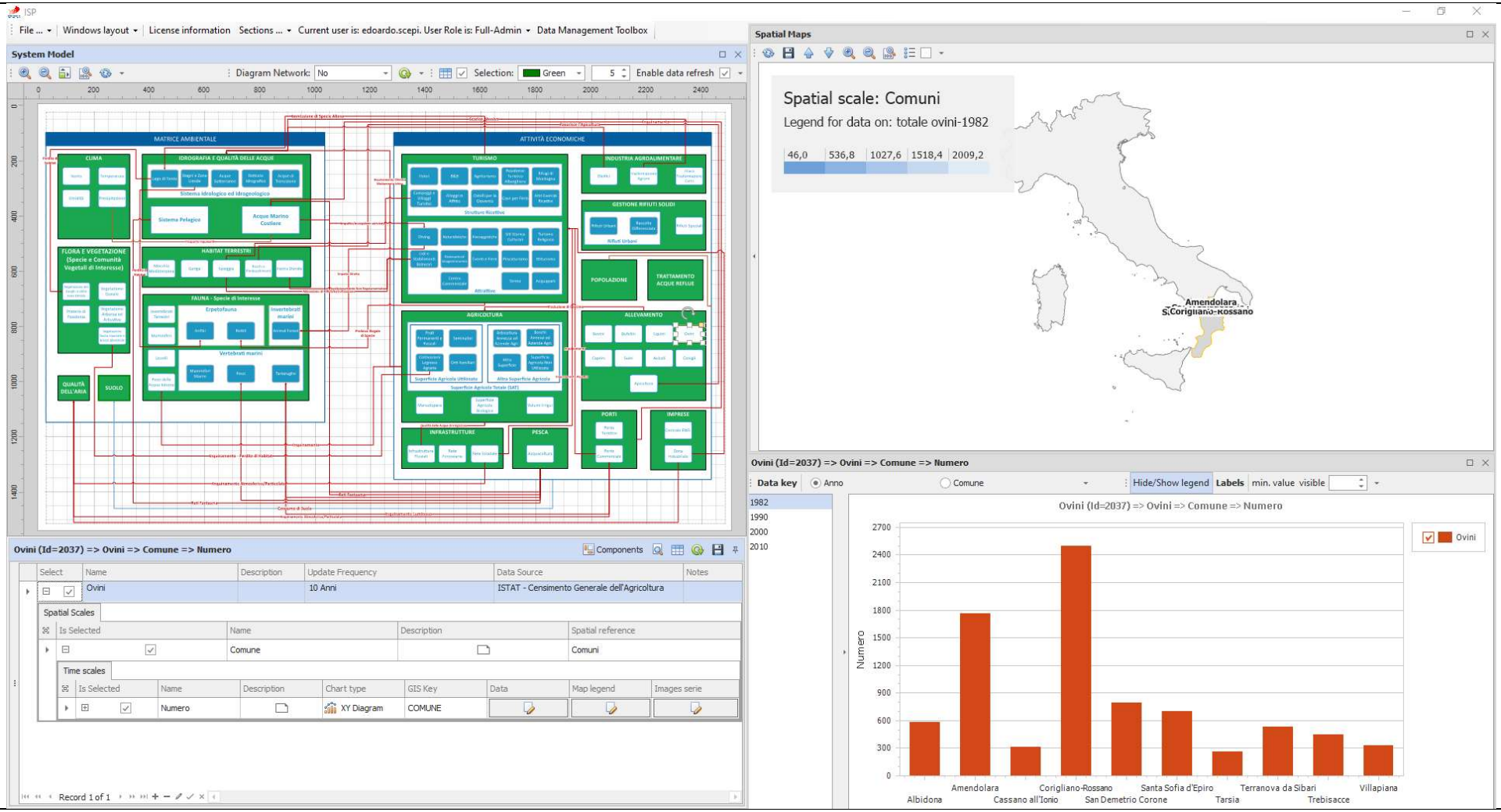
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



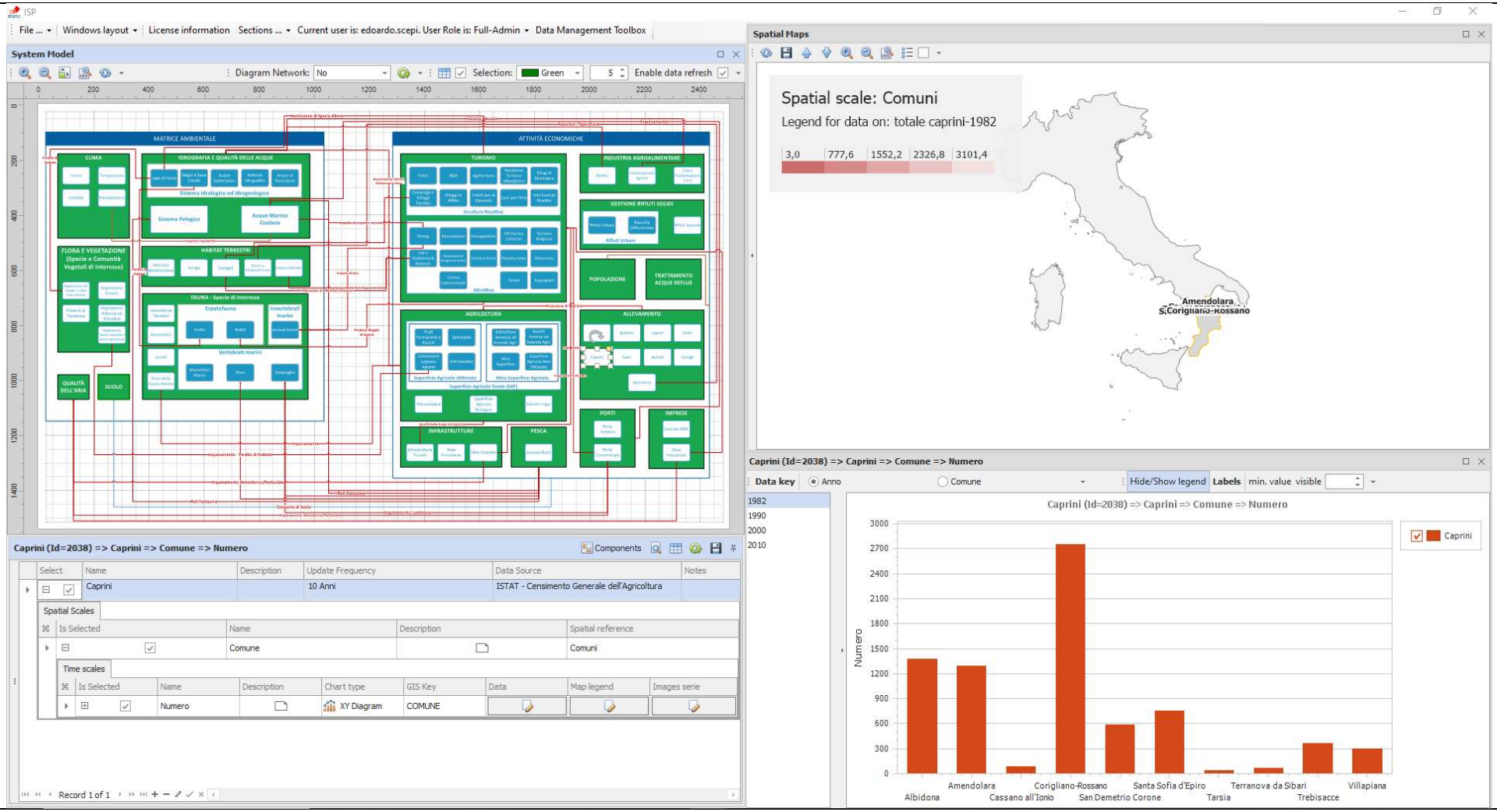
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



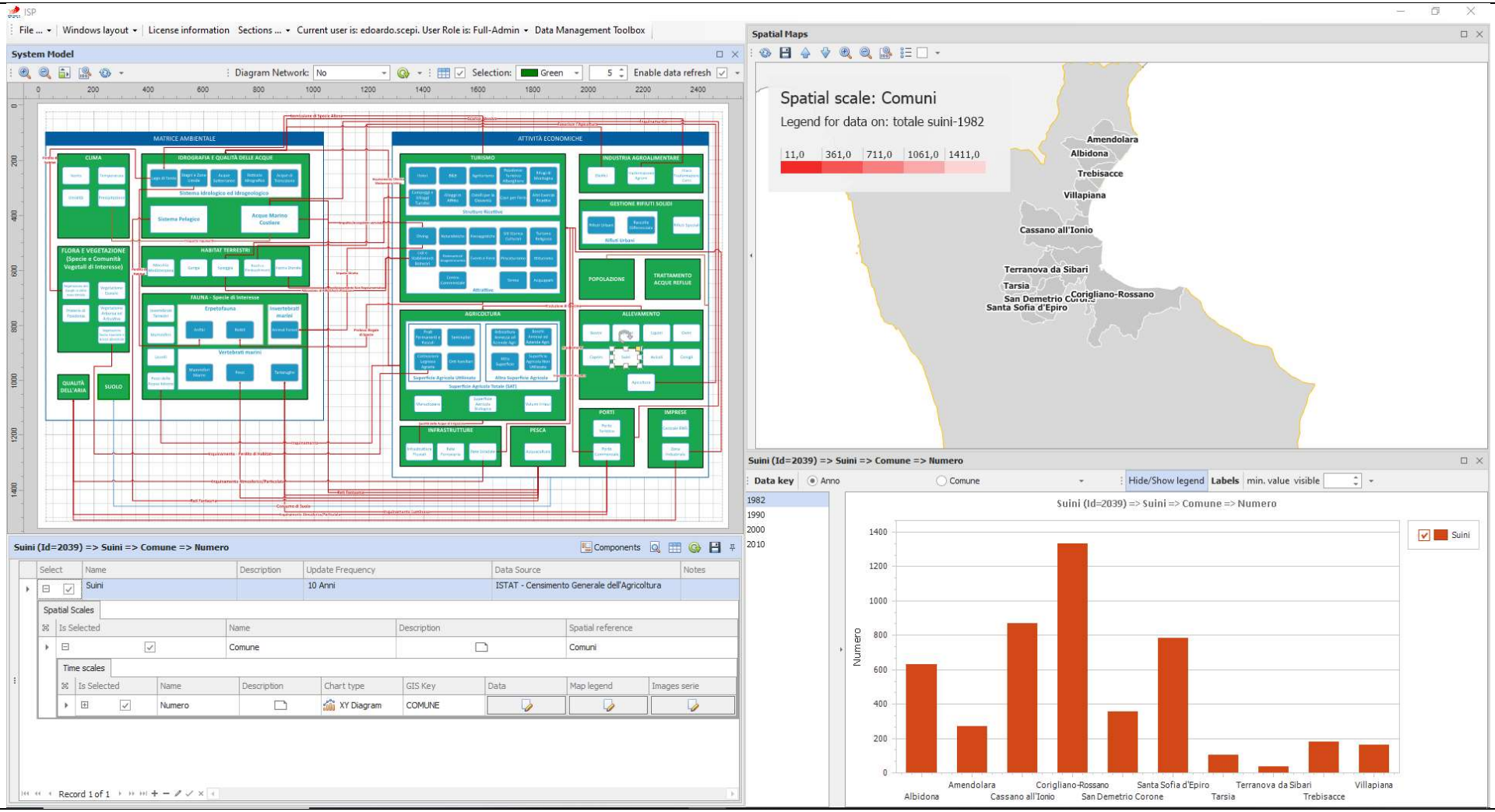
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



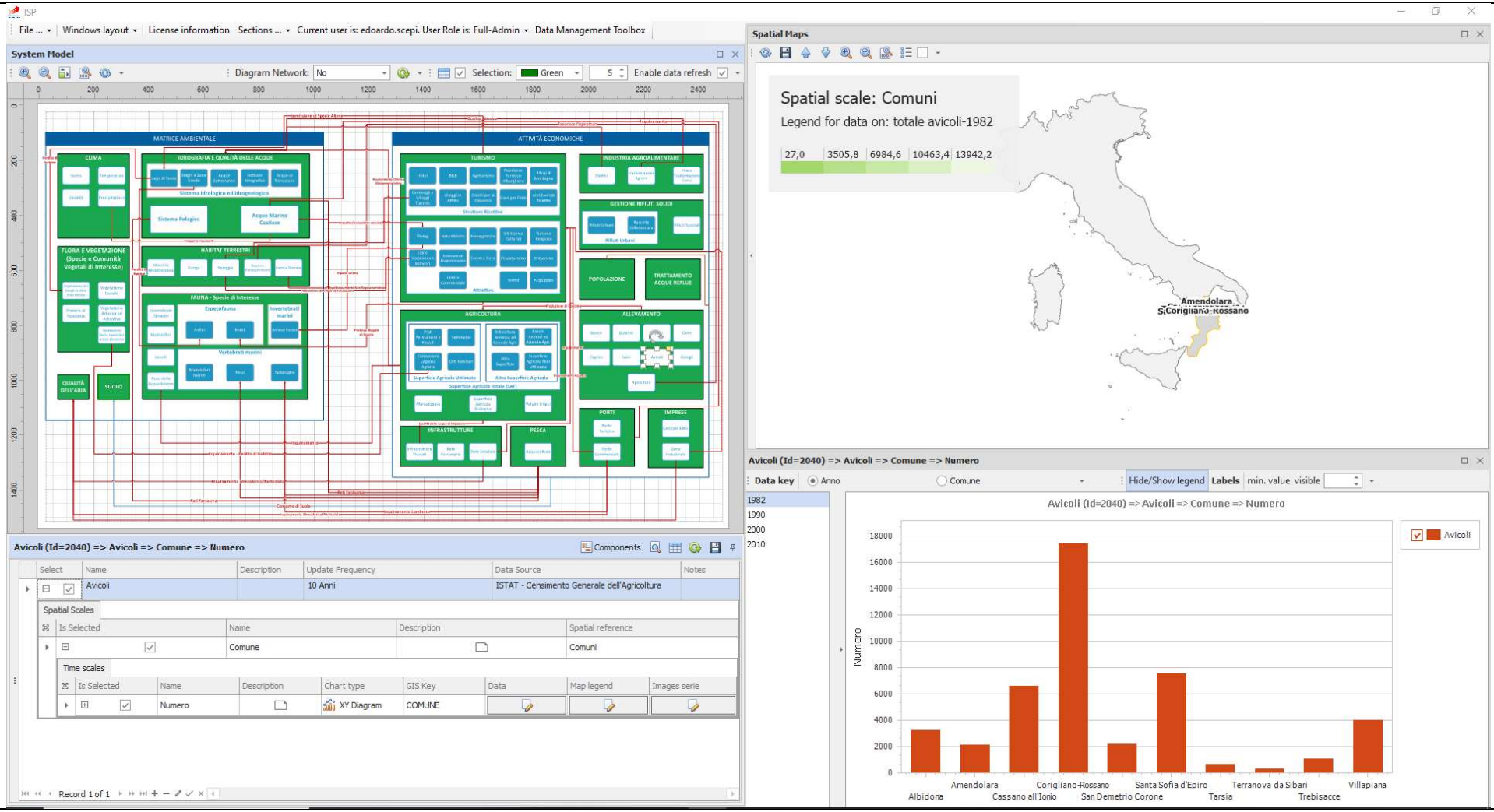
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



