P. 8. 1
ARCAS Vocational Training Programme

Project: New Evaluation Method for Homes of Social, Sustainable and Energy Efficient Interest – Architecture for Climate- in the Sudoe Territory (ARCAS)

Technical reference

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Executive summary

This document is part of Work Package 9 (WP 9) of the ARCAS project and describes the vocational training programme of the application and certification of the ARCAS Method that will be given in professional institutions belonging to the value chain of ARCAS, such as designers, construction managers, builders, and clusters, among others.

The structure of the present document is as follows: it includes three training blocks that cover the general criteria (block 1), the climate map viewer (block 2), and the ARCAS Tool (block 3). For more information about the Climate Map, Deliverable 1.1 may be consulted as well as Deliverables 5.1 and 5.2 to get more details about the ARCAS Tool.

1. CONTEXT

1.1 The ARCAS Project

The objective of the ARCAS project is to develop an assessment and design methodology aimed at the renovation of buildings and groups of multifamily housing buildings of social interest, to address energy poverty and promote sustainable renovation, energy efficiency, and healthy indoor environments in the SUDOE territory. The project is based on the integration of three research axes:

- AXIS 1 - Energy autonomy - efficiency
- AXIS 2 - Social quality - energy poverty
- AXIS 3 - Air quality - health

As a result of this integration, the work in the project is developed to determine the optimal relationship between the three mentioned axes and obtain the best energy efficiency while maintaining the social quality and well-being of citizens.

ARCAS is based on the use of similar climatology in the South Atlantic region for the development of a tool that allows, through key indicators, the design of building architecture based on maximizing energy efficiency, air quality and thus promoting social welfare, making use of the best available techniques, including renewable energy sources.

This project combines efforts to develop strategies and measures that facilitate the development of policies, at national, regional and local governments scale, for the renovation of multifamily housing buildings with great autonomy and energy efficiency (axis 1), with healthy air quality for building occupants (axis 3) and reducing energy poverty, which is so important in many European countries (axis 2).

ARCAS results and outcomes will be applicable and reproducible in the public and private institutions participating in the project and will be especially useful for professional associations, manufacturers, builders and for national, regional and local public administrations.

The Action Plans that will be developed in an integrated manner on the three axes of the research project by ARCAS beneficiaries, in collaboration with ARCAS associated partners, constitute a key element that will ensure the transfer of knowledge to the entire SUDOE territory, as well as the future sustainability of the ARCAS methodology.

From a methodological point of view, the project is structured in different Work Packages (WP). In the first phase, the indicators that will be used in the ARCAS methodology are defined. These indicators are proposed within the first four Work Packages, as well as the specifications and protocols for their quantification. Those four Work Packages are specifically:

- WP 1 - Climate indicators selection
- WP 2 - Selection of energy efficiency indicators in residential buildings
- WP 3 - Selection of indicators on best technologies available in renewables
- WP 4 - Selection of social quality indicators

In WP 5, the ARCAS methodology will be developed and implemented in a computer tool. Therefore, it is essential that the indicators selected in the previous WPs can be measurable and evaluable, in addition to being compatible with their application to different types of residential buildings and in different countries.

The methodology will be validated in WP 6. For this, a set of demonstration buildings will be selected. As selection criteria, buildings that include a casuistic representative of the three axes considered and the three countries of the consortium will be sought.

WP 7, WP 8 and WP 9 encompass the part of the project that can be considered as the capitalization part. More specifically, in WP 7, the ARCAS certification procedure will be detailed, generating a series of guides for project owners, and other relevant actors that will audit ARCAS projects. This work will be carried out in coordination with the associated partners of the project. As for WP 8, this group of tasks has as its main objective the training of professionals, and to achieve it, a training program will be defined to train professionals in the application and certification of the ARCAS method, and a pilot program will be provided training in professional institutions that belong to the ARCAS project value chain. Finally, in WP 9, strategies will be developed to establish new sustainability, energy efficiency, and social quality policies in the renovation of multifamily buildings of social interest. This includes, amongst others, proposals for renovation policies, financing models, and criteria to prioritize interventions. For that, the indicators defined in WPs 1 to 4 will be used and will be carried out in coordination with the public administrations and private organizations associated with the ARCAS project.

1.2 WP 8 – ARCAS training programme

The main objective of WP8 is to elaborate a vocational training programme about the application and certification of the ARCAS Method that will be given in professional institutions belonging to the value chain of ARCAS, such as designers, construction managers, builders and clusters, among others.

