Weather Station Networks

Using knowledge to take action

Tragsatec
Grupo Tragsa

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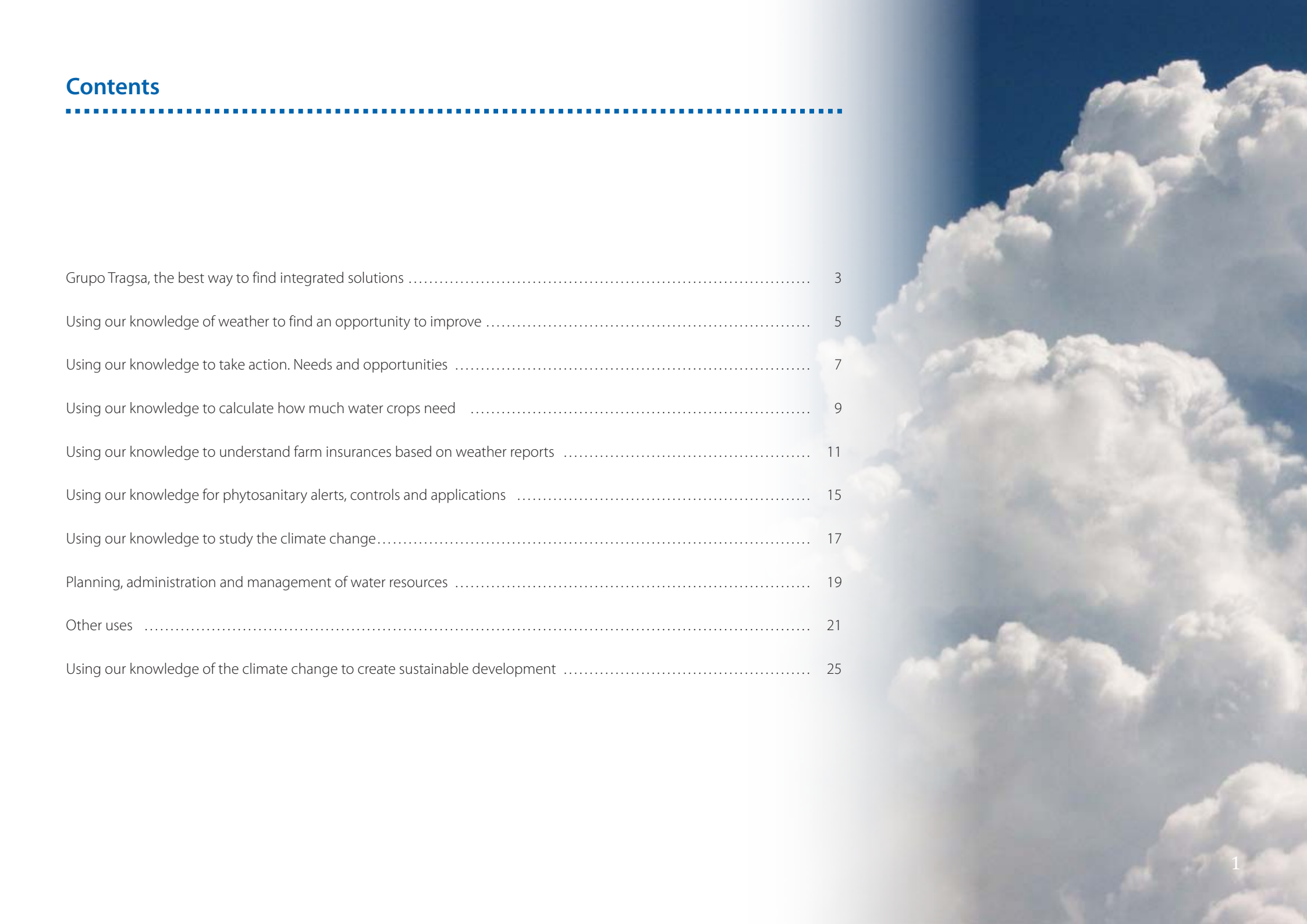


Grupo Tragsa, the best way to find integrated solutions

Grupo Tragsa has been working for 35 years to encourage sustainable development of the rural and marine environment, drawing up projects that care for the environment and improve peoples' quality of life.

Creating the capacity to develop

Grupo Tragsa is formed by Tragsa (Transformación Agraria, S.A.) and its subsidary, Tragsatec (Tecnologías y Servicios Agrarios, S.A.). Both companies are specialists in providing integrated services and solutions with a high added value, and are participants in actions related to institutional strengthening, the development of skills and the transfer of technology. Their experience in engineering, consulting and technical assistance related to agricultural, forestry and rural development, environment and marine issues, establishes them as an innovating company in regard to drawing up leading engineering projects with cutting edge technology.