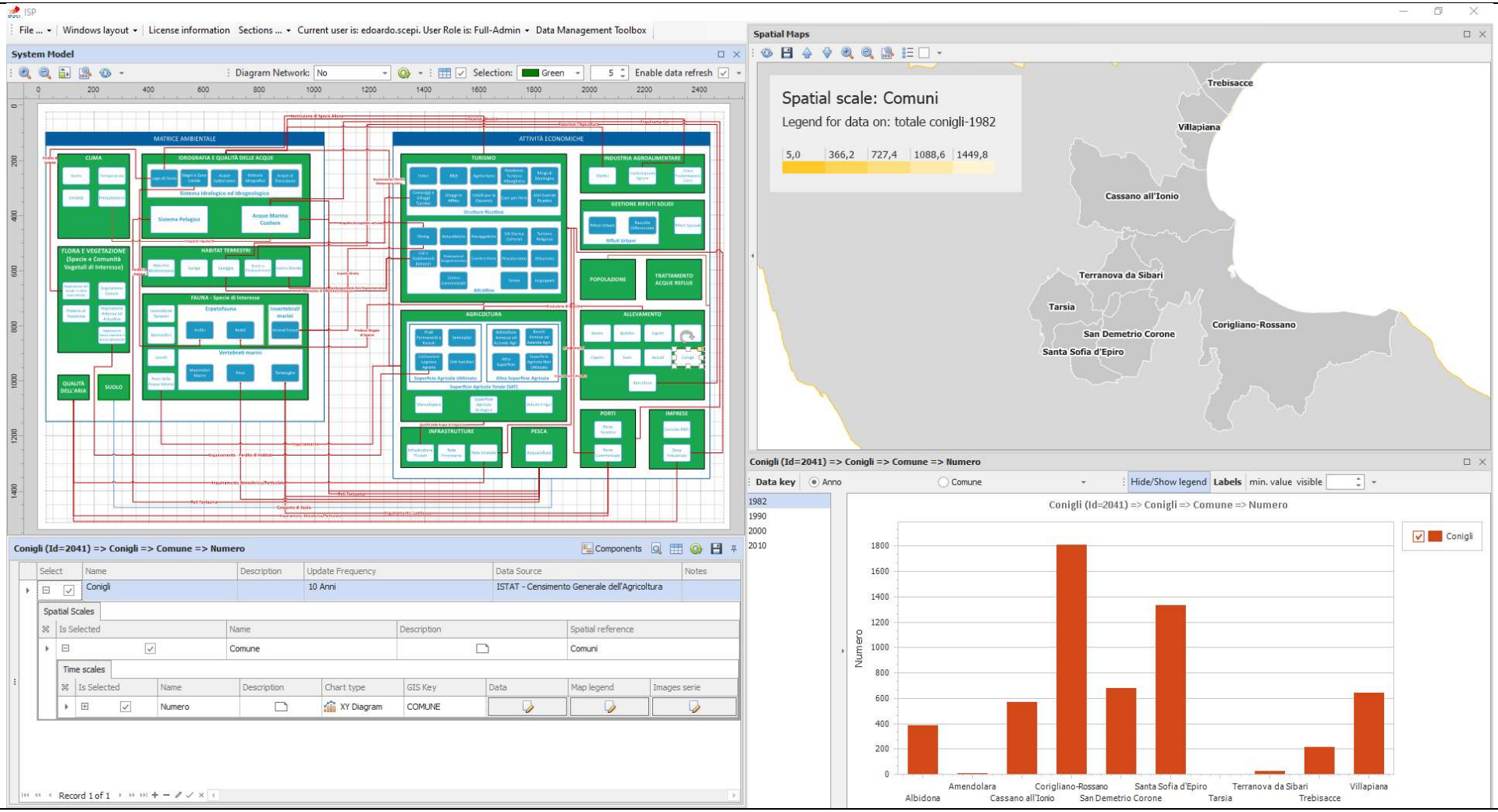
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