The framework of the programme revolves around 3 training blocks: the general criteria (block 1) the climate map viewer (block 2) and the ARCAS Tool (block 3). They are described hereafter.

2. ARCAS Tool training proposal - General criteria (Block 1)

- **Architecture for the Climate- in the SUDOE territory**
- **Funded by the Interreg Sudoe Program and the European Regional Development Fund.**
- **New evaluation method for social interest, sustainable and energy-efficient home in the Sudoe territory (SOE3/P3/E0922)**
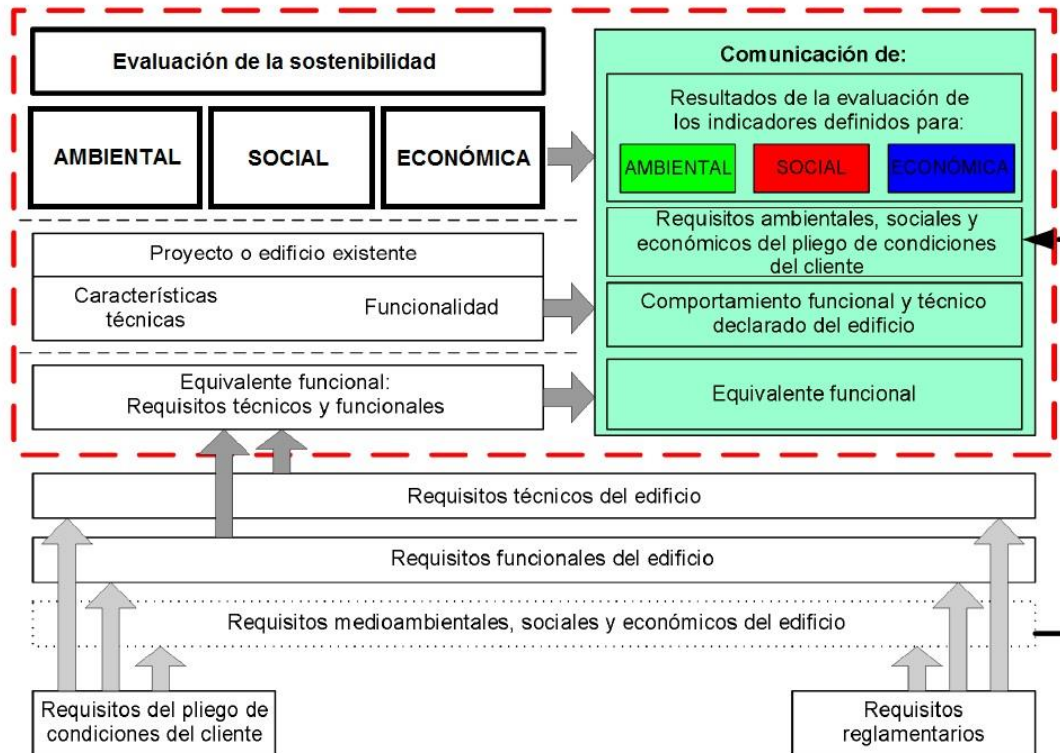
VISION AND GENERAL FRAMEWORK OF THE PROJECT. THE SDGs
SDGs and project work package

https://www.une.org/ods

ARCAS-SUDOE AND GENERAL FRAMEWORK FOR ASSESSING THE SUSTAINABILITY OF BUILDINGS.

UNE-EN 15643-1*:2012* Figure of the standard on page 16 of D5.1

OBJECTIVES OF THE ARCAS-SUDOE PROJECT

- Development of a methodology for the evaluation and design of the rehabilitation of buildings and groupings of collective social housing buildings based on the criteria of:
  - Energy poverty,
  - Sustainability and energy efficiency and
  - Health in the SUDOE territory.
- Development of support tools to meet these objectives that make the ARCAS method operational for different groups of work.

ARCAS-SUDOE METHODOLOGY

- Use of the similarity of climatology for the SUDOE area, establishing filtering systems through key indicators

- Development of multi-criteria computer tools based on large families of indicators.