Using our the knowledge of weather to find an opportunity to improve

20 years ago, the World Commission on Environment and Development acknowledged that environmental, economic and social matters are interrelated and it recommended including these aspects when taking decisions associated to **sustainable development.**

In order to be able to make these decisions, one of the issues that can be treated in depth is the understanding of weather. If this knowledge is well-used by local agents it can be transformed into high financial, social and environmental profits.

For this reason, there are reasons for which it may be necessary to gather **meteorological information** *in-situ,* measuring the specific variables that are required by the different activities (farming, renewable energies, research, etc.) to which support will be given.

To obtain this information, the areas that need it (rural areas, nature reserves, etc.) can be provided with **weather station networks** that have been specially designed for the specific needs which are to be promoted, providing data in real time with a higher degree of precision and representation, offering a quality product in the form of meteorological data placed at the disposal of local activities, thus enabling them to improve their efficiency and capacity to develop.

Within this framework, **Tragsatec** via the **Department of Telemetry of the Architecture and Engineering Management,** have extensive experience in the **design, scale, assembly, use and calibration** of different networks in the farming-environmental field.

The Telemetry Department deals with extremely complex requirements and projects with the necessary **agility and flexibility** that is essential in order to guarantee this type of automatic network can be run successfully, applying the latest advances in new technologies, regarding both instruments as well as data transmission.

Two examples that prove Grupo Tragsa's success:

- www.magrama.es/siar
- http://reddeparquesnacionales.mma.es/parques/rcg/index.htm

Grupo Tragsa offers you the chance to improve

Using our knowledge to take action. Needs and opportunities

International, economic and social trends, the evolution of the international trade of farm products, technical and scientific progress and the climatic change make up a completely different environment for international policies, which are focused towards improving economy preserving natural resources.

> The stations make precise measurements with proven reliability and offer the possibility to adapt each one to the requirements of the application.

Via the automatic weather stations, the locality has a tool which adapts new technologies to user needs with the aim of guaranteeing and providing information of quality for a multitude of activities that enables and strengthens **sustainable economy:**

- Calculation of **water requirements** of crops.
- Use of data for **insurance companies.**
- **Phytosanitary** control.
- Planning, administration and management of **water resources.**
- **Climatic change.**

Other uses:

- **Alert** systems in the event of **meteorological** risks: frost, heatwaves, etc.
- **Project design** (the search for new crops, characterisation of the climate).
- **Renewable energies.**
- **Quality of the air.**
- **Training.**

These networks can be designed to simultaneously take measurements of a multitude of parameters with the **advantage that they can be adapted to the needs of one or several applications** which, together with the possibility of placing them in areas that are influenced by the activities to be supported, confers quality and precision to the data that has been obtained thanks to the representation of the information offered.

Using our knowledge to calculate how much water crops need

According to the Food and Agriculture Organisation of the United Nations (FAO) 2.5 % of the world's water resources is made up of fresh water and only 0.3 % of this quantity can be used. Depending on the area of the planet, water is either considered to be an asset at the disposal of everyone, or it is a scarce resource. A **shortage of water** that occurs when the way it is consumed and distributed does not satisfy users' needs (homes, farming, environment, etc) due to demographic pressure and the level of needs of all countries.

Farming depends on climatic conditions and natural resources. An efficient level of farming can be reached by means of **good water management,** which is obtained by making a precise calculation of how much water will be required by crops. A network of agrometeorological stations provides the opportunity to obtain **useful and rigorous information of quality** and helps **improve planning, management and control** of irrigated farmland, thus **reducing operating costs, optimising the use of water** and improving **energetic efficiency.**

A tool of invaluable value at the service of administrations and local towns. It offers the opportunity to predict how much water is going to be required and help adjust discharges from reservoirs, adapting them to real demands.