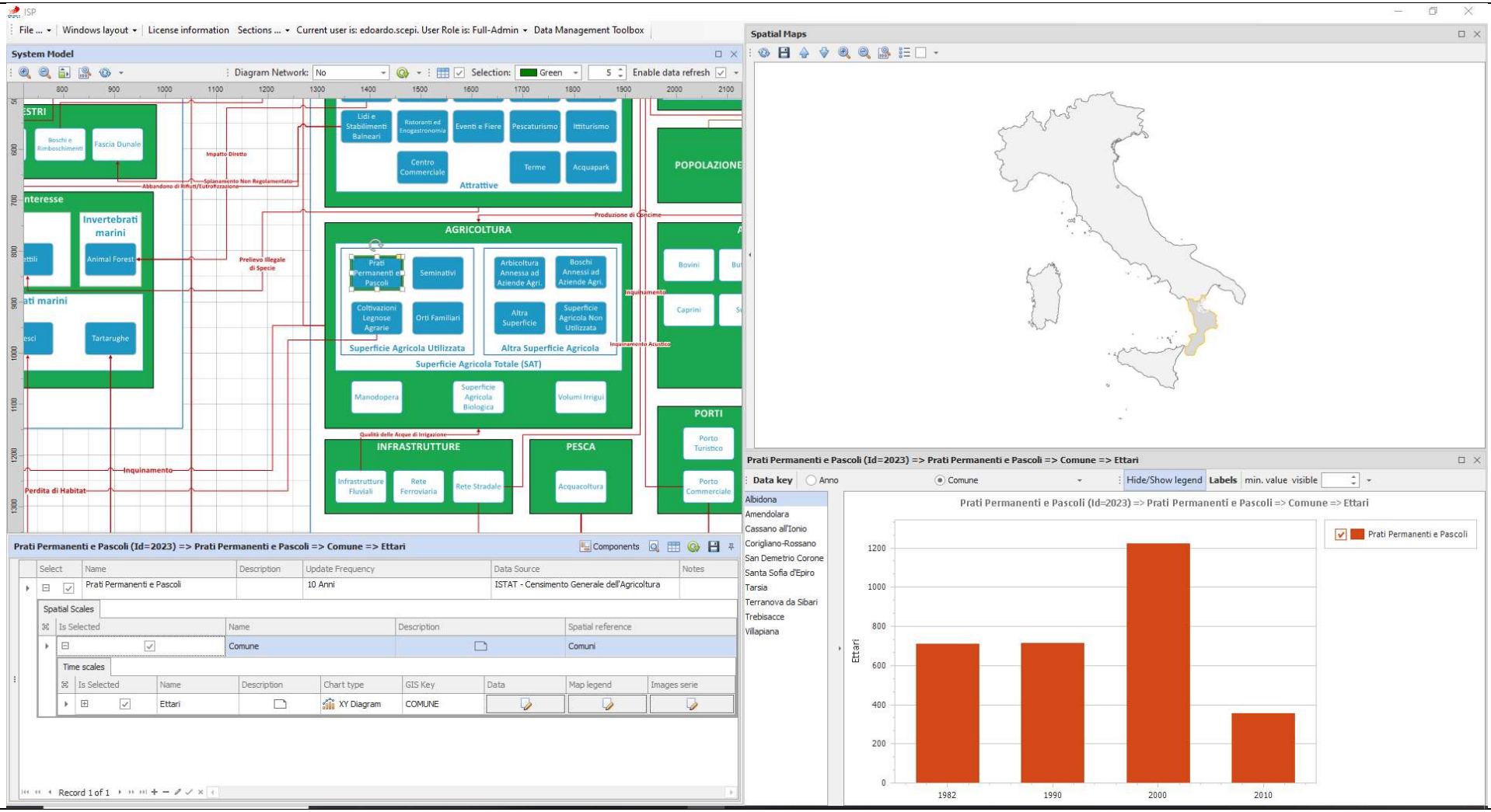


Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

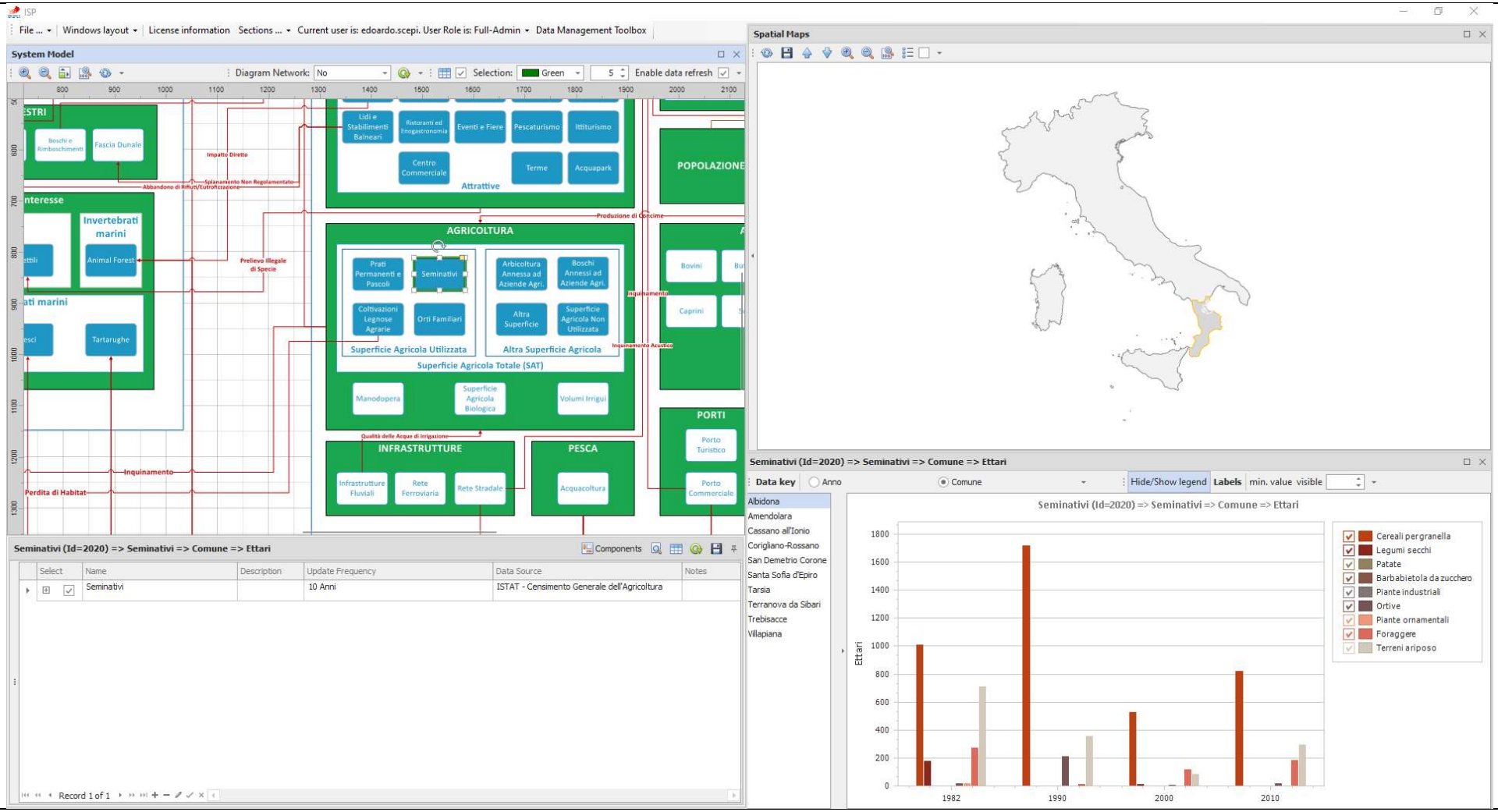


Data on Livestock Statistics

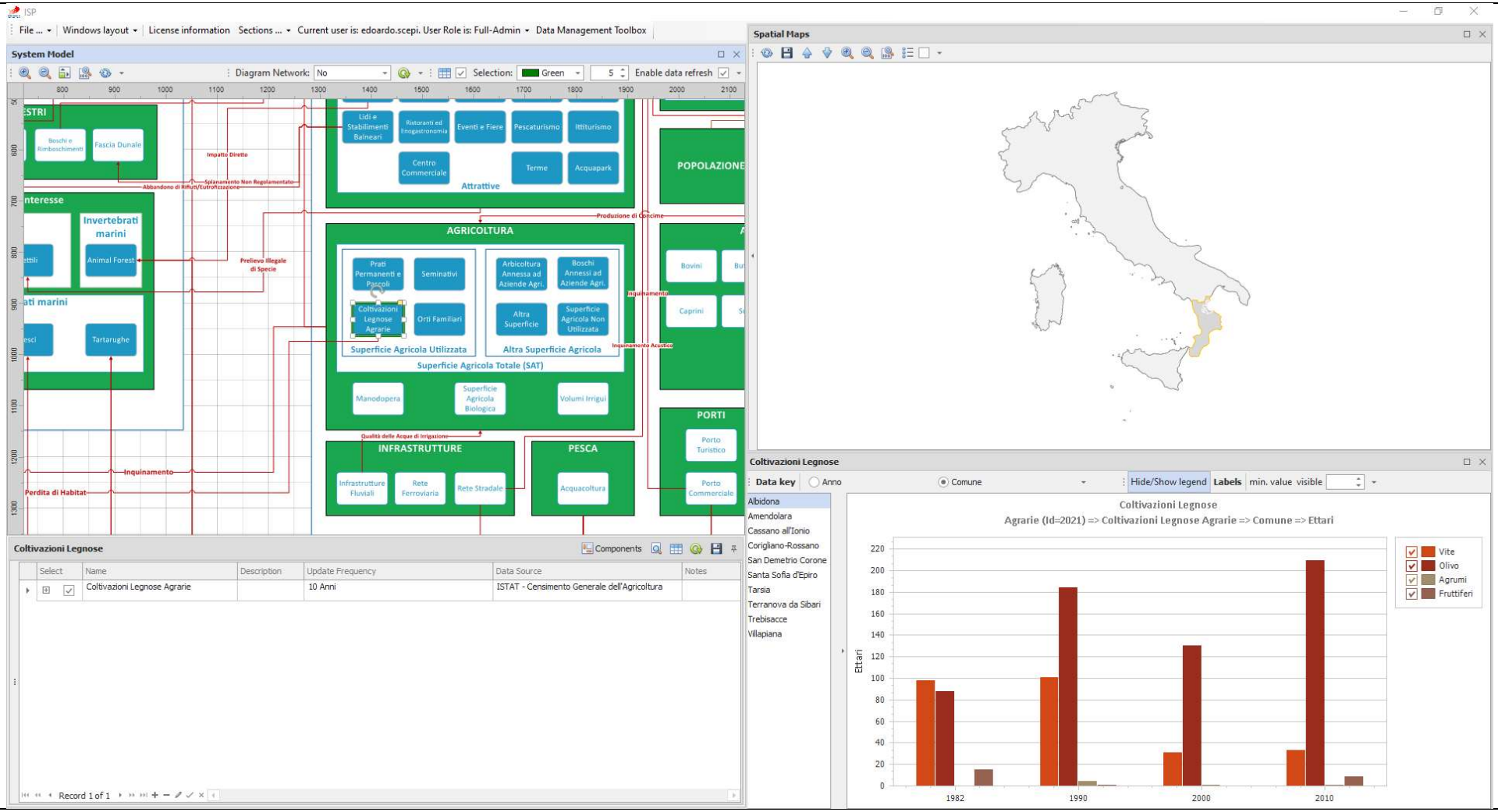
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



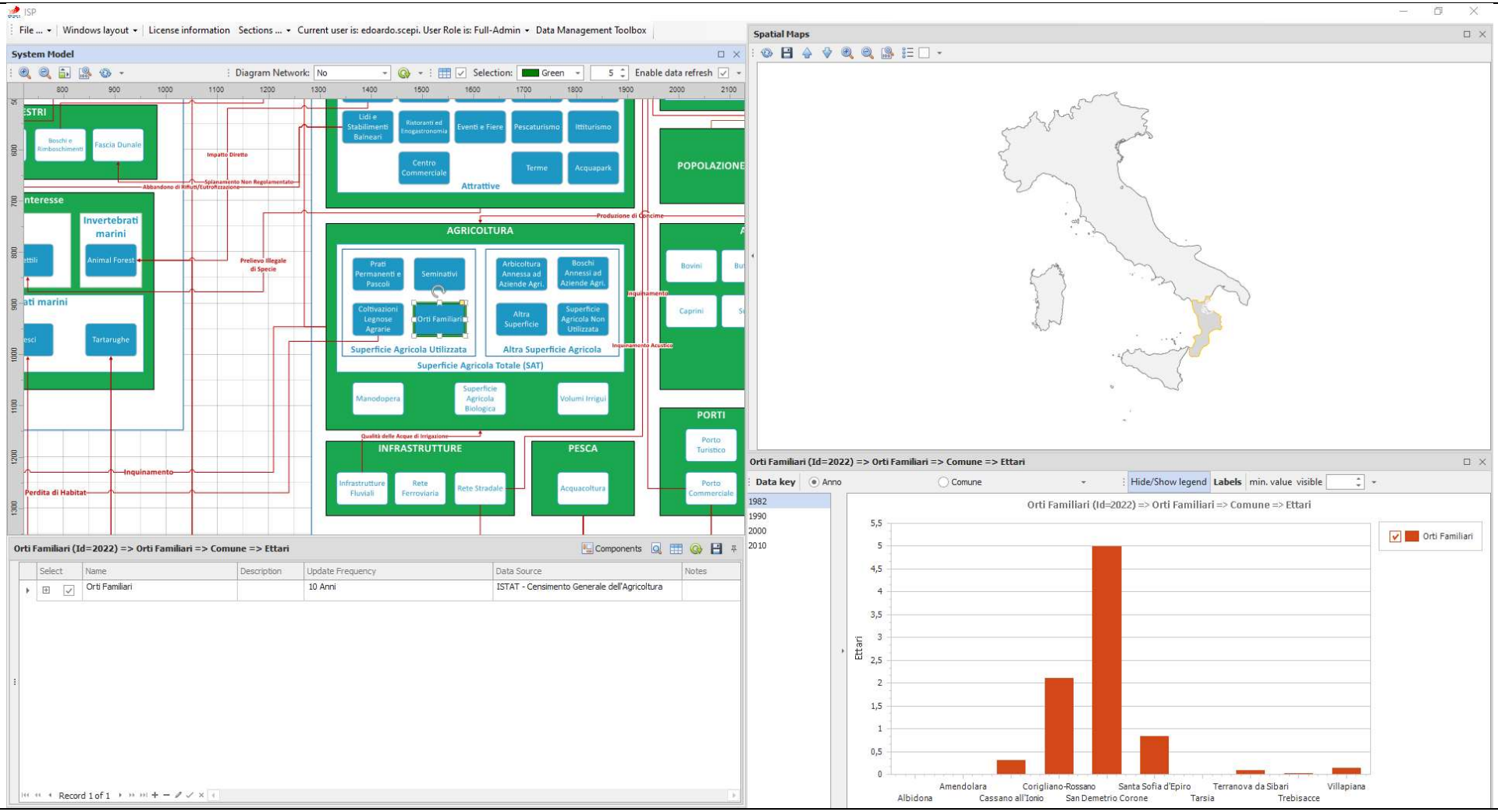
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



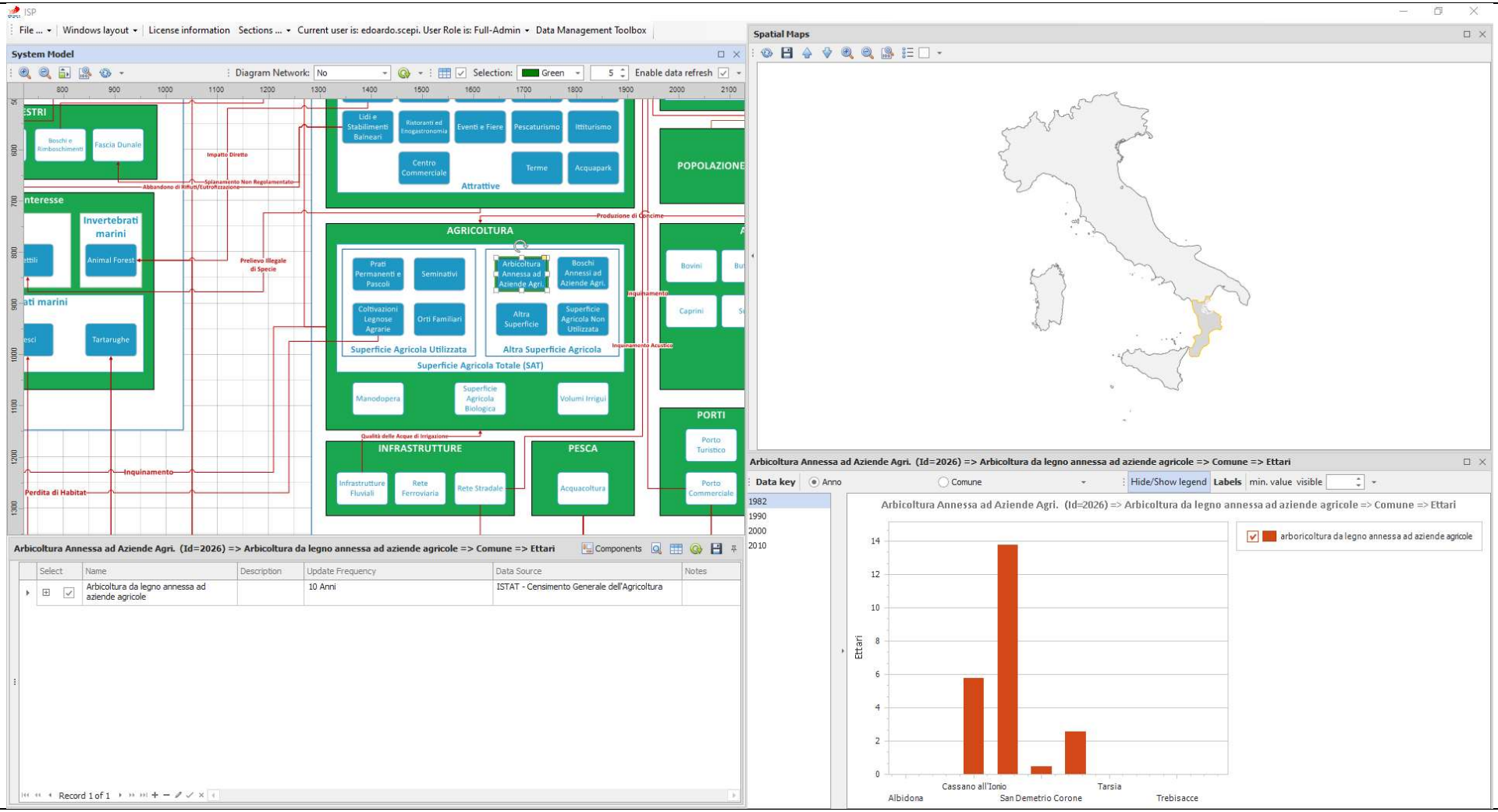
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



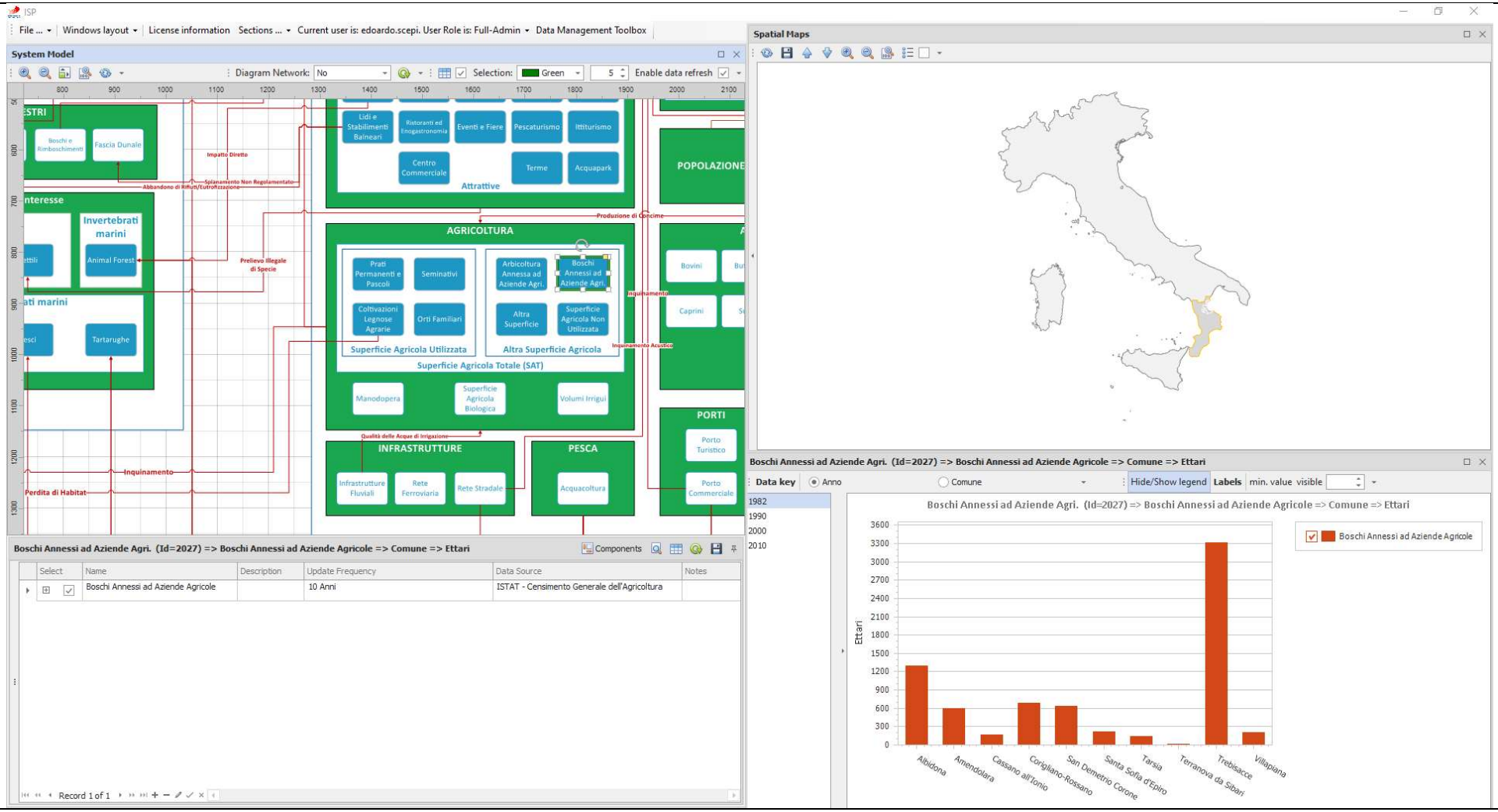
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



