European Commission

Joint Research Centre

Researching the Future

A history of the Joint Research Centre's Ispra site

Paolo Castello, Matteo Gerlini, David Wilkinson

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By Paolo Castello, Matteo Gerlini and David Wilkinson
Translation by Chiara Frescurato

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Foreword

We are delighted to present this book on the history of the Ispra site of the European Commission's Joint Research Centre.
The book, which is an authoritative history researched and prepared under the lead of Professor Matteo Gerlini of the University of Siena, traces the development of the site from its inception in 1956 as an Italian national research centre focused entirely on the peaceful use of nuclear energy through to its present-day role supporting European Commission policymaking.
During that 70-year history, the site has constantly evolved, in terms of both the fields of the scientific research undertaken there and its infrastructure and facilities, while consistently being at the forefront of scientific developments and their relevance to efficiently address the increasingly complex policy challenges facing the European Union.
Today, the site is the European Commission's third-largest premises after those in Brussels and Luxembourg, home to nearly 2 500 workers, of whom 1 700 are statutory staff, working in a truly multinational and multicultural environment with a vast network of international scientific contacts. Its dynamic evolution through the decades has progressed in parallel with that of first the European Community and then the European Union. Yet no matter how far that evolution has gone there is always continuity with the early days in the lively and mutually enriching relations between the staff on site and both the host Country authorities and the neighbouring public. The European Commission will be forever grateful for this ecosystem of collaboration, which provides essential support to its Ispra-based activities.
Finally, we would like to thank the authors and all our JRC colleagues who have helped in preparing this book, as well as the European Commission Library, the European Commission's Historical Archives Service and the Historical Archives of the European Union for the invaluable help they have provided in carrying out the necessary historical research. We hope this book can serve the dual purpose of both formally documenting the site's history for future reference and being an interesting read for all our staff and stakeholders in Italy and beyond.

Bernard Magenhann
Director-General, JRC

Rien Stroosnijder
Site Manager, JRC Ispra

October 2025

Chapter I

The origins (1956-1960)

View of Ispra, 1902.

Chapter I

The origins (1956-1960)

At the beginning of the period covered by this historical overview, Ispra was a lesser-known municipality in the Varese province. The province experienced substantial economic growth during the 20th century. At the start of the 1900s, the area was primarily a holiday destination for the bourgeoisie of Milan, but the establishment of the Varese province in 1928 contributed to the industrialisation of the city of Varese; it became the capital of the province, which includes both the Valle Olona and Busto Arsizio–Gallarate manufacturing areas. This institutional transformation, combined with economic growth and the proximity to the Swiss border, established Varese as a hub for financial activities in Lombardy.

The area has played an integral part in Italian history: notably, the Battle of Varese on 26 May 1859, was a pivotal moment in the Second Italian War of Independence, ending in the defeat of Austrian forces by Giuseppe Garibaldi's Hunters of the Alps. Just the day before, a contingent fighting for the Kingdom of Lombardy–Venetia had attacked Garibaldi's forces in Sesto Calende, near Ispra. Considering Italian history from a distinctly different perspective, it is worth remembering that the Milan–Varese highway – built just over 60 years after the battle – was Italy's first motorway.

Ispra, a lakeside municipality of the Verbano area (Lake Maggiore, on which the town is situated, is also known as Lake Verbano), was already established during the Kingdom of Italy, but, unlike other parts of the province, it did not benefit from the industrialisation that took place at that time. The lakeside community relied on existing artisanal production of lime – which was carried to Milan via the waterways running through the Lombardy region – on agriculture and on summer holiday visits by Milan's citizens.

A marginalised presence within the provincial context, Ispra unexpectedly intersected with 20th-century history by embarking on the farthest path from its municipality past: that of European scientific research.

The science that shaped the post-war era was undoubtedly nuclear physics. In Italy, research in this emerging branch of physics began under Fascism with the work of the young Enrico Fermi, the first holder of the theoretical physics chair at La Sapienza University of Rome, and his school, the *'Via Panisperna boys'*, named after the street housing the physics institute.

Fermi was awarded the Nobel Prize in physics in 1938 and took the opportunity to avoid returning to Italy, due to the new racial laws, seeking refuge in the United States (US) with his Jewish wife, Laura Capon.

In the States, Fermi built the first atomic pile, contributing significantly to the Manhattan Project, aimed at developing the nuclear bomb. The bombings of Hiroshima and Nagasaki put an end to the war and initiated the tension between the victorious nations, in particular the United States and the Soviet Union, that had defeated the Axis powers.