ARCAS PROJECT STRUCTURE

- **The 9 Work Packages and the synergies between them.**
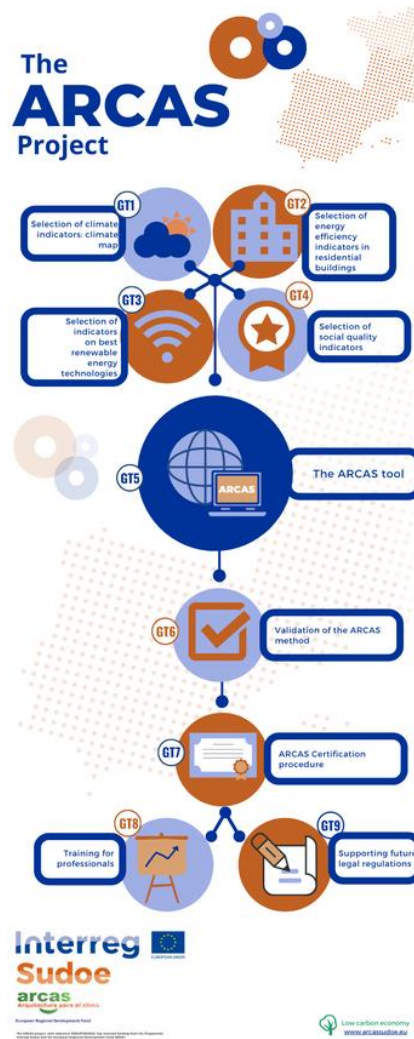
RESULTS AND RECIPIENTS

- **What are the ARCAS products?**

- **Tools used by different interest groups.**
- **F*inal tools***
  - *Weather data viewer and management tool*
  - *ARCAS-SUDOE tool for energy/environmental/social assessment of existing residential buildings focused on social housing.*
- **ARCAS energy certification services for the rehabilitation of residential buildings in the SUDOE area.**
  - *Online services. ARCAS-SUDOE tool, self-assessment and certification,*
  - *Offline services. Certification.*

WHAT ARE THE ARCAS INDICATORS?

- **ARCAS indicator.**

OBJECTIVES OF THE TOOLS GENERATED

- Generate a basis for the optimization of the sustainable rehabilitation of buildings.
- ARCAS certification. Certification of the behaviour of rehabilitation actions based on measurements of the most relevant indicators.
- Provide technicians and administrations with sufficient knowledge about the criteria that support the assessment achieved and the possible improvement options for the rehabilitation of the building stock based on these criteria.

MOST SIGNIFICANT ARCAS TOOLS

- ARCAS Tool access: **https://arcas-tool.predictia.es/arcas-tool**
- ARCAS climate and air quality map: **https://fecea-viewer.predictia.es/**

3. ARCAS Tool training proposal - Climate map viewer (Block 2)

PRESENTATION OF THE CLIMATE AND AIR QUALITY VIEWER AND ASSOCIATED CLIMATE TOOL.

Similarities and differences between the 3 regional areas of ARCA SUDOE.
**Utility of the climate tool for different users. Data for analysis.**
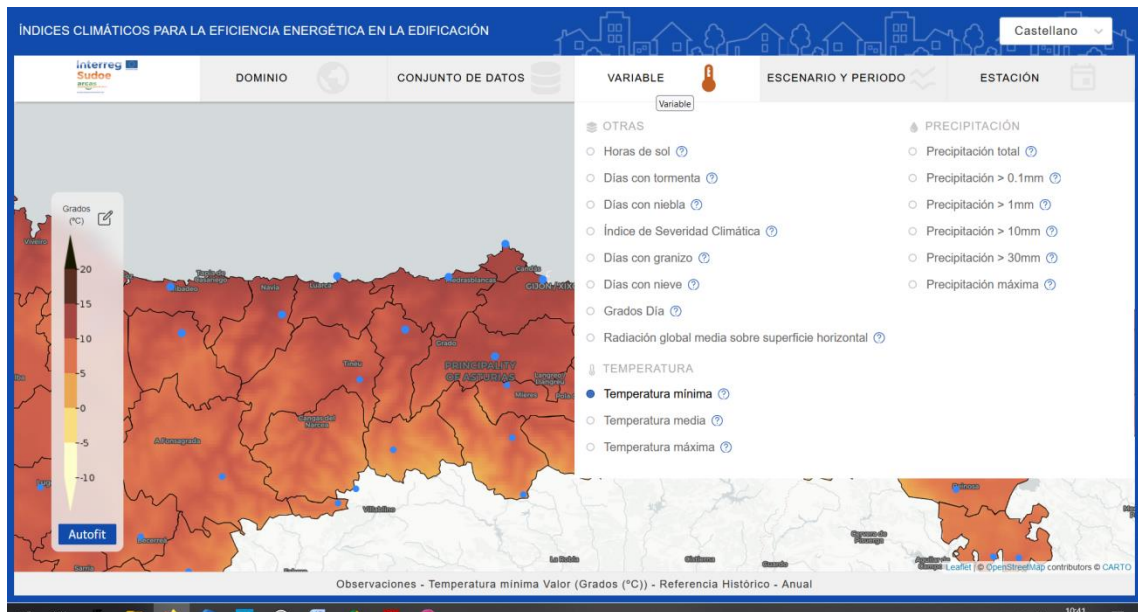
THE SOUTH TERRITORY. MESOCLIMATE CONDITIONS.