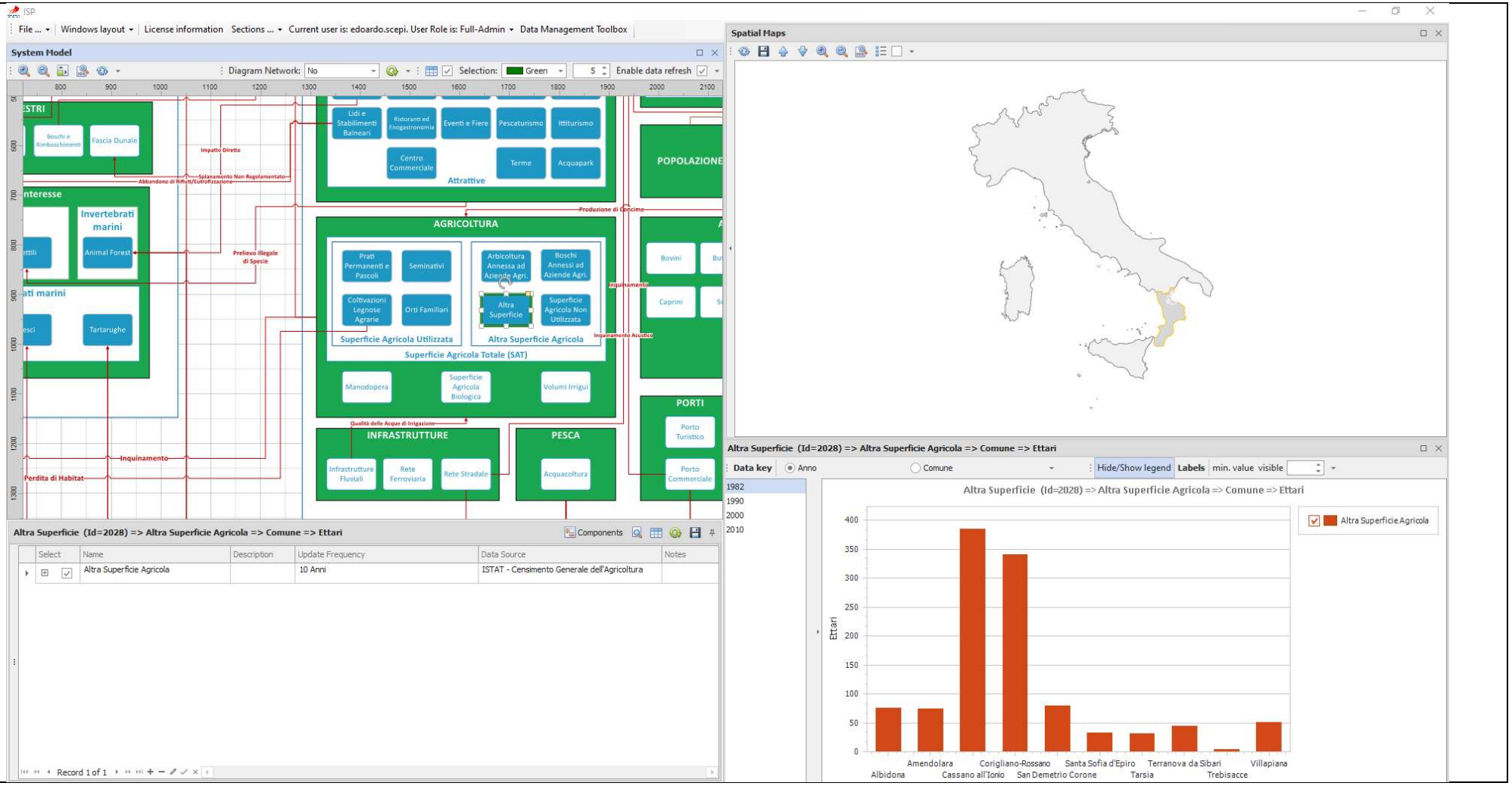
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



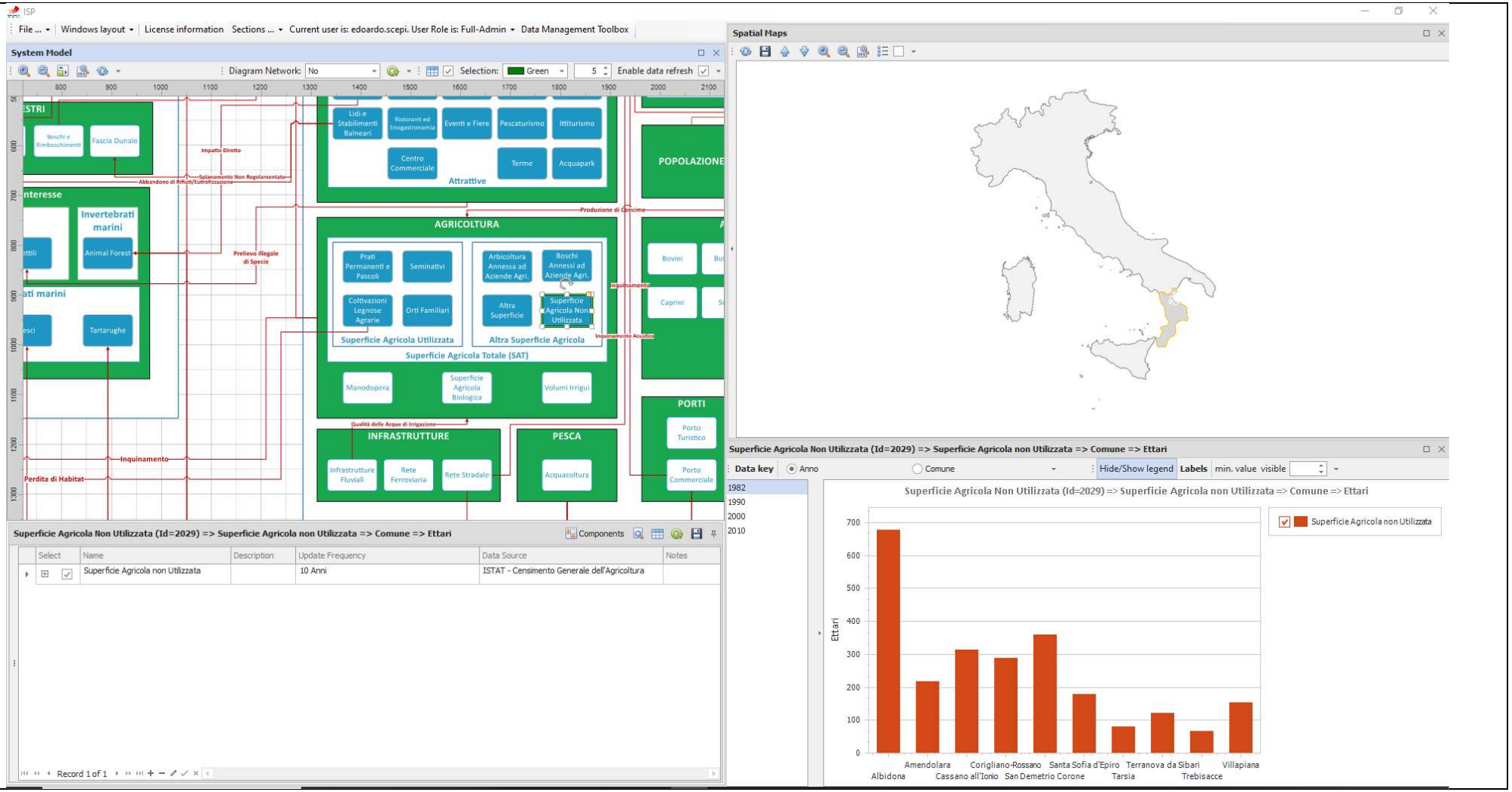
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



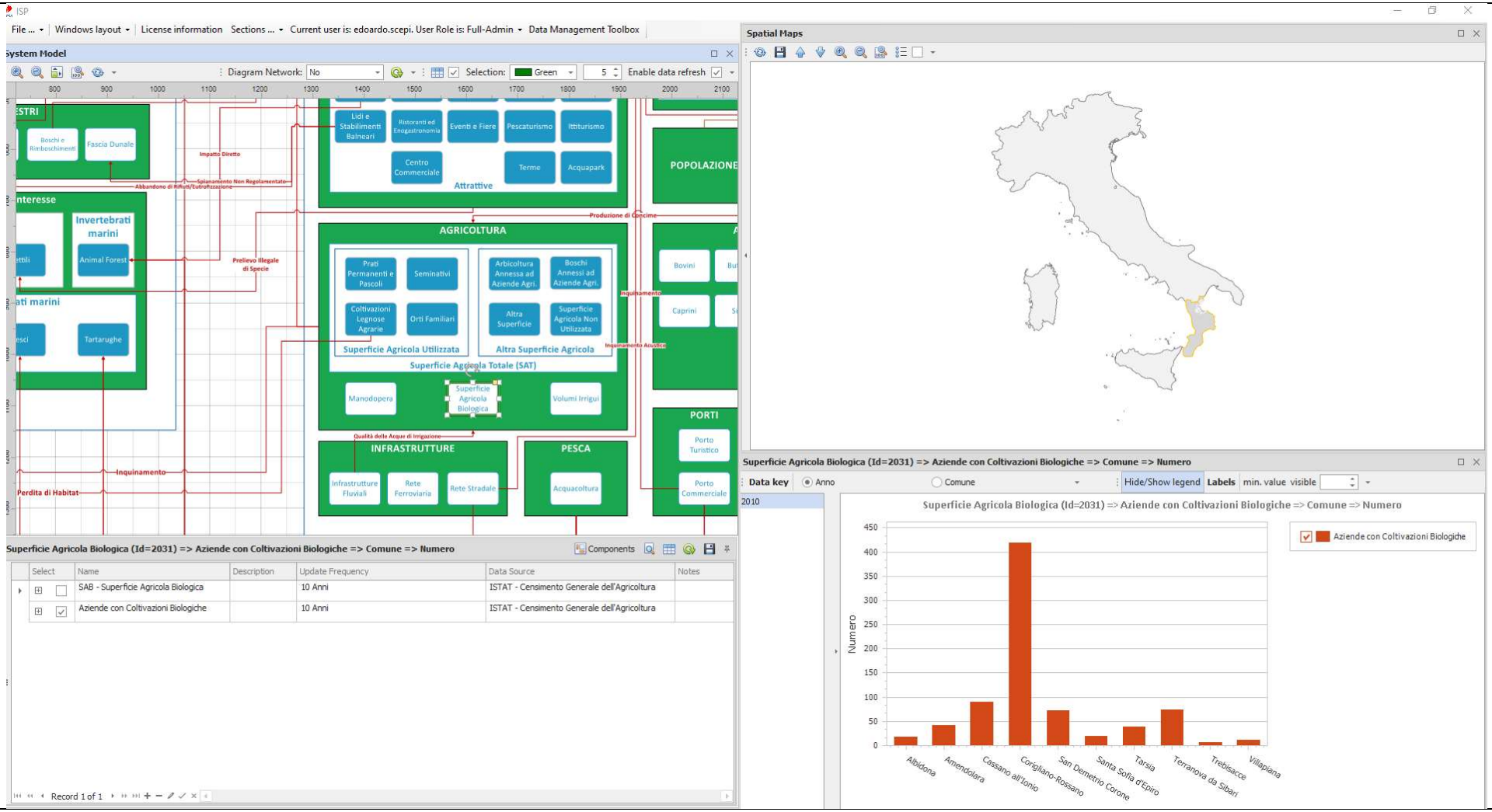
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