Garibaldi's Hunters of the Alps repel an attack by the Austrian Division of General Urban in the Battle of Varese on 26 May 1859 (Edoardo Matania, 1847-1929).

The A8 motorway at Gallarate.
(Source: Autostrade per l'Italia historical photography archive).

In post-Second World War Italy – emerging from the German occupation and the civil war against Fascism – nuclear energy garnered immediate attention. On 19 December 1946, the private firm Information Centre for Studies and Experiments (*Centro Informazioni Studi Esperienze* – CISE) was founded in Milan by a group of technicians and scientists from academia and the largest Italian electric company, Edison. Engineer Vittorio De Biasi, the managing director of Edison, tasked the young engineer Mario Silvestri with running the nuclear programme, alongside Giuseppe Bolla, a professor of physics at the University of Milan, and his collaborators Giorgio Salvini and Carlo Salvetti. Edoardo Amaldi – one of the Via Panisperna boys and the most distinguished Italian nuclear physicist of the post-war era – also joined them. Other major Italian industries such as Fiat (automotives), Cogne (steel), Montecatini (chemicals) and Società Adriatica di Elettricità – SADE (electricity) participated in the CISE. A delegation of experts and scientists, led by Bolla, requested a meeting with the prime minister of the newly established Italian Republic, Alcide De Gasperi, in Paris, where peace negotiations between the Allies and Italy were under way. The delegation sought assurance that the peace treaty would not contain clauses preventing Italy from using nuclear energy for civil purposes.

The CISE envisaged Italy following a technologically and industrially advanced path aimed at the domestic construction of a power reactor, the purpose of which would be the production of electrical energy. Achieving this would require acquiring technology, training personnel and selecting reactors fuelled by natural uranium, which would be cooled and moderated by heavy water. Natural uranium did not, *per se*, require the extremely expensive 'enrichment' process that is needed to increase the percentage of specific isotopes within uranium. Heavy water (defined as such due to its

The Via Panisperna boys.
From left: Oscar D'Agostino, Emilio Segrè, Edoardo Amaldi, Franco Rasetti and Enrico Fermi.
(Source: Sapienza University of Rome, archive of the Department of Physics, Fondo Lodovico Zanchi, Series 7, fasc. 3, subfasc. 1, Via Panisperna Institute).

Robert Schuman presenting the Schuman Declaration proposing the European Coal and Steel Community, in the Clock Room, Quai d'Orsay, Paris, 9 May 1950.

higher percentage content of the hydrogen isotope deuterium) was produced using a similar but much less costly process.

While major industries were pursuing national programmes, European politics was considering the prospects for shared economic development, beyond solely national boundaries. Economic and political integration was perceived by the governments of what was then defined as western Europe as a means of achieving peace in a continent already divided by the dominance of the Union of Soviet Socialist Republics (the Soviet Union) over central and eastern European countries. The situation was essentially an armed peace, as these governments feared Soviet expansionism and the growing influence of communist parties.

The North Atlantic Treaty was signed in 1949, binding the United States to protect western Europe and initiating the process that allowed the US to permanently deploy its military forces overseas within the NATO framework.

In May 1950, the French Minister of Foreign Affairs, Robert Schuman, a staunch advocate for European unification, proposed the establishment of a high authority to oversee the production of and trade in coal and steel. This supranational institution, not directly controlled by Member States' governments, would manage the integration of the national coal and steel sectors for the benefit of all participants in the community. In this way, the Franco–German conflict over the Saar and Ruhr mining areas would be resolved within a European forum enabling free trade and regulated production, with the participation of Italy and the Benelux countries. The proposal was for a European Coal and Steel Community (ECSC), which would grant new political legitimacy as a sovereign entity to the Federal Republic of Germany – West Germany, created when the country was divided after the war.

On 18 April 1951, the Member States approved the Treaty establishing the European Coal and

Steel Community, which came into effect on 25 July 1952, with Belgium, West Germany, France, Italy, Luxembourg and the Netherlands (known as *'the Six'*) as Member States.
Jean Monnet, a prominent figure in European integration, was appointed President of the Community's High Authority. The government of the United Kingdom and the Scandinavian monarchies did not accept the Community's supranational framework, although the Member States had balanced the High Authority's power by establishing the ECSC Council of Ministers, an intergovernmental body akin to other international organisations.

Jean Monnet on the staircase of the seat of the ECSC High Authority, 1 January 1953.