The information and dissemination of these techniques which reduce the consumption of water and energy used for farming is an ideal application of farming policies. The focus is on improving profitability of farmlands while preserving natural resources, which is reflected by **economic and environmental profits.**

In this area, Tragsatec, via the Department of Telemetry Networks of the Architecture and Engineering Management, have worked on the design, scale, assembly, maintenance and use of the **Agroclimate Information System for Irrigation (SiAR)** for the Ministry of Agriculture, Food and Environment. From the architecture and design of the station to the installation of the 361 assembled stations and 12 Zonal Centres.

http://www.magrama.es/SiAR

SiAR
Sistema de
Información Agroclimática para el Regadío

Using our knowledge to understand farm insurance based on weather reports

Risk is associated to farming. Farmers face the instability of farm produce and the loss of competitiveness in local or international markets as a consequence of the **risks caused by variations in the climate.** Harvests can be destroyed by droughts, frost, hurricanes, earthquakes, torrential rain and floods. These fluctuations generate insecurity in regard to resources, prices and profitability which, at the same time vary depending on the nature of the produce, agroclimatic region, institutional characteristics and local public policy.

Crop insurance:
the establishment of premiums depending on climate risk.

To manage this risk in such a way the economic capacity of rural towns enables them to innovate, invest and work, providing farmers with guaranteed access to **insurances based on weather reports** and other risk management tools. To achieve this it is necessary to invest in meteorological networks designed to obtain and spread these reports.

Adequate, solid and highly developed infrastructure that improves the quality of precise climatic data at the correct moment is vital for the success of insurances based on weather reports.

The benefits of networks for Administrations:

- Farmers guarantee their financial stability because they **protect their investments.**
- **Confidence is strengthened** of all the parties involved and who are dependant on the production (farmers, insurance companies, trading companies, distribution channels and local or regional management bodies).
- **Economic development** of a region or country is encouraged due to its increased subsistence and independence regarding the management of climatic risks.
- Insurance companies can **forecast, know and adapt** to the actions their insurances cover, as well as being able to determine the rates of their products by means of the data provided by the stations.
- Administration of the insurance is improved because it is **less expensive** than traditional farming insurances due to the fact it is not necessary to carry out inspections *in situ* or evaluate individual losses.
- Payment of compensations are made by following previously specified patterns of **climatic reports,** allowing rates to be decided and contract clauses to be drawn up.
- Governments are also protected from risk because when they can count of these types of insurances they have a **line of liquidity.**
- **Discrepancies** between insured parties and insurance companies are settled in the event an agreement is not reached.
- Financial services and the distributors of consumer goods are more inclined to grant **loans** to administrations and farmers that insure their products with insurances based on weather reports.
- **Insurance contracts** are drawn up against specific risks or events that arise from performance losses in areas that are determined by droughts, hurricanes, floods, etc. which are registered at a regional level in accordance with the weather station that offers the climatic data.
- Risks can be covered in accordance with different **climate areas.**

Both the institutional and individual capacities of the rural world are strengthened

Using our knowledge for phytosanitary alerts, controls and applications

The influence of meteorological factors that cause the development of plagues and diseases in crops is considerable. Knowing about the **biological cycle** of a plague or disease in any area of the world and associating it to **meteorological data,** humidity, temperature and thermal integrals means that bioclimatic models can be used to make predictions and minimise the damaging effects they cause.

> Apply what is only strictly necessary, at the right moment

Prediction models are made to give phytosanitary alerts. These models relate the biological signs that indicate the presence of disease with meteorological data taken from **weather station networks** that are used for:

- Early diagnosis of the outbreak or the state of a plague or disease.
- Knowing when to act against parasites.
- Predicting the severity of diseases for each climatic season, periods of rain or droughts.
- Rationalising the use of phytosanitary products.
- Maintaining plantations in a good state of health.
- Reducing the production costs of the crops grown on the farmlands.

> To guarantee phytosanitary products are applied with respect for the environment and the health of consumers, it is necessary to use them in a responsible manner, guaranteeing the sufficient level of safety when faced by risks.

An example of the success of the weather station networks associated to phytosanitary monitoring and alerts on which Tragsatec has worked is **Red Dacus** of the Ministry of Agriculture, Food and Environment of Spain. The project was drawn up to control, alert, assess and monitor the olive tree fly.

The Red Dacus has proven to be a very beneficial phytosanitary control system for olive tree farmers because the information generated by this network has played a vital role in the control of the olive tree fly, reducing the cost of phytosanitary treatments and obtaining greater productions of better quality.

Tragsatec has been responsible for designing, installing, maintaining and operating the network since 1990.

Using our knowledge to study the climate change

The **climate change** is one of the greatest problems faced by society today. The term includes **variations** in the climate during a period of time, paying special attention to significant fluctuations of both **temperatures and precipitations.**

Preparing decision-making institutions by providing them with reliable information about the climate, in order to enable them to adapt to the climatic change

The global consequences of these changes are a fact: reduced water resources, an increase of conflicts caused by the use of water, contamination of natural resources, acceleration of desertification, increase of agricultural losses. A series of changes that has been produced by the so-called **Global Change.**

Given these circumstances, the Global Change is a priority on international agendas as it is a **global problem** with local impacts. If the current and future repercussions of these impacts are assessed, it will be possible to **establish adaptation** strategies when making decisions regarding social, economic and environmental sustainability.