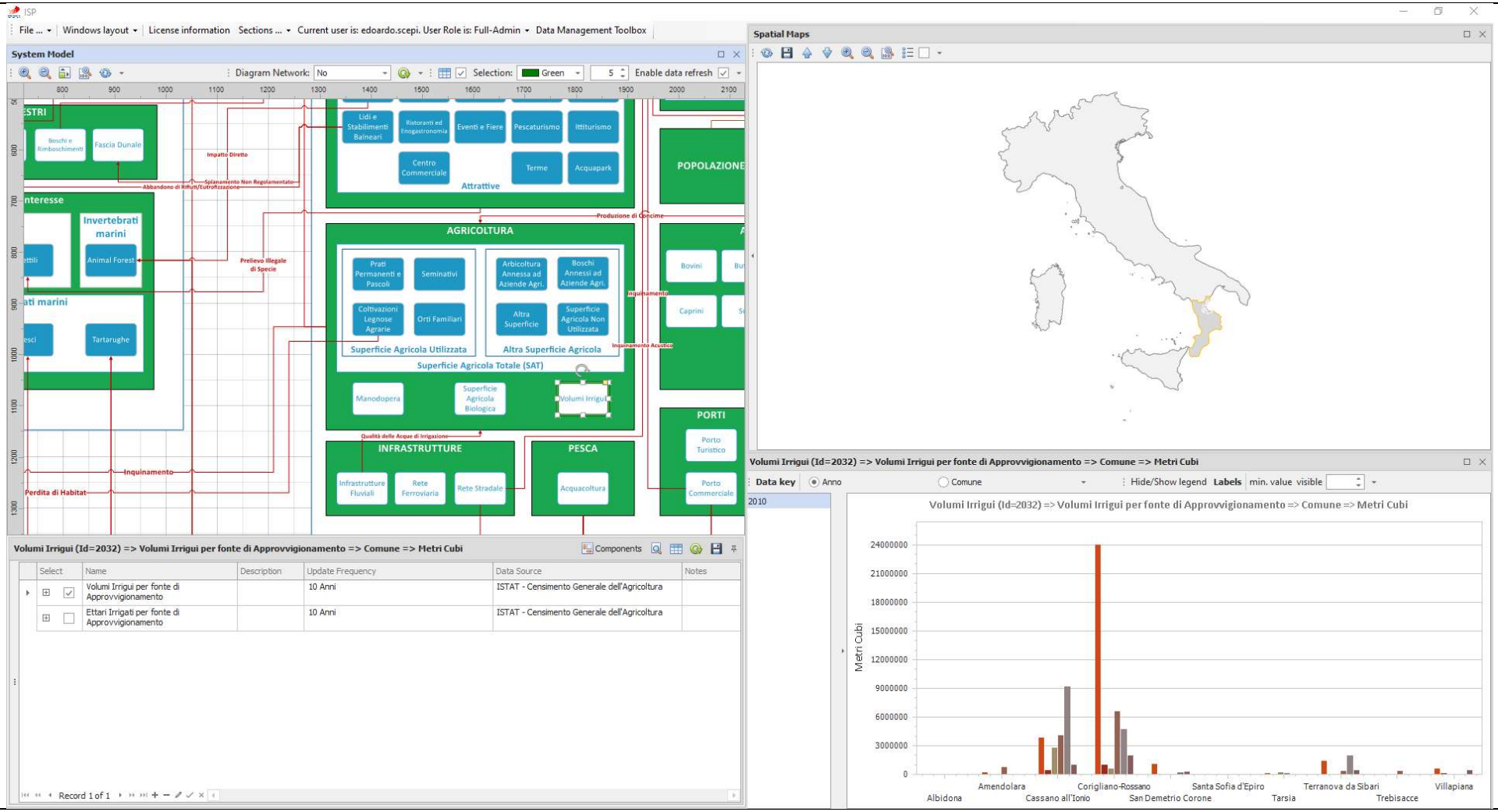


Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Data on Agricultural Statistics

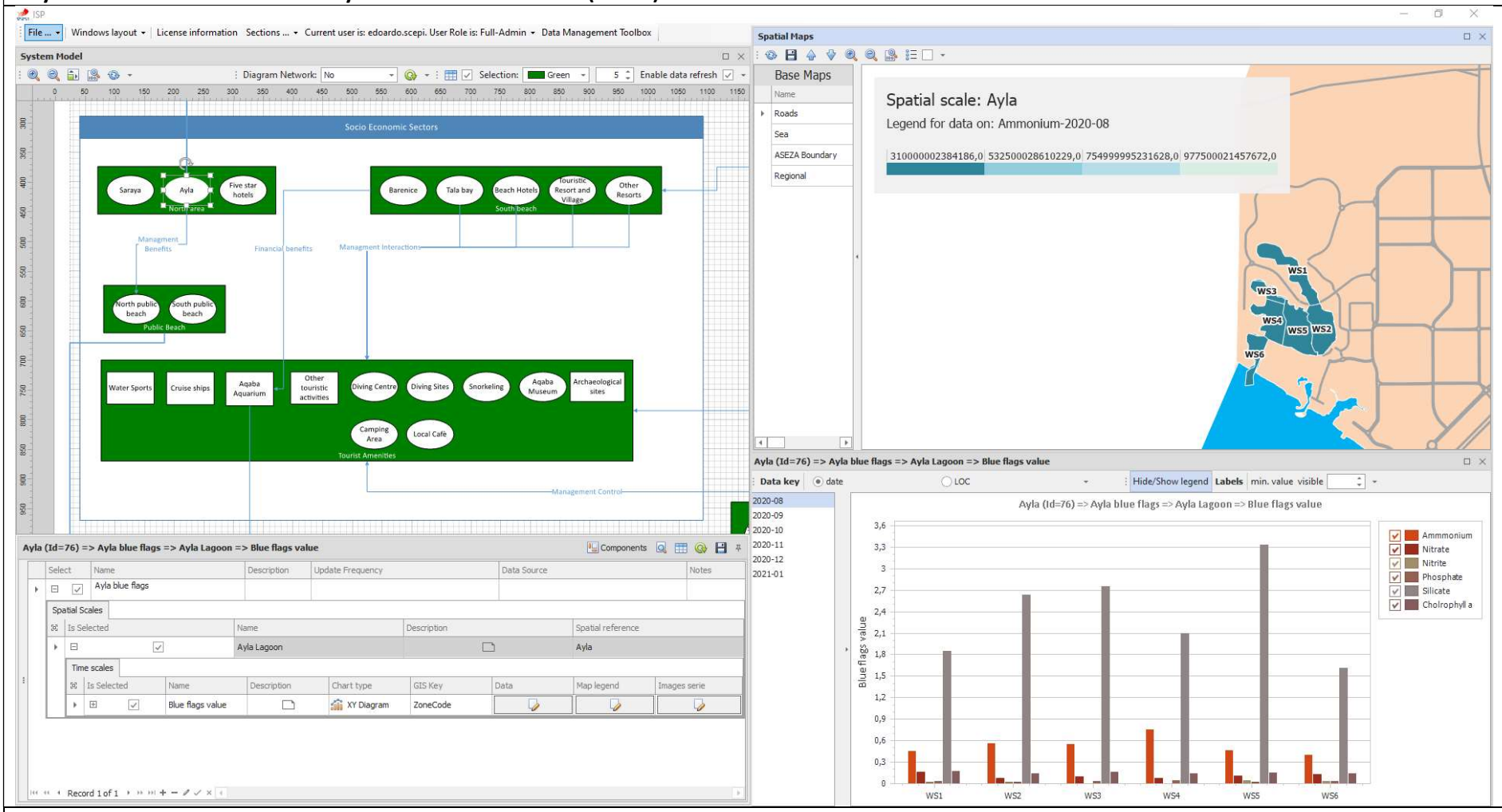
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Data on Agricultural Water Use

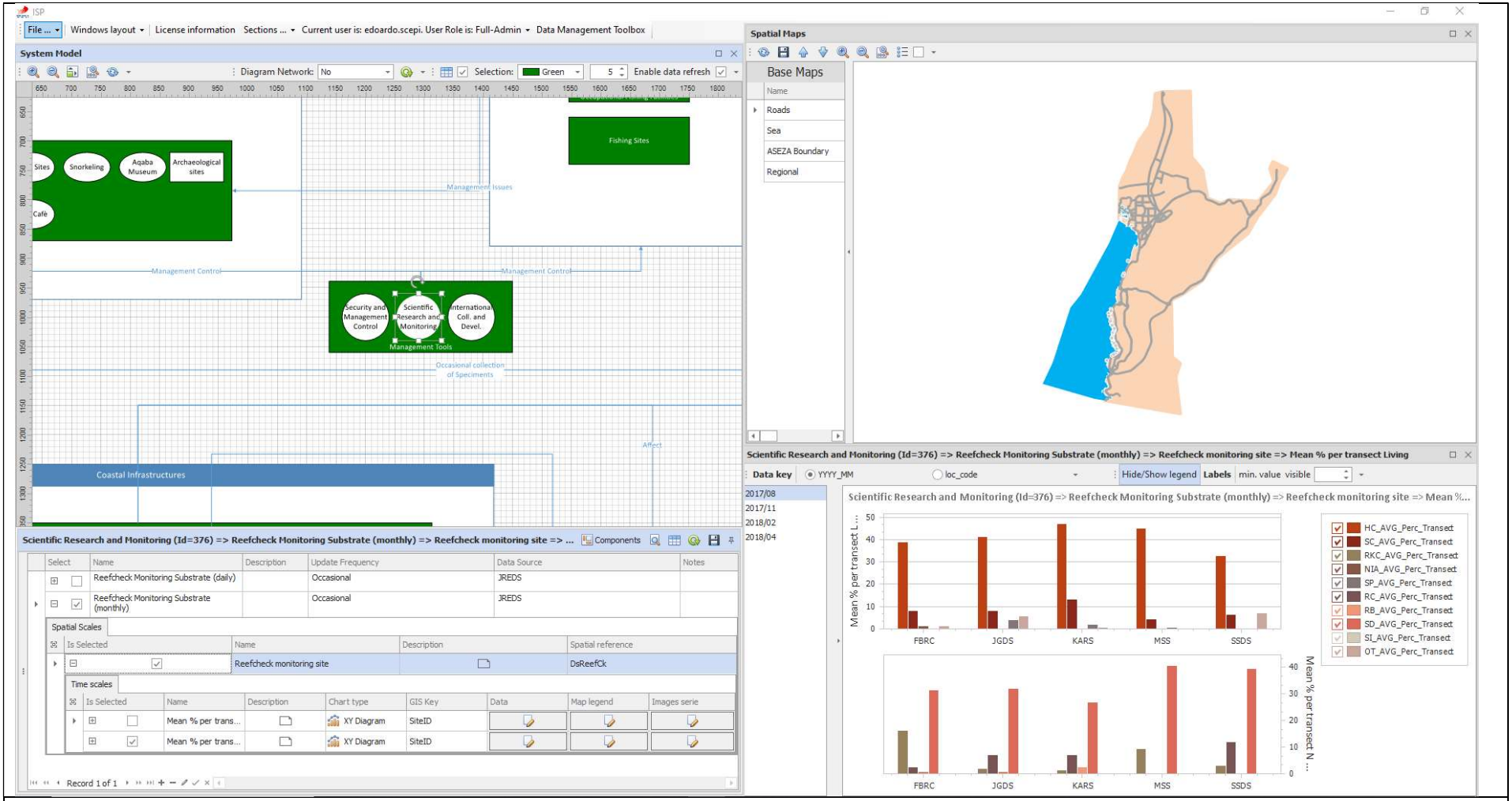
Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/

Royal Marine Conservation Society of Jordan EB-ICZM-DSS (JREDS)



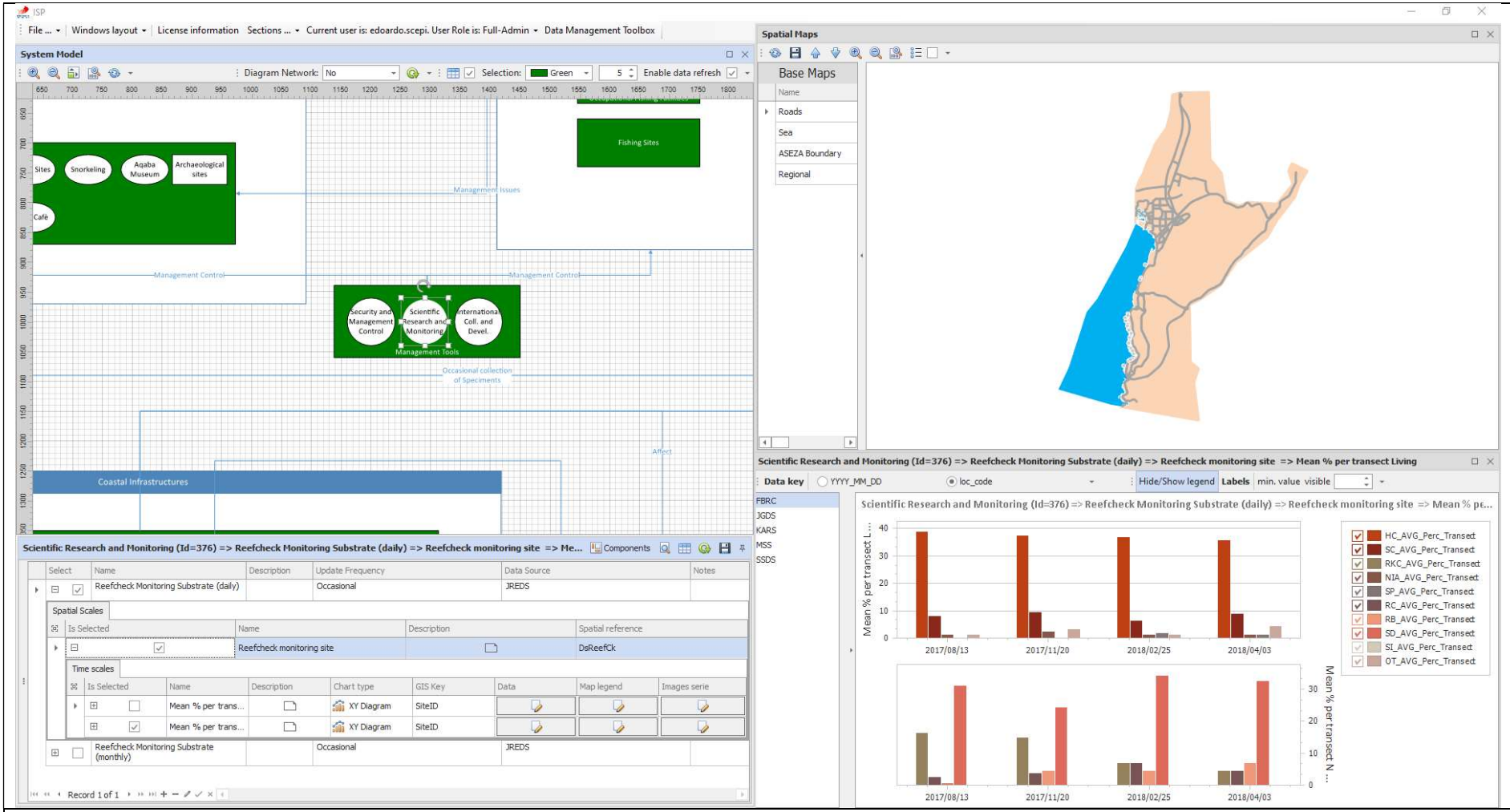
Data on Water Quality inside the Lagoon of the Ayla Residential Area