The Six attempted to apply the same supranational model in forming a European Defence Community (EDC). The United States advocated its creation as a strategic and political necessity to defend western Europe against a potential Soviet invasion. The French Prime Minister, René Pleven, proposed a plan for the Treaty establishing the European Defence Community, which was signed in 1952 by the Six; however, the French parliament rejected its ratification in 1954, ultimately terminating the plan. The ECSC demonstrated the willingness of European governments to integrate the coal and steel sectors under supranational principles. Conversely, the EDC exposed the limits of such integration in a sensitive area such as defence. The objectives that the EDC sought to realise – primarily active German participation in the Western defence system – were pursued through other international organisational channels. Politically, however, the EDC project was not limited to the common defence but intended to result in significant progress towards European unification. With its collapse, the European integration discourse faced a crisis, and political action reached a standstill.
As the debate on the EDC intensified, on 26 June 1952 Italy approved a decree establishing the National Committee for Nuclear Research (*Comitato Nazionale per le Ricerche Nucleari* – CNRN), which became the first body responsible for formulating the state's nuclear policy and technical and scientific choices in this area. The CNRN lacked its own legal personality, serving as an advisory body to the National Research Council (*Consiglio Nazionale delle Ricerche* – CNR). Francesco Giordani, Professor of Electrochemistry at the University of Naples, chaired the CNRN, while Felice Ippolito, Professor of Applied Geology at the same university, was its secretary-general; Amaldi was a committee member.
The CNRN's development strategy focused on acquiring US technology, taking advantage of the United States' shift in policy concerning access to

vital information for civil nuclear energy use. This change was heralded by President Dwight David Eisenhower's *'Atoms for Peace'* speech at the United Nations on 8 December 1953, in which he offered to extend US cooperation on peaceful uses of atomic energy to all countries that requested it.

In the spring of 1954, a delegation led by Francesco Giordani, Felice Ippolito and Carlo Salvetti of the CISE travelled to the United States and negotiated the purchase of a 1-megawatt research reactor of the CP-5 type, then operational at the Argonne National Laboratory. This reactor was powered by uranium-235, enriched to 20%, and moderated and cooled by heavy water. It was the last in the Chicago Pile (CP) series, the first of which had been created by Enrico Fermi. This decision to take a 'turnkey' approach faced opposition from within the CISE, as some would have preferred to develop a reactor of this kind domestically. However, in October 1956, the CNRN and the large company American Machine and Foundry (AMF) signed the contract for the CP-5's delivery: the reactor was to be installed at Ispra, where a nuclear research centre would be established. The CISE was to participate in the preparation of the site and the management of the reactor, with Carlo Salvetti set to oversee the entire centre.

The opportunities presented by nuclear cooperation with the superpower appeared to reinvigorate aspirations of European integration. To advance the discussion, the Six organised a conference in Messina, Italy, in 1955, at which the project of creating a nuclear community and that of creating an economic community with a common market were discussed.

The conference established an intergovernmental committee – a group of people with a range of political viewpoints and technical expertise, chaired by Belgian statesman Paul-Henri Spaak – and tasked it with managing negotiations on both communities.

The Spaak Committee produced a report outlining the concept of the European Atomic Energy Community, known as Euratom. In October 1956, the Six appointed a committee on atomic energy, referred to as the 'three wise

A commemorative 'Atoms for peace' stamp (Source: Bureau of Engraving and Printing - U.S. post Office, via Popova Olga, Adobe Stock).

Representatives of the countries participating in the Messina Conference of 1955.
From left to right: Johan Willem Beyen (the Netherlands), Gaetano Martino (Italy), Joseph Bech (Luxembourg), Antoine Pinay (France), Walter Hallstein (West German) and Paul-Henri Spaak (Belgium).

men': Louis Armand of France, Franz Etzel of West Germany and Francesco Giordani of Italy. Their report concluded with a recommendation to gradually replace coal- and oil-fired power plants with new nuclear facilities. Simultaneously, from late 1955 to July 1956, the CNRN and the CISE debated the installation and management of the CP-5 research reactor acquired from the US, to be installed at the future Ispra site; the reactor had been named Ispra-1.

During those months, the world was experiencing events that would significantly impact the international system, and the history of Italian nuclear energy was intertwined with them.