BASIC CLIMATE DATA. TEMPERATURE.

Seasonal and daily variations; and repercussions on the rehabilitation of the thermal envelope of the building. The bioclimatic design.

Bioclimatic design

Building orientation | Windows type and area | Thermal insulation
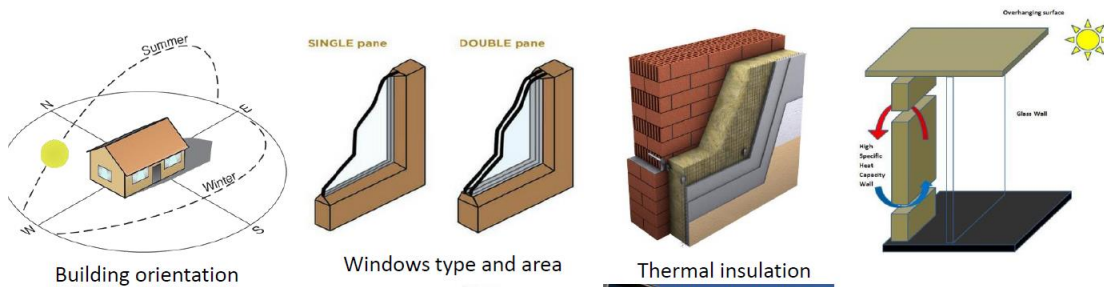
Seasonal and daily variations; and repercussions on the selection of thermal conditioning and energy supply systems.

BASIC CLIMATE DATA. HUMIDITY.
Natural ventilation:
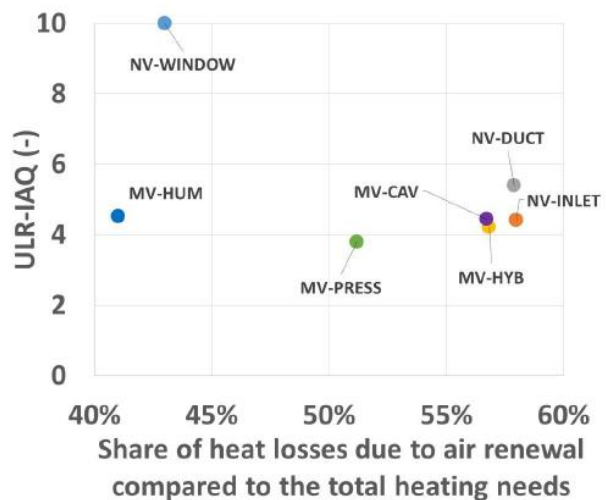**Hygienic ventilation. Influence on indoor air quality.**
Bioclimatic ventilation. refrigeration strategies.
Influence of humidity in the selection of thermal supply systems based on the use of renewable energies.

Bioclimatic design: comparison of ventilation systems
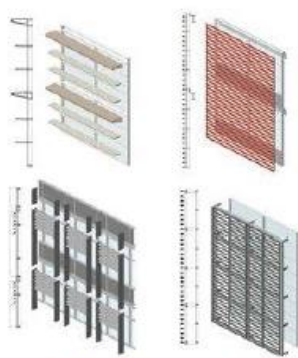
7 ventilation systems:
- Natural ventilation (NV)
- Mechanical ventilation (MV)

RADIATION DATA.

Utility in the different stages of the rehabilitation of buildings of continuous use for housing.

Strategies in bioclimatic rehabilitation.

Shading systems

Intelligent façades

Green roof/ roof pond

Renewable energy generation systems and solar radiation.