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



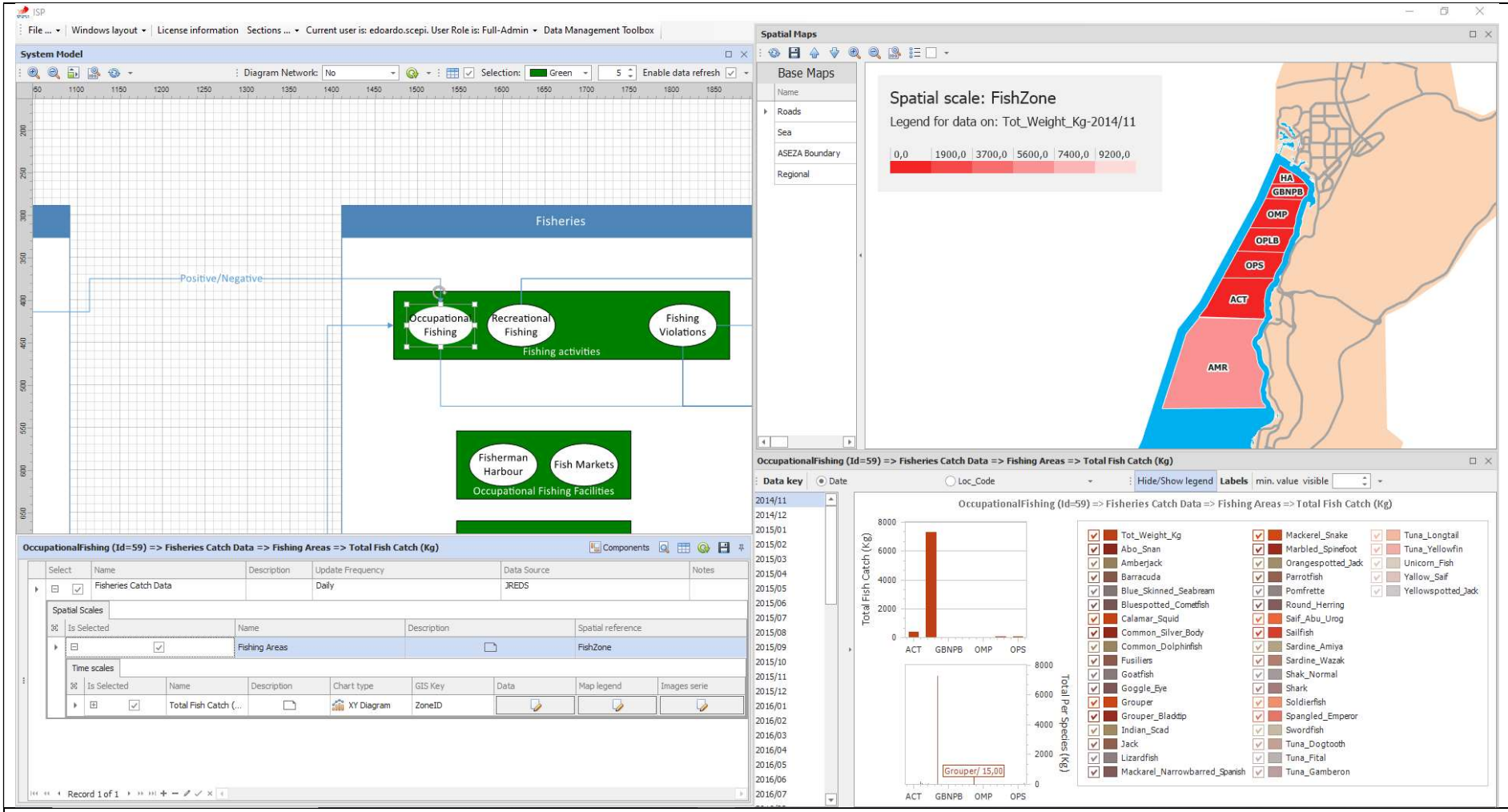
Data Reefcheck Monitoring Substrate (monthly)

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



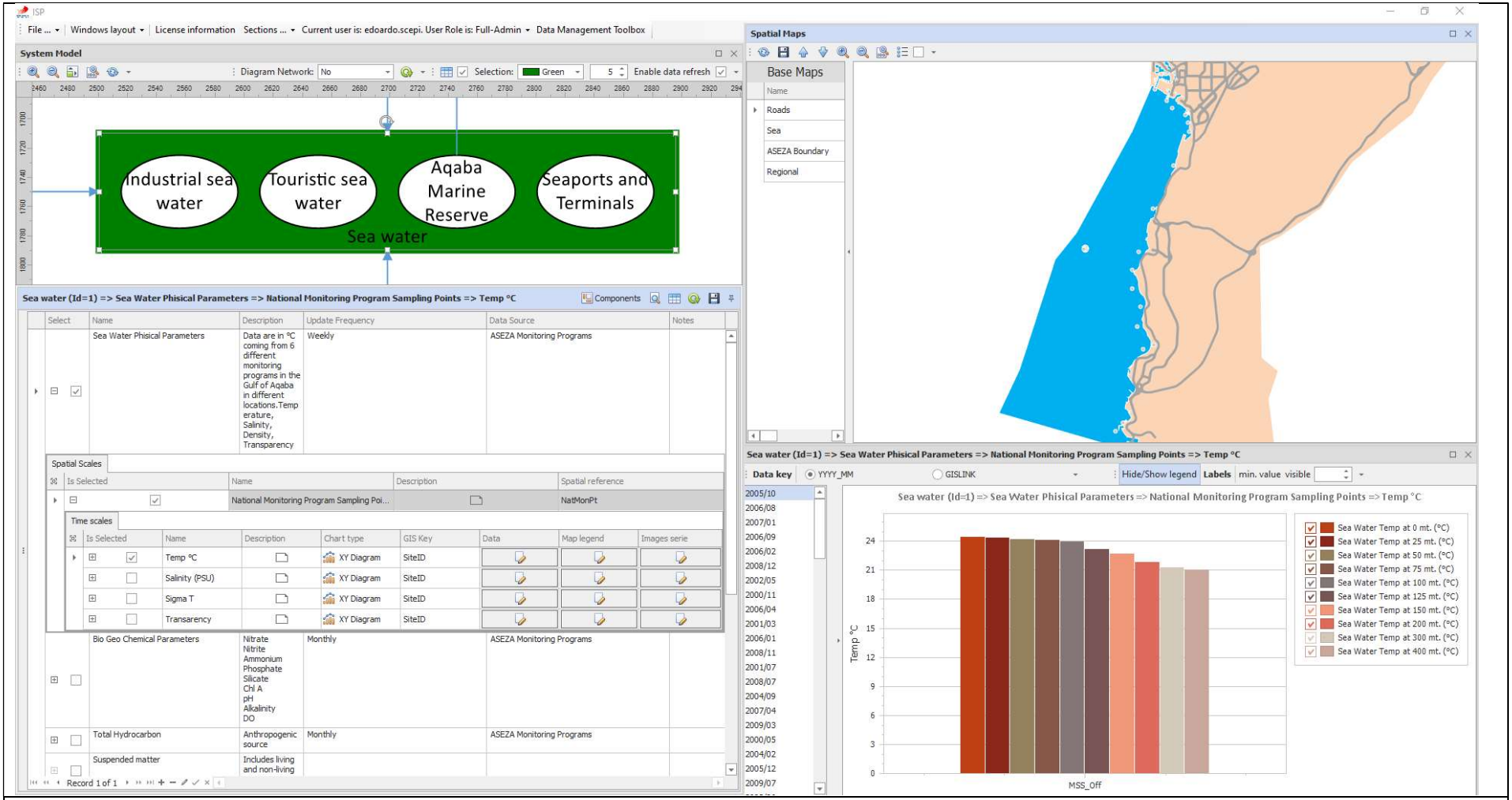
Data Reefcheck Monitoring Substrate (daily)

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



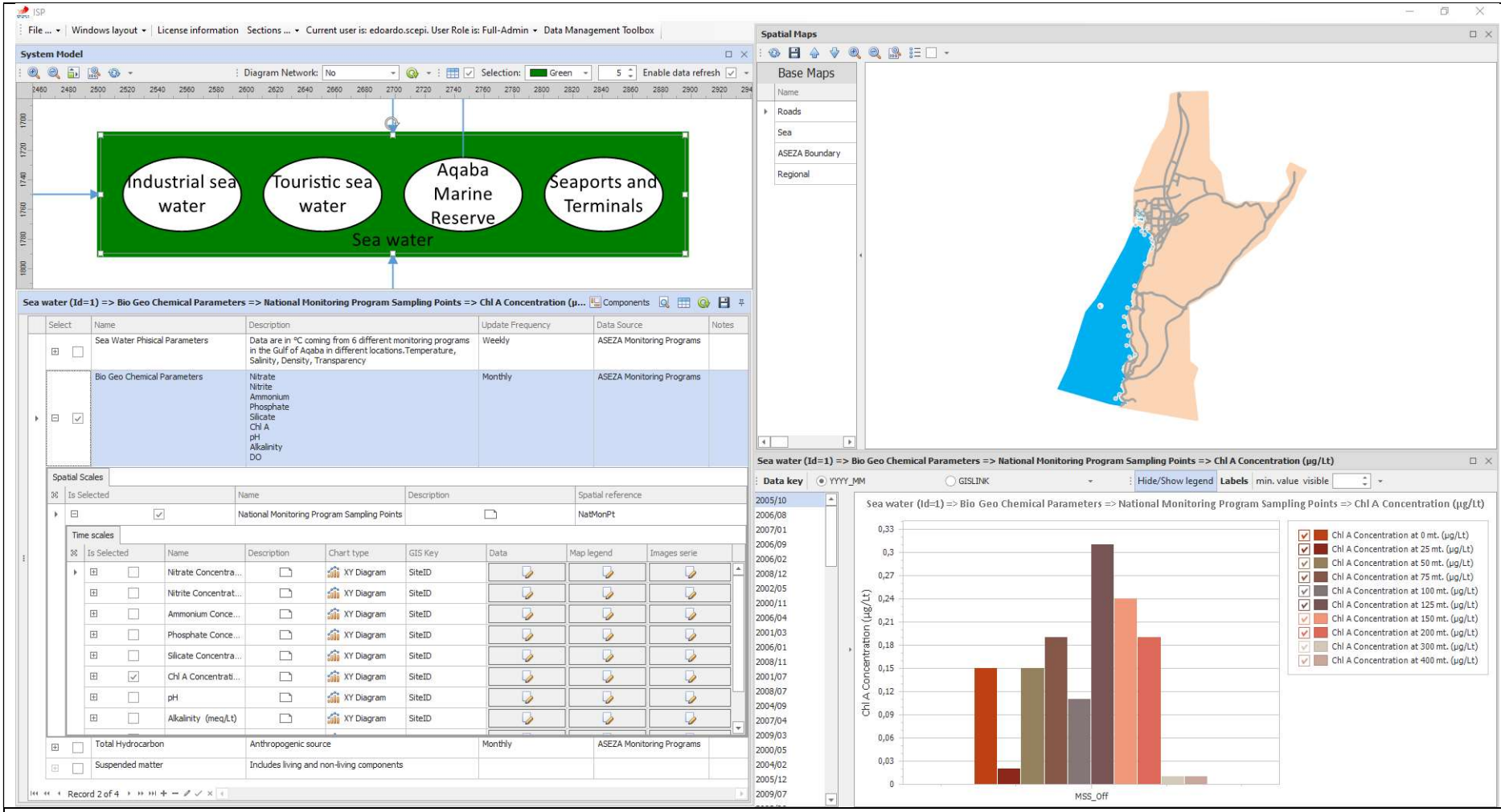
Data on Occupational Fisheries Statistics