In 1956, the nationalist Egyptian government requested a loan from the World Bank for the construction of a second dam on the Nile. However, amid complex political manoeuvring involving the British and the Americans, the funding was ultimately denied. Instead, the bank financed the Italian government's project to build a nuclear reactor in southern Italy, the Garigliano plant. Consequently, the Egyptian government decided to nationalise the Suez Canal, expropriating the Anglo–French company that managed it. In response to the nationalisation and its implications for the colonial world, Israeli, British and French armed forces attacked Egypt at the end of October, but both superpowers quickly dissuaded them from continuing hostilities. Nevertheless, the canal remained closed from October 1956 to March 1957, forcing tankers travelling from the Persian Gulf to Europe to circumnavigate Africa, thereby exposing the fragility of supply lines and the repercussions on the production of electricity from fossil fuels.

This revelation of the vulnerability of oil supply to political upheavals in a far from stable region further convinced the Six of the potential of nuclear energy as a driving force to revive the European integration process.

Steel and coal had been pivotal elements of economic development and military power both historically and in 1950s Europe, but nuclear energy was viewed as the key energy source for the future economic growth of nations.

In February 1957, the three wise men of the Euratom project visited the United States, expressing interest in US civil programme technologies and discussing participation in research programmes of mutual interest.

Their hosts from the US Atomic Energy Commission (AEC) suggested that exchanging experiences could lead to mutual technical advancements. The reasons behind US support for the Euratom project were manifold: the community would integrate West Germany more organically into the Western coalition; it would further enhance Franco–German relations; it would promote the peaceful dissemination of nuclear technology, steering Europeans away from military programmes; and it would rapidly foster a robust nuclear industry in Europe, serving as a customer of the US nuclear complex.

The Spaak Committee's final report provided a historical perspective on the loss of European energy independence, evident during the past five years of post-war economic expansion, underscoring that a shortage of domestic electricity production sources hindered economic growth. The Suez Crisis had revealed the risks of reliance on Middle Eastern oil, and the report thus advocated for the swift construction of nuclear power plants to enhance domestic production from energy sources other than hydrocarbons. It also addressed initial challenges in nuclear plant construction – such as costs, location and the technologies to be employed – and other possible nuclear energy applications, such as in the radioisotope sector.

On 25 March 1957, the Treaties of Rome were signed, establishing the European Economic Community (EEC) and the European Atomic Energy Community (Euratom).

The signing of the Treaties of Rome, 25 March 1957.

The event garnered significant attention not only from the press but also through a communication campaign highlighting the creation of the Communities as an important step towards a better future for citizens of the six Member States. For example, a poster was produced for French schools illustrating the benefits of the EEC and setting out essential data such as surface area, population and the combined agricultural and industrial production of the Six.
In the preamble to the Euratom Treaty, the governments of Belgium, West Germany, France, Italy, Luxembourg and the Netherlands reaffirmed their shared commitment to developing nuclear energy within their territories. Nuclear energy promised to be *'too cheap to meter'*, as declared in a famous 1954 speech by AEC's President Lewis Strauss. However, despite differences among countries in the development of their national nuclear complexes, none of the Member States yet had a true nuclear industry. Therefore, it was necessary to find an external supplier – the United States – to accelerate the development of the European industries.
The treaty outlined the functioning of the Community through its organs, including the Assembly, the Council, the Commission, the Court of Justice and the Economic and Social Committee. The Commission was required to consult a Scientific and Technical Committee on specific scientific issues.
The objective of Euratom was delineated in the treaty's first article: the Community's mission was to contribute to creating the necessary conditions for the rapid establishment and growth of nuclear industries, which would significantly enhance the living standards of the Member States' populations and foster international trade.
The Six believed that nuclear energy was an essential resource for developing and revitalising the European industrial sector, enabling progress in peaceful relations with other countries and promoting scientific research.
Therefore, the Community was intended to be open to further members and, above all, to the world. Among other provisions, the Euratom Treaty included the creation of the Joint Research Centre (JRC) to promote nuclear research and development within the European Community ([1]).
Title II of the treaty contained *'provisions for the encouragement of progress in the field of nuclear energy'*, stipulating that the JRC was to ensure the execution of research programmes and other tasks assigned to it by the Commission and the establishment of a common nuclear terminology and of a standard system of measurement.
The treaty also established a central bureau for nuclear measurements and specified that the JRC's activities could, for geographical or functional reasons, be conducted in separate establishments. Although Ispra was not initially a top choice for housing the JRC, Felice Ippolito's recollections suggest that it had already been informally decided during the Euratom Treaty negotiations that the JRC's headquarters would be in Italy.
At that time, Ispra was already the scene of an unfolding debate about different Italian nuclear visions, particularly concerning technological choices: in September 1957, a rift emerged between the CISE and the CNRN over the site's future, part of a broader discussion on the type of reactor to invest in nationally.
Throughout 1957, the CISE worked on the CISE Mist Reactor project (*CISE Reattore a Nebbia* – CIRENE), developing a prototype reactor utilising natural uranium moderated by heavy water and cooled by light water (i.e. normal water); *'mist'* referred to the steam produced during thermal exchange.