Renewable energy integration

- Thermal energy
  - Solar energy
  - Wood
  - District heating

- Electrical energy
  - PV panels
  - Windmills
  - Cogeneration
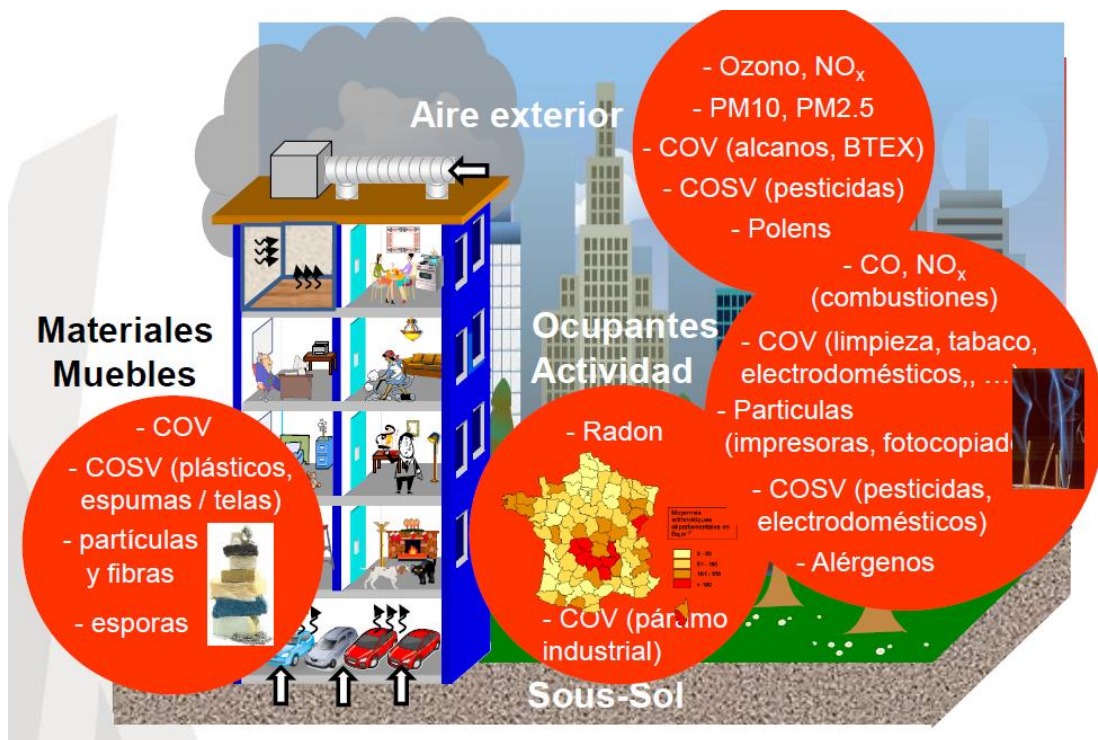
WIND DATA.
Bioclimatic strategies:
Adjustment to hygienic ventilation needs.
Wind protection during the underheated period.
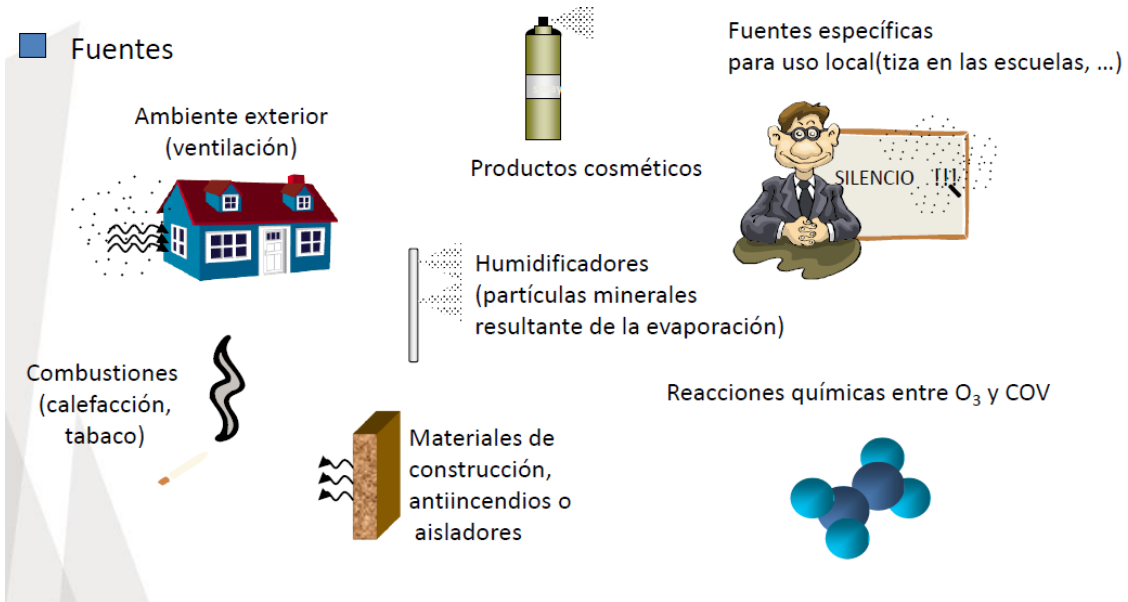**Natural ventilation during the overheated period.**