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



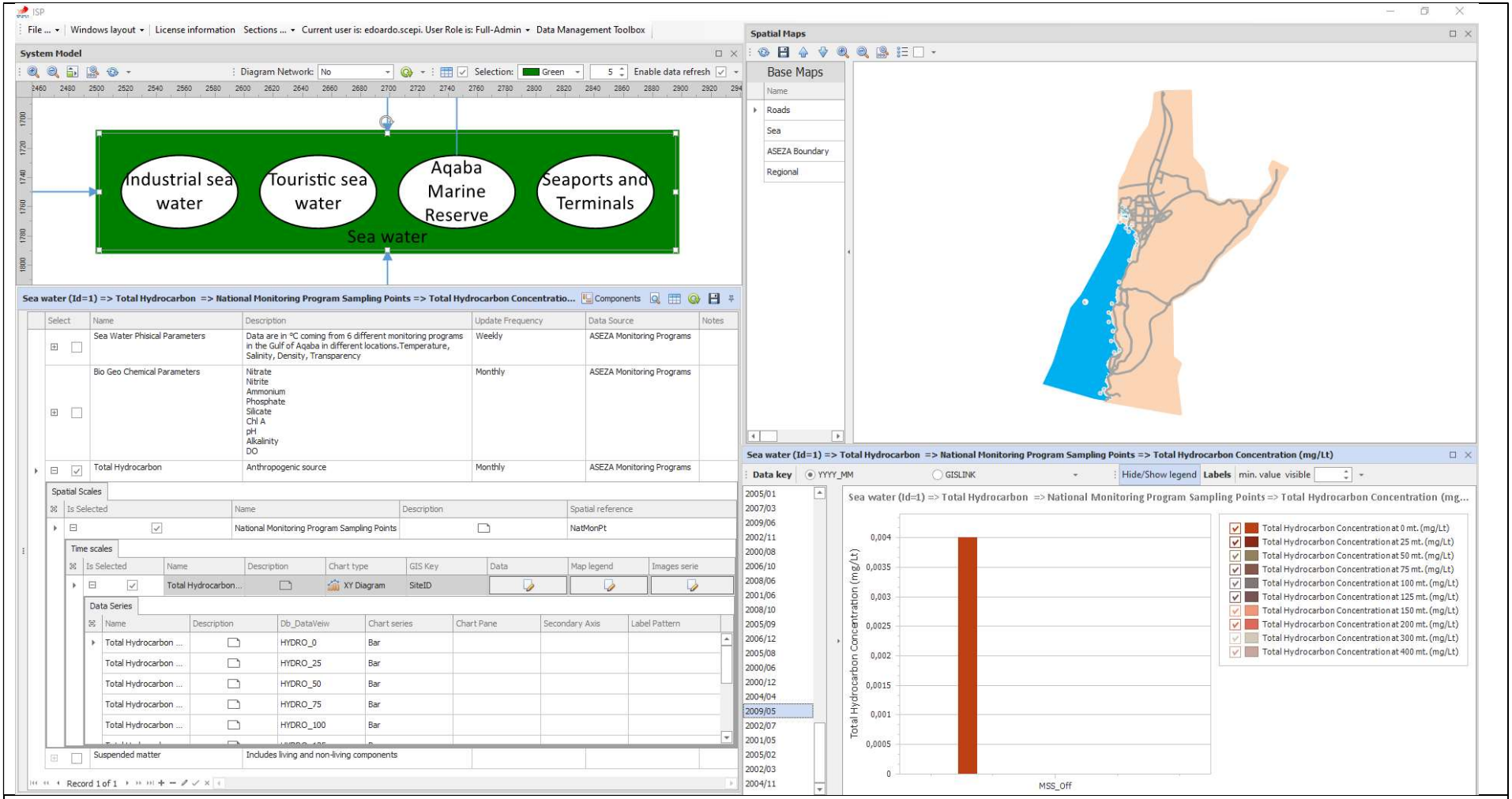
Sea Water Physical Parameter (Temperature, Salinity, Density, Transparency)

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



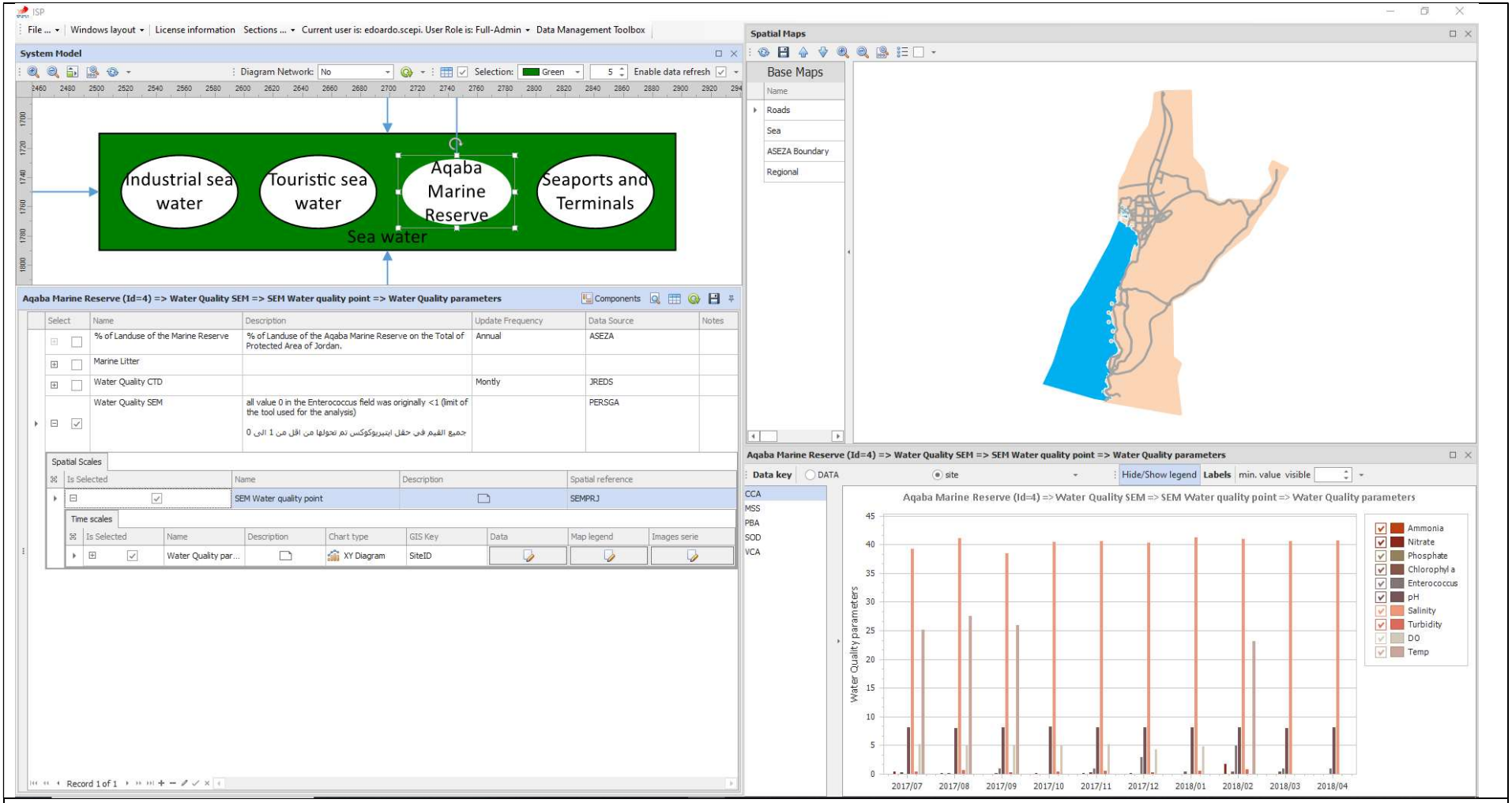
Bio Geo Chemical Parameters (Nitrate, Nitrite, Ammonium, Phosphate, Silicate, Chlorophyll A, pH, Alkalinity, DO)

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



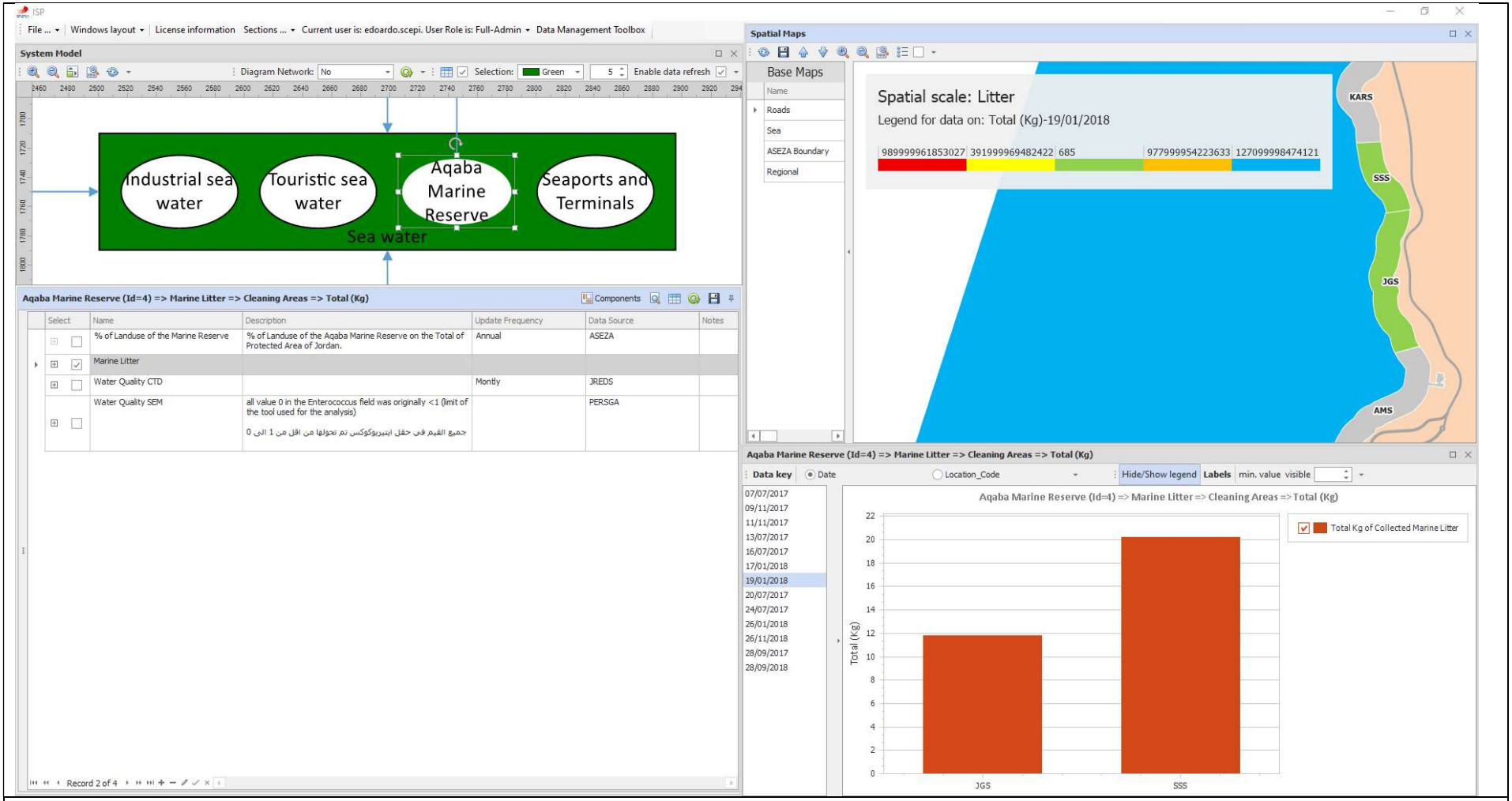
Data on Sea Water Total Hydrocarbon

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



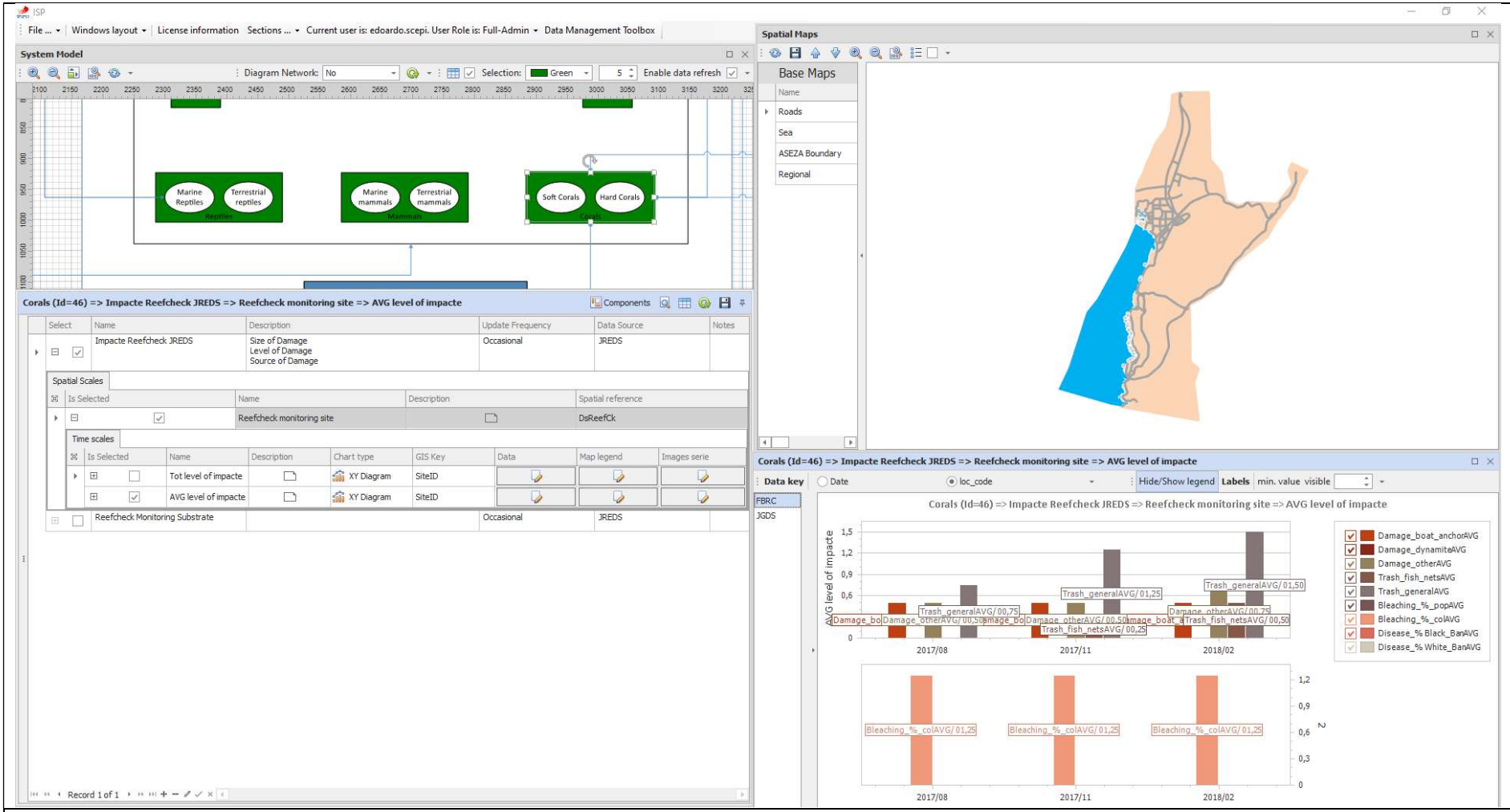
Aqaba Marine Reserve – Data on Water Quality from project SEM