([1]) The official name was 'Joint Nuclear Research Centre' (JNRC), but the 'N' was often omitted. Consequently, the centre was known as 'the JRC', although the official name change would not take place until later. Today, the English abbreviation JRC (Joint Research Centre) is used in all EU languages.

French poster printed on the occasion of the signing of the Treaties of Rome, 1957. (Source: *Treaties of Rome document – Studocu* - https://www.studocu.com/fr/document/lycee-professionnel-denis-papin/histoire-geographie/ccf-cap-la-france-et-la-construction-europeenne-doc-sur-la-cee/100504311).

Jules Guéron in Ispra in 1962.

The project was to be funded by Euratom and subsequently managed by Ansaldo Meccanica Nucleare (AMN), the nuclear branch of the large Italian company Ansaldo. This venture, carried out in Italy, aimed to achieve the CISE's goal of national autonomy in the reactor supply chain. However, CNRN had planned a different type of reactor for Italian nuclear development. It was equally innovative: a reactor powered by enriched uranium, moderated by heavy water and cooled by a mixture of organic liquids. The project was dubbed the Organic Reactor Project (*Progetto Reattore Organico* – PRO), and the first reactor fuel load would involve collaboration with the Martin Marietta Corporation in Baltimore. Subsequent fuel loads were to be produced domestically, relying on the success of various projects in the fuel cycle sector that had involved Italian participation. Italy was involved in Eurochemic, a company founded on the initiative of the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD), which, under French direction, had established an isotope separation facility in Mol, Belgium.

French political debate was again crucial, given the focus on nuclear decisions arising from the national military programme, which was soon to be crowned with success. The presidents of the Euratom Commission were French, as was Euratom's first Director-General for Research and Training, the physical chemist Jules Guéron, who took office in January 1958. The rapid establishment of the JRC was a priority for Euratom, and internal Commission debates centred on two options: constructing the JRC anew at a site within one of the Member States' territories or transferring an existing national facility to the Community. On 16 April 1958, Guéron presented a memo on site selection to frame the Commission's discussion, focusing on the option of transferring an existing national nuclear centre to Euratom and outlining the benefits, drawbacks and conditions.

The country transferring an existing centre to Euratom would gain three advantages. First, it would host a prestigious Community institution. The second point was complementary to the first: the Member State would gain credit within the Community for providing the JRC with headquarters. Third, it would enable the development on its territory of a large-scale centre, far greater than would be achievable with national resources alone, courtesy of Euratom's means. Euratom itself would benefit from accelerated completion times compared with creating a new centre from scratch.

Which existing nuclear centre could then be transferred to Euratom? Many active centres were unsuitable. For example, the French nuclear research centre at Saclay, near Paris, was too large for Euratom's budget and closely tied to an *'important national programme'* – specifically, France's nuclear armament programme. However, there were no technical objections regarding the transfer of other centres including those in Mol, Belgium; Grenoble, France; and Karlsruhe, West Germany.

The sole condition was that transferring one of these centres to Euratom must not coincide with or be followed within five years by the establishment of a new national centre without Euratom's approval. Should this occur, according to Guéron, the JRC's role would be diminished. Another consideration was maintaining geographical and political balance within the Community, meaning that the country hosting the JRC could not also be home to the Community's decision-making bodies. According to the Commission's plan, the JRC would recruit a substantial number of personnel, maintain a significant annual budget and potentially attract substantial investments.

Guéron argued that, even if opting for the creation of a new centre, the simultaneous establishment of a new national centre nearby should be avoided, as this would disperse efforts and funding.

The fact that Italy, unlike West Germany and France, did not yet have a large, operational nuclear research centre, made it comply with the Commission's technical and political assessments. In June 1958, the Commission considered the possibility of establishing not a single JRC, but a network of centres with different functions within a comprehensive general plan, introducing a transversal element to both options. On 7 July 1958, the Commission decided, in principle, to transfer an existing centre instead of building a new one, while gradually building a network of centres with varying tasks and capacities. During that summer, the six Member States, with the exception of Luxembourg, expressed an interest in providing a centre to Euratom, each with specific conditions or ambitions: Grenoble would focus on thermonuclear research; Mol would be a minor centre, as the Belgian government's primary goal was hosting the Community's headquarters; in Petten, the Netherlands would construct a new centre with a high-flux reactor; Karlsruhe would focus on transuranic elements and plutonium prospects.