AIR QUALITY DATA.
Indoor air quality (IAQ) data analysed and impact on user comfort conditions.

Effects of EAQ on IAQ requirements in:
- *passive energy efficiency strategies*
- *use of renewable energy for residential use buildings*

Fuentes

Ambiente exterior (ventilación)

Productos cosméticos

Fuentes específicas para uso local(tiza en las escuelas, …)

SILENCIO !!!

Combustiones (calefacción, tabaco)

Humidificadores (partículas minerales resultante de la evaporación)

Materiales de construcción, antiincendios o aisladores

Reacciones químicas entre O_3 y COV

SYNERGY BETWEEN CLIMATE VIEWER DATA AND ENERGY RETROFITTING STRATEGIES FOR CONTINUOUS USE BUILDINGS AND USERS WITH LIMITED RESOURCES.

Design accessible data
Exportable data from the weather viewer by the user
Use different tools that take climate analysis into consideration.
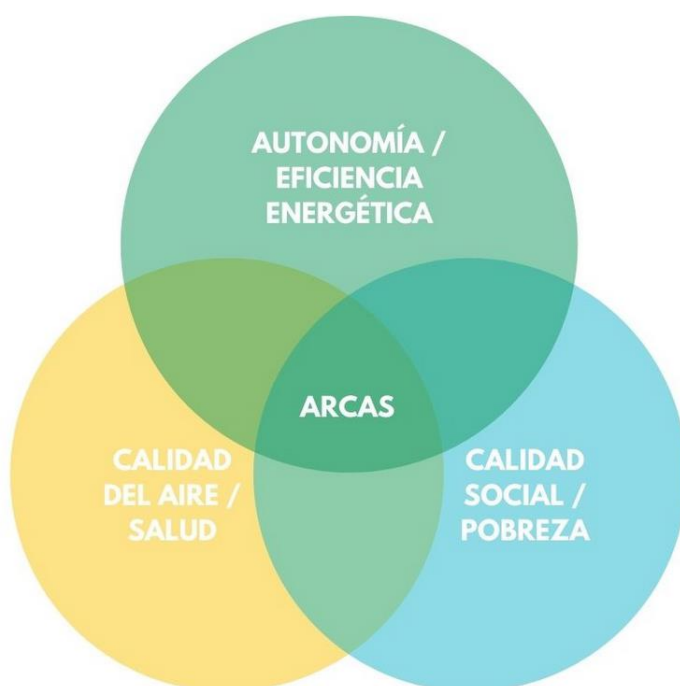**Files in Excel.**
Data of standard meteorological years based on MET and based on CSV.

4. ARCAS Tool training proposal – ARCAS TOOL (Block 3)

THE ARCAS TOOL

- **Goals:**
  - Develop reference criteria and indicators used by the different groups

- **Lines of action**

TOOLS. THE INDICATORS

- **Weather indicators. ARCAS climate and air quality map: https://fecea-viewer.predictia.es/**

- **Energy efficiency indicators and best renewables technologies available.**

- **Indoor air quality indicators.**

- **Social quality indicators selected to carry out the evaluation in buildings.**