Mitigation and adaptation measures

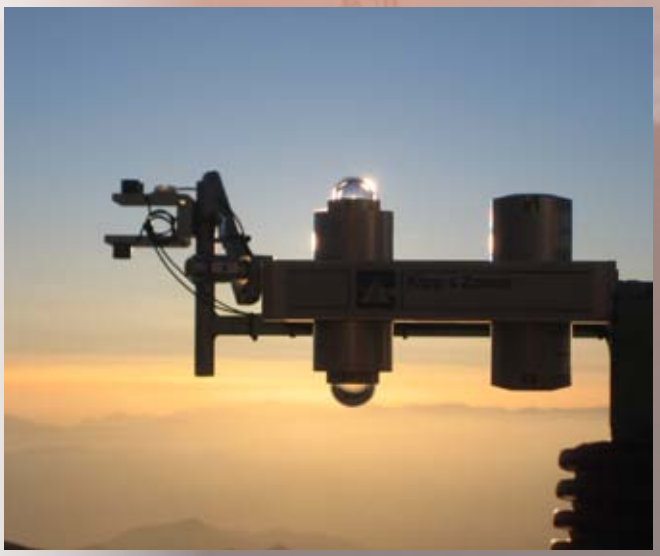
Therefore, huge amounts of high quality data are necessary in order to efficiently watch over and predict the phenomena these changes cause.

From a meteorological point of view, it is therefore necessary to maintain **infrastructures** that can collect data *in situ,* to obtain long series of homogeneous and quality meteorological data, which can be used to develop a system to monitor the climatic impact and its variability.

From the global change to the local change

The meteorological information offered by these station networks can help to:

- Have historical series of data.
- Have an information base that supplies the research programmes.
- Create predictive models about the projections of the climate change.
- Take adaptation and mitigation measures.
- Adapt agriculture for protection against local climate changes.
- Consolidate food security.
- Establish measures to reduce impacts on biodiversity.
- Mitigate the risks of water shortages.
- Balance the energy demands.
- Limit the spread of diseases.



Planning, administration and management of water resources

The water resources industry depends on a wide range of meteorological and climate information, such as observations, models, forecasts, etc., for making decisions. Therefore, it is necessary to use specialised data sources offered by the networks of **meteorological stations.**

Operations such as the construction of reservoirs, diversions or desalination plants require high investments, and for their planning, we must have reliable data on which decisions will be based. The possibility of having meteorological information based on reliable historical series contributes to a better **planning, administration and management of water resources:**

- **Water balances of river basins or underground aquifer systems.**
  - Analysis of water balances to describe water inflows and outflows.
  - Calculation of water balances in an aquifer.
  - Piezometric studies. Comparison of piezometric curves with rainfall.
- **Hydrological planning for the construction of dams.**
  - Hydrological modelling of water availability and recharge of aquifers with rainfall and evaporation data.
  - Determination of the location of a reservoir by measuring the distribution of rainfall in a river basin.
  - Studies of relative storage prior to the location of a dam.
  - Determination of the relationship between storage and performance by means of historical series of climate data.
  - Economic advantages arising from optimisation of resources.
- **Hydrological planning and adaptation responses.**
  - Support for the management of the release of water for water consumption uses.
  - Meteorological information for early warning.
  - Forecast of flows.
  - Encouragement of hydroelectric operations.

They strengthen the technical strategies of water administrations for a better management both of underground and surface water.

Other uses

Apart from all of these uses described, a **good coverage of meteorological data** obtained through networks of automatic meteorological stations creates an information source we can take advantage of in endless practices, for a wide range of industries:

Warning systems for meteorological risks

As data sources for models of forecast and warning with regard to natural disasters:

- Severe storms.
- Floods.
- Heat waves and droughts.
- Tropical gales, hurricanes and cyclones.
- Cold fronts.
- Danger of fire.

Project design

Identifying the meteorological behaviour in geographical areas or specific zones that may affect the security or performance of any engineering project sensitive to atmospheric variations, is vital to guarantee the success of any infrastructure or study.