In September 1958, the Euratom Commission engaged in discussions regarding the location of the main centre, delegating physicist Enrico Medi and engineer Paul de Groote, representing Italy and Belgium respectively in the Commission (Medi was also the Vice-President), to prepare documentation for negotiations with the Member States. In particular, de Groote outlined the site requirements, which served as criteria for evaluating the best national proposal.

The list of requirements began with *'the need for any real estate properties not to hinder site expansion, as the centre could develop unpredictably. The JRC should be located near an existing national nuclear research centre to facilitate its initial development by providing access to some existing general services (laboratories, medical services, site surveillance, canteens and everything necessary for the centre's staff). Construction should meet high standards of resistance, and the centre should be located in an area not prone to earthquakes. A guaranteed supply of fresh water was essential, as large quantities would be needed for cooling experimental reactors, as well as regular water use. Cooling the reactors would also demand substantial amounts of electricity for powering water pumps, and this electricity supply should be uninterrupted to ensure reactor safety; thus, the site should be connected to high-voltage power lines. The site should also be well connected to transport routes, permitting easy visits and personnel missions, necessitating proximity to a major airport and an important rail hub; it should also be close to industrial areas, to supply heavy*

Enrico Medi (right) and Paul de Groote, Brussels, 1963.

equipment not producible on site. Regarding human resources, the JRC should be near academic institutions, in a region providing staff not only for the centre's specific research activities. Yet the site should not be too close to densely populated areas, for safety reasons; it would need to allow easy evacuation in the event of a nuclear accident, with winds not predominantly directed towards populated areas, to prevent dispersal of any radioactive material, and avoiding flood- or tornado-prone zones. The site should allow for easy disposal of low-level radioactive waste water and, for related reasons, be far from potable water basins for large urban areas'.

Interesting too were the *'human criteria'*, proclaiming that the JRC should be *'populated by happy people'*, living comfortably. Therefore, the site should not be too far from a major city, enabling staff to engage with artistic and cultural activities (exhibitions, concerts, the theatre). To ensure the happiness of the personnel, the centre would ideally be in a *'pleasant natural environment: forests, lakes, mountains, or similar areas enabling a wide variety of sports activities'*. Ideally, the area surrounding the JRC would facilitate easy integration of new residents with existing inhabitants, to avoid creating a residential area housing only JRC staff and their families. Based on these criteria, Medi proposed establishing the JRC in Ispra, Italy. Medi's proposal specified that Ispra would host general chemistry, physics, electronics and metallurgy laboratories, specialised laboratories for nuclear fusion and isotope separation, prospection and mineralogy, a central office for nuclear measurements, and information and documentation services.

Transuranic element activities would take place at Karlsruhe. De Groote requested that Medi alter the provisional proposal by assigning the measurement office to Mol, and at the same time it was decided that the information and documentation services would be located at Euratom's headquarters in Brussels.

Dutch Commissioner Emanuel Sassen, former Minister and Senator of the Kingdom, requested time to evaluate the proposal and the criteria based on which the JRC site was to be selected. Commission President Étienne Hirsch and Guéron made use of this period of reflection to attempt to allocate the entire JRC – not just thermonuclear research – to Grenoble, but by early 1959 support for this option had faded due to opposition from the leadership of the French Atomic Energy Commission (*Commissariat à l'Énergie Atomique* – CEA) including its head, Francis Perrin.

Once Grenoble had been discarded, Hirsch and Guéron turned to the Germans, proposing Karlsruhe, but this option was also rejected. The German government warmly accepted Medi's proposal to host the transuranic laboratory of the JRC only, not its central headquarters.

Thus, the Italian proposal prevailed: in April 1959, Euratom's Scientific and Technical Committee recommended that the Commission approve the transfer of the Ispra nuclear research centre to Euratom and establish the JRC's headquarters there. Francis Perrin strongly supported the proposal in the Scientific and Technical Committee, demonstrating that most French nuclear sector representatives favoured the Italian proposal. On 25 May, an Italian delegation travelled to Brussels to draft the text transferring Ispra to Euratom.