PRESENTATION OF THE ONLINE TOOL

AXIS 1. AUTONOMY AND ENERGY EFFICIENCY

- Home energy balance

D2.2.1.Page 25
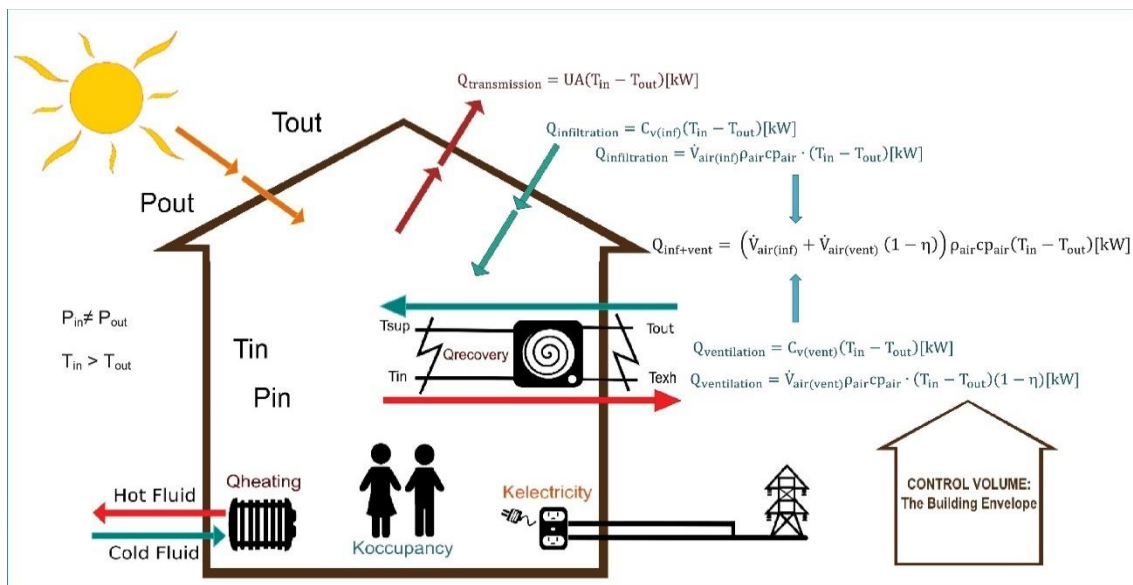
AXIS 1. AUTONOMY AND ENERGY EFFICIENCY

- **The indicators**

AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Energy needs
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Energy needs
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	HLC
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	HLC
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Primary energy consumption
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Primary energy consumption
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Renewable energy self-sufficiency ratio
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Renewable energy self-sufficiency ratio
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Renewable energy self-consumption ratio
AXIS 1: ENERGY EFFICIENCY/AUTONOMY.	Renewable energy self-consumption ratio

AXIS 2. ENERGY POVERTY AND HOUSING UNITS.

- What is it and how it can be defined for each of the areas analysed and defined by the ARCAS-SUDOE project.
- Intervention possibilities within the scope of potential energy poverty adjusted to basic indoor air quality requirements.

AXIS 2. ENERGY POVERTY AND HOUSING UNITS.

- The indicators

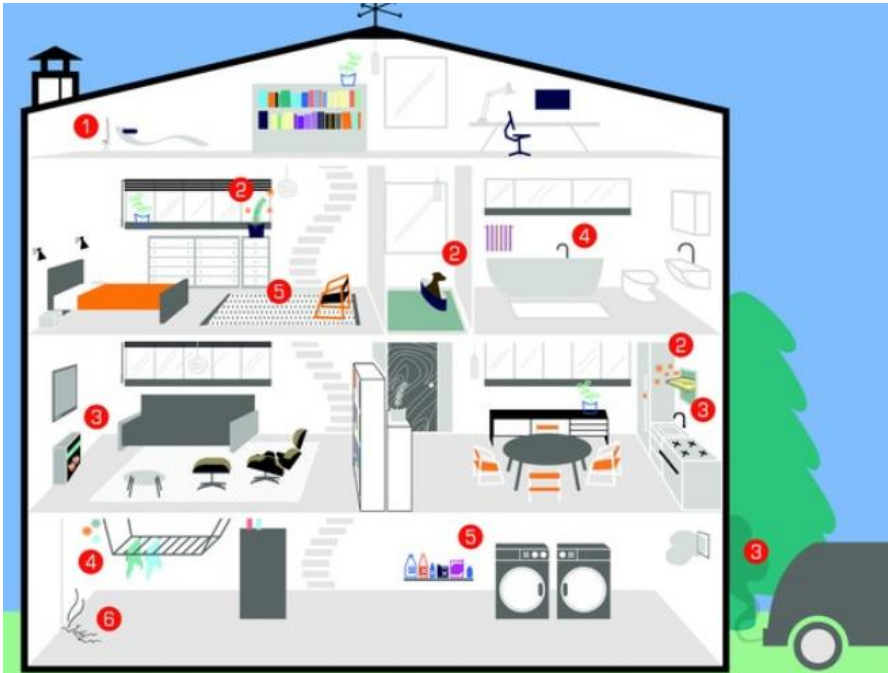| AXIS 2: ENERGY POVERTY	10%
AXIS 2: ENERGY POVERTY	10%