Providing updated information of the climate conditions is necessary for establishing a starting point allowing engineers to value and decide about the design, execution and management of their projects:

- Interdisciplinary works in the development of the architectural, town planning and civil work design.
  - Information which is necessary to guarantee the security of the constructions.
  - Selection of locations in civil engineering, architecture, etc… projects.
  - Long term investment in infrastructures from evaluations of severe meteorological and climate phenomena.
  - Making profitable decisions with regard to the construction methods to be used.
  - Calculation of the peak charges in heating and refrigeration of buildings.
  - Sizing of equipment: protection against frost, high pressures, etc.
  - Bioclimatic architecture.
  - Environmental sustainability of constructions.
- Agronomic engineering:
  - Long term investment in infrastructures and locations of agricultural buildings (premises, greenhouses, etc).
  - Climate studies which are necessary for the analysis of project design alternatives.
  - Information for the design, planning and management of agricultural exploitations.
  - Selection of crops in terms of the climate characteristics of an area.
  - Protection of crops depending on the meteorology of the area (frost, heat waves, etc.).
  - Management of livestock exploitations.
  - Application of meteorological data in the management of crops.

Renewable energies

The renewable energy industry is particularly sensitive to meteorological and climate factors, and therefore, has a wide experience in the use of meteorological information. Meteorological data are used to design facilities and know their economic feasibility (investment return), and to know *a priori* the potential production in time (day, week), and thus to be able to program the consumption strategies.

> Key element in the development of energy saving technologies

Solar energy

Companies installing and exploiting **solar energy** plants consume meteorological information to be able to establish the amount of energy we can take advantage of on a specific area.

Therefore, compiling reliable meteorological data is important for the sizing and planning of solar installations, both thermal and photovoltaic, and this can be achieved through a network of stations located on the area near to the place where we want to perform the implementation and exploitation of this type of technologies, thus allowing us to obtain historical data.

Eolic energy

The same as with solar energy, the wider and more reliable the available meteorological information is, the greater the accuracy when choosing an optimal location for the production of eolic energy. Therefore, the station networks are ideal for the world of eolic energy, as they are a data source for the planning of plants.

Besides, these data can supply the meteorological forecast models helping to estimate as precisely as possible the wind conditions on each time area and moment, allowing the **management of the energy offer** of these plants.

> They have become standard in the acquisition of data from meteorological signals and sensors in wind farms.

Air quality

The bad quality of urban air is a local problem, but it has global consequences, due to the emission and spread of some pollutants that affect people's health. The assimilation of observation meteorological data supplies the forecast and diagnosis models of air quality.

> Reinforcement of the actions against the climate change by improving the urban air.

Research

The use of past, present and future data supplied by the networks of meteorological stations promotes research in all fields and needs, putting at its disposal information for many projects:

- Research about physical climate system and its natural variability.
- Promotion of R&D&i in the field of evaluation of data series:
  - Historical data.
  - Meteorological statistics.
  - Climate maps.
  - Climate trends.
  - Seasonal climate characteristics.
  - Meteorological instruments.

Training: strengthening capabilities

A network of meteorological stations is a spreading vehicle. With these systems, public administrations have at their disposal the necessary technical support to strengthen the use of reliable and useful information, being a strategic starting point in education and culture of the target public.

> The knowledge of the climate by population connects it automatically with the environment, reduces its vulnerabilities and enables it for making decisions.

It is a starting point to spread the knowledge of **climate training** in schools, secondary education centres and universities; the exposure of students to climate knowledge makes them sensitive about things happening on their environment, and develops creativity, reasoning, observation and mathematical capability; understanding the climate aspects and relations, they will be able to easily master many other aspects of learning and knowledge.

> Widening knowledge

Using our knowledge of the climate change to create sustainable development

The advance towards **sustainable economy** requires environmentally friendly infrastructures giving support to the different economic sectors for the development of their activities. Technological tools providing added value to the products of the different industries changes them into economic motors, supporting managers for a correct decision making; the decisions will serve as a catalyser of new impulses, which will be the support of the **green economy** of a country.

Tragsa Group: Improving capabilities as an answer to climate challenges.

Tragsatec meets this demand, providing its wide experience and its highly qualified multidisciplinary technical team; this ensures the success of investments and operations in this type of infrastructures, thus creating the capabilities that are necessary for a **sustainable development.**

TRAGSA
Central Office
C./ Maldonado, 58
Tel.: +34 91 396 34 00
Fax: +34 91 396 34 88
28006 Madrid

TRAGSATEC
Central Office
C./ Julián Camarillo 6 B
Tel.: +34 91 322 60 00
Fax: +34 91 396 34 69
28037 Madrid

comunicacion@tragsa.es
www.tragsa.es