The Commission had already started recruiting JRC personnel. Friedrich Geiss, a German chemist who became a JRC researcher in 1960, wrote a personal history of the institution filled with anecdotes about his colleagues. He described the early JRC researchers as pioneers of a common European citizenship, living on the first land managed by a European institution.

Although recruitment was based on assignments – rather than on an employment relationship, as in national institutions – and thus social security benefits and job security were lacking, the atmosphere among personnel of all nationalities was excellent and collaborative from the outset. The rule that French was to be used as the primary language did not pose a significant barrier, and the average employee age was 25. The new staff were temporarily housed at Euratom's headquarters on rue Belliard, Brussels, awaiting the JRC's inauguration in Ispra. Geiss indicates that Guéron considered that the new staff lacked experience of teamwork.

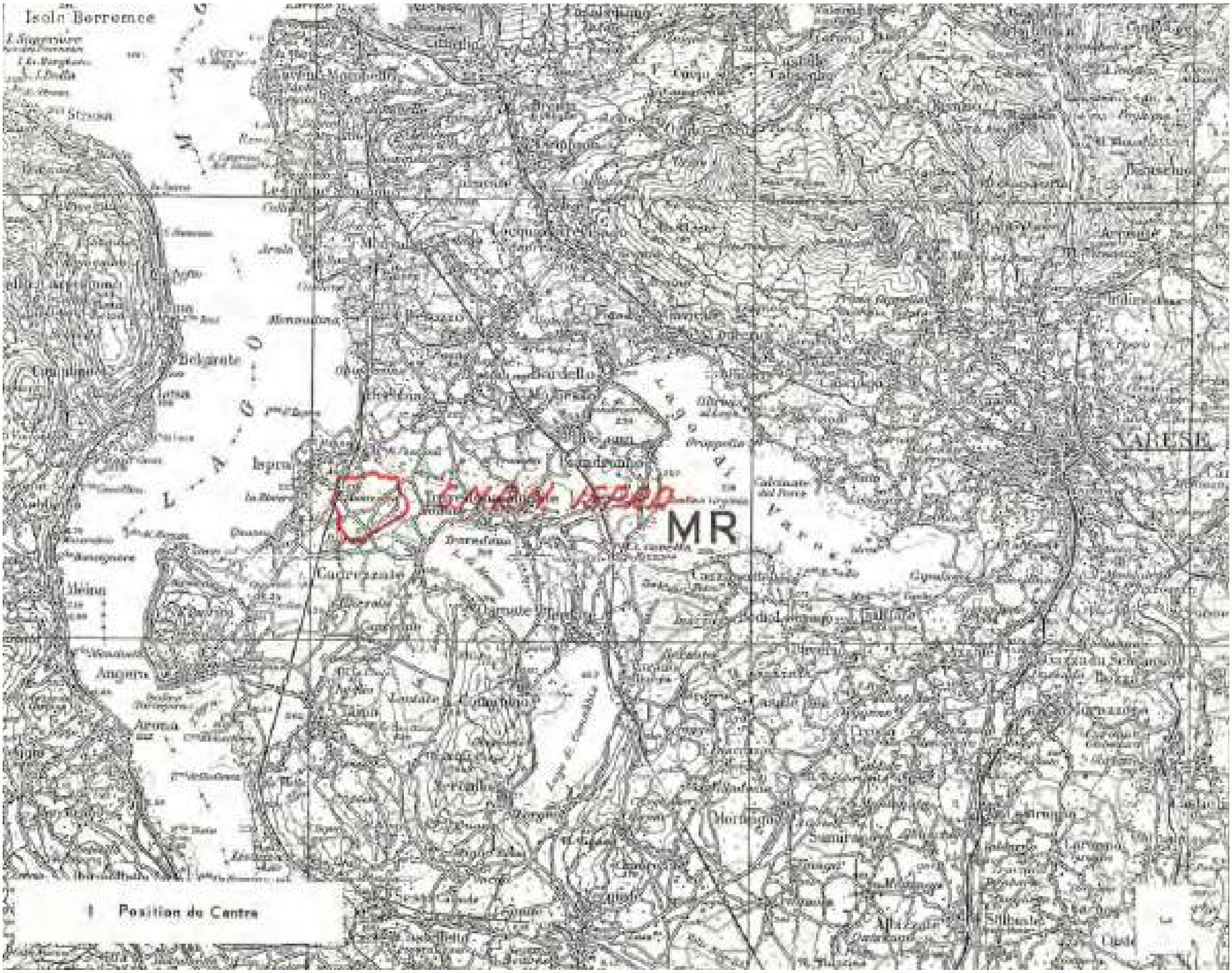
Guéron also lamented the Euratom Commission's composition, considering that its members lacked applied nuclear expertise, as none had worked in the United Kingdom's or the United States' nuclear programmes during the war; however, he recalled an atmosphere filled with both enthusiasm and curiosity.