AXIS 3. AIR QUALITY AND HEALTH

- Inside comfort:
  - Thermal comfort
  - Lighting comfort
  - Acoustic comfort

- Indoor air quality

https://www.construcia.com/noticias/como-mejorar-la-calidad-del-aire-interior-de-los-edificios/

1 / El humo del tabaco
La exposición puede agravar los problemas respiratorios (por ejemplo, el asma), irritar los ojos y ser causa de cáncer de pulmón, dolor de cabeza, tos y molestias de garganta.

2 / Alérgenos (incluidos los pólenes)
Pueden agravar los problemas respiratorios y provocar tos, opresión torácica, irritación ocular y erupciones cutáneas.

3 / Monóxido de carbono (CO) y dióxido de nitrógeno (NO_2)
El CO puede ser mortal en dosis altas y provocar dolor de cabeza, mareos y náuseas. El NO_2 puede causar irritación de ojos y garganta, sofocaciones e infecciones respiratorias.

4 / Humedad
Cientos de especies de bacterias, hongos y mohos pueden crecer en espacios cerrados si disponen de suficiente humedad. La exposición puede causar problemas respiratorios, alergias y asma y afectar al sistema inmunológico.

5 / Sustancias químicas
Algunas sustancias químicas nocivas y sintéticas utilizadas en productos de limpieza, alfombras y menaje pueden dañar el hígado, los riñones y el sistema nervioso, provocar cáncer, dolor de cabeza y náuseas e irritar los ojos, la nariz y la garganta.

6 / Radón
La inhalación de este gas radiactivo puede ser perjudicial para los pulmones y provocar cáncer de pulmón.

Fuente: Centro Común de Investigación de la Comisión Europea.

AXIS 3. AIR QUALITY AND HEALTH. THE TAIL METHOD

Overall quality of indoor environment

Quality of T-A-I-L

AXIS 3. AIR QUALITY AND HEALTH.

- The indicators

AXIS 3: HEALTH/AIR QUALITY.	TAIL	Thermal confort
AXIS 3: HEALTH/AIR QUALITY	TAIL	Thermal confort
AXIS 3: HEALTH/AIR QUALITY	TAIL	Acoustic confort
AXIS 3: HEALTH/AIR QUALITY	TAIL	Acoustic confort
AXIS 3: HEALTH/AIR QUALITY	TAIL	Indoor air quality
AXIS 3: HEALTH/AIR QUALITY	TAIL	Indoor air quality
AXIS 3: HEALTH/AIR QUALITY	TAIL	Luminous confort
AXIS 3: HEALTH/AIR QUALITY	TAIL	Luminous confort

THE ARCAS TOOL AND THE ASSESSMENT OF ENERGY RENOVATION ACTIONS.

- Source data: what basic information has to be provided by the user or the responsible technicians.
- Previous data for the analysis calculated and/or estimated. Energy certification prior to analysis using the ARCAS method.
- Data measured in situ.
- Types of data and measurement tools.
- Minimum measurement period and user intervention.
- Relationships provided by the tool based on the results of the project in the different WP 1 to 9.

QUALITATIVE AND QUANTITATIVE ANALYSIS OF THE RESULTS OF THE REHABILITATION.

- Comparison with other tools/methods aimed at promoting and evaluating energy rehabilitation mechanisms that take indoor air quality into consideration.
- The TAIL protocol applied to the residential sector.
- Repercussions of the energy poverty parameters in the analysis.

THE ARCAS TRAFFIC LIGHT. EVALUATION FOR THE MOST SIGNIFICANT PARAMETERS.

PURPOSE OF THE TOOL FOR THE INTERPRETATION OF THE ENERGY RENOVATION RESULTS.

PURPOSE OF THE TOOL FOR THE DEVELOPMENT OF NEW ENERGY RENOVATION ACTIVITIES.

FINAL RESULTS. ADMINISTRATIVE UTILITY

- End users:
  - owners
  - designers
  - Energy efficiency specialists
  - Public administrations

- Administrative and technical output file types:
  - PDF file (closed and validated)
  - Excel file
  - CSV file