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



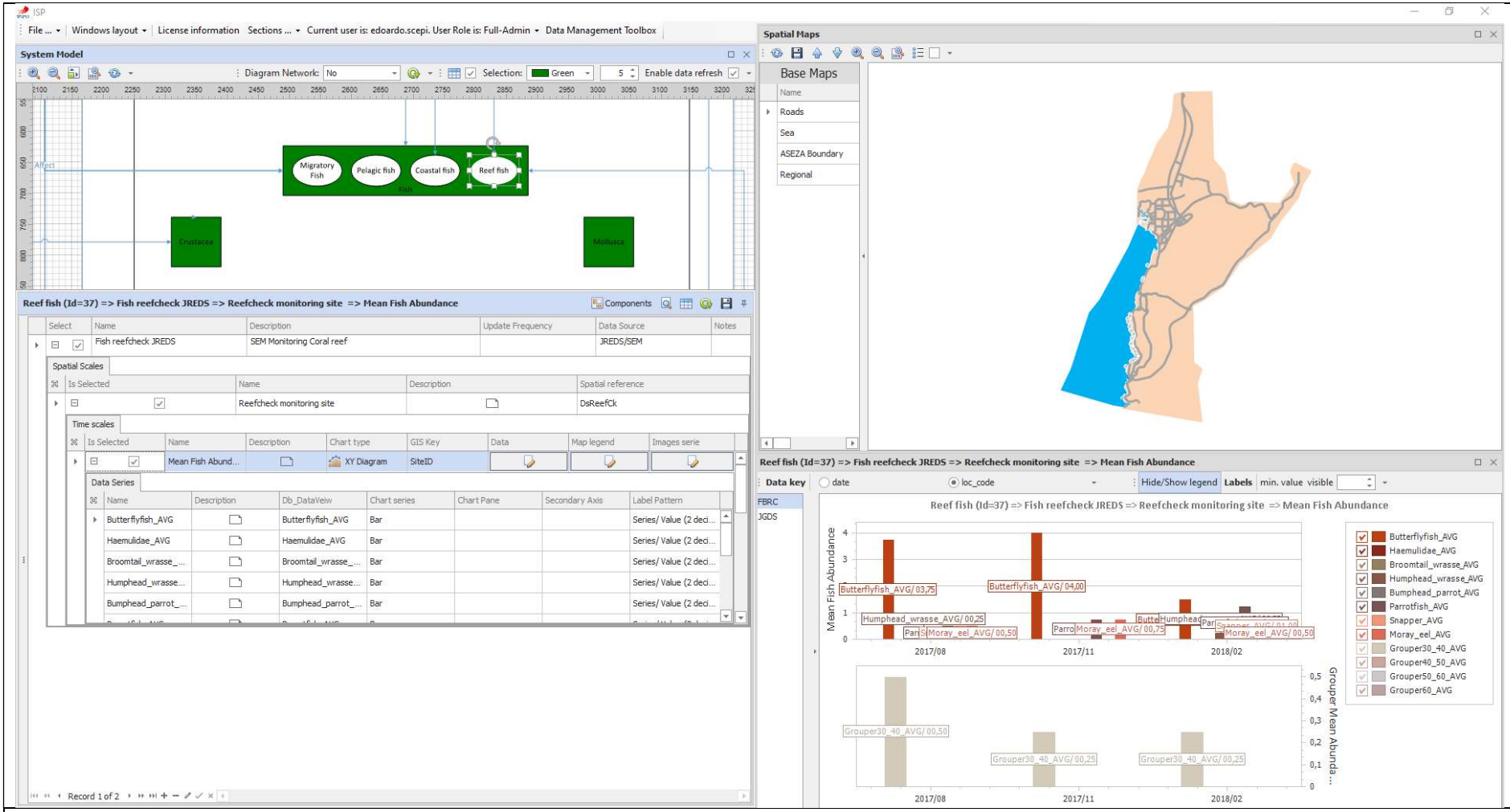
Aqaba Marine Reserve – Data on Marine Litter

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



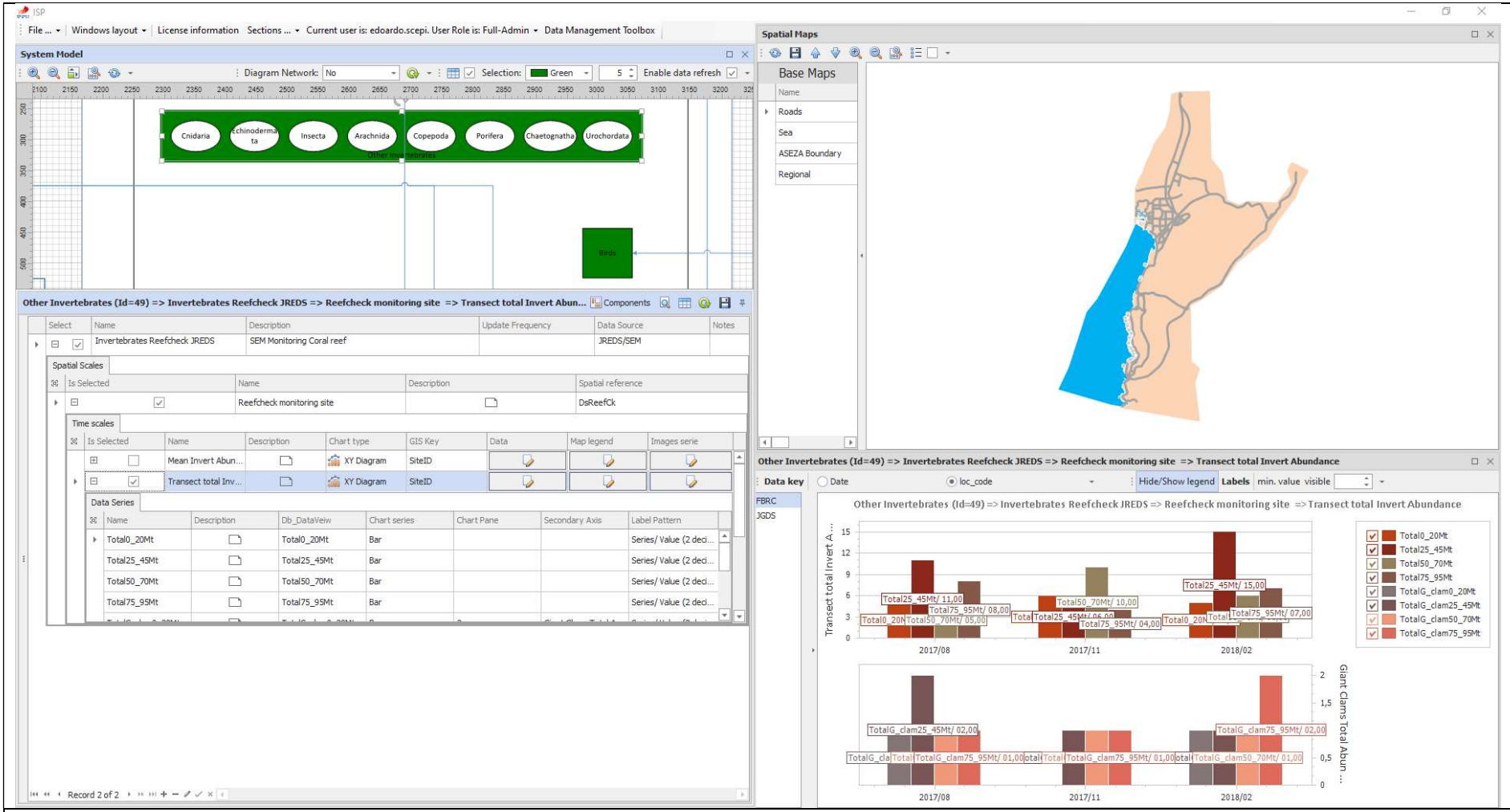
Data on Impact Reefcheck JREDS (Size of Damage, Level of Damage, Source of Damage)

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Coral Fish reefcheck JREDS

Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/



Invertebrates Reefcheck JREDS

Prepared by: E. Scepi.
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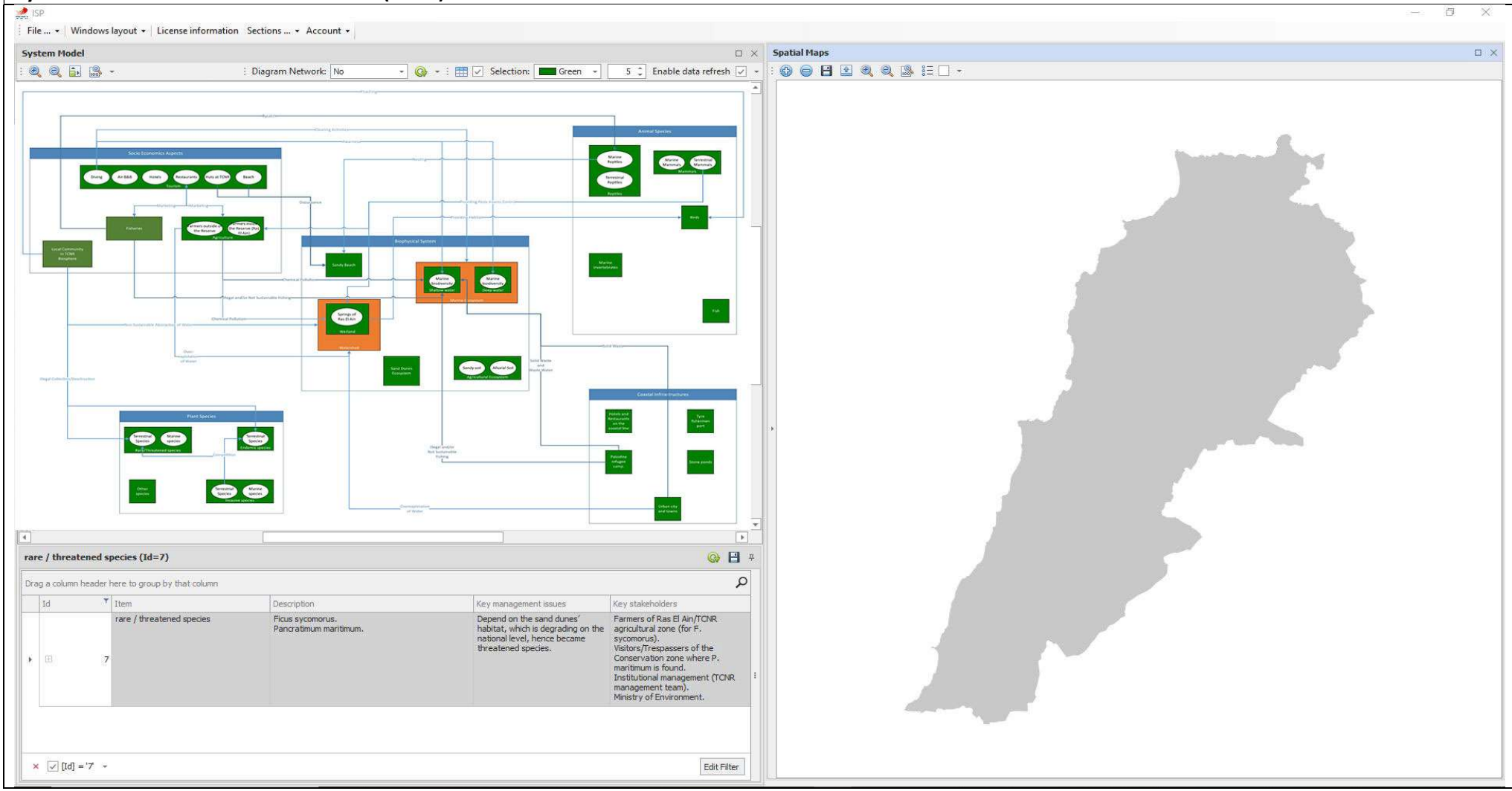
Tyre Coast Nature Reserve EB-ICZM-DSS (TCNR)



Prepared by: E. Scepi.
Amici Della Terra - ONLUS - www.amicidellaterra.it/