Meanwhile, the majority of the resources allocated to Italy's nuclear programme had been invested in the Ispra site.

With plans to have the Ispra-1 reactor operational in the latter half of 1958, CISE acquired 155 hectares of land from the original owners, most of whom were eager to sell their parcels, known as *'Prati Magri'* (lean meadows) due to their low agricultural value. The land was quite damp, necessitating the construction of a large drainage ditch and other complementary works, taking all summer of 1957. When parts of the CP-5 reactor arrived at the port of Genoa, they had to be stored in hangars until land remediation could be completed. Between July and September 1957, CNRN recruited personnel from CISE to lead the site, offering them higher salaries.

The Ispra-1 reactor was completed on 24 March 1959, but infrastructure construction was still ongoing when the proposal to transfer the site to Euratom was discussed and ultimately approved by the Commission members.

Euratom's acceptance of the proposal to make the Ispra site the JRC's headquarters was



Location of the future Joint Research Centre, 1959.
(Source: CNRN - Servizio Progettazioni e Lavori Civili – 1959).

announced on 30 May 1959, when the President of Italy, Giovanni Gronchi, had only recently inaugurated the centre. In the following weeks, a national debate raged over the wisdom of making the offer. Most of the Italian press opposed the transfer, claiming that it would be a colossal waste of national resources. Only a few supported the transfer, arguing that the research centre would vastly expand at the European Atomic Community's expense.

On 22 July 1959, in Rome, Hirsch signed the agreement with the Italian government for Ispra's transfer to Euratom. It stipulated that the government would provide the Ispra nuclear studies centre and its approximately 160 hectares for a duration of 99 years, at an annual symbolic rent of 1 European Monetary Agreement (EMA) unit ([2]). The Euratom Commission pledged to develop the Ispra site as a general expertise joint research centre, concentrating a significant portion of its research programme there until 31 December 1962, in accordance with the objectives outlined in the annexes to the agreement.

The transfer to Euratom would be gradual, starting from date of the agreement's entry into force; details of the transfer arrangements and the cooperation between Italian and Euratom researchers and technicians during the transition period were to be specified in appendices to the agreement. The Italian government committed to completing laboratories, general services, training facilities, a European school, visitor accommodation and meeting rooms, with the technical plans for these buildings drawn up by the Commission, with the involvement of CNRN. Italy also agreed to finance this construction work to the amount of 9 million EMA units by 31 December 1962.

The government further agreed to provide housing under market conditions for centre personnel and their families, as determined under a joint CNRN–Commission agreement. For its part, Euratom committed to investing 24 million EMA units in the JRC Ispra site by 31 December 1962, in the form of scientific equipment and potentially property installations. The Euratom Commission also allocated a total of 16 million EMA units to the operation of the Ispra site for the period to 31 December 1962.

By that date, specific agreements would need to be signed regarding the protocol on the privileges and immunities of the Euratom Community at the Ispra site, especially in relation to the customs and tax rules applicable to the essential goods and materials necessary for the functioning of the centre, which would also need to comply with the existing agreements on the common nuclear market. The procedures for the application of the protocol to Ispra staff, particularly Italian citizens, and, in general, regulations governing all categories of staff, would also need be established. Health and safety control measures, secrecy rules and procedures for admitting individuals who were not nationals of Member States to the centre, would also need to be put in place, taking into account the provisions of the Euratom Treaty. Presented to the Italian parliament for ratification, the agreement became national law (Law No 906 of 1 August 1960), specifying that the Italian authorities' responsibilities would fall

([2]) The European Monetary Agreement (EMA) was established through an understanding signed in Paris on 5 August 1955, with the aim of intensifying collaboration among European countries in the monetary and exchange rate fields. This agreement came into effect on 28 December 1958, following the decision of several European states – including the United Kingdom, the six Member States of the European Community, the Scandinavian countries, Austria and Portugal – to make their currencies convertible. It was based on a system that enabled the multilateral regulation of payments between participating nations, supported by the presence of a European fund. Essentially, it functioned as a multilateral clearing mechanism that ensured the periodic rebalancing of both active and passive balances at predetermined exchange rates.

The CNRN Ispra site in 1956 (above) and in 1959 (below).

The signing of the agreement on the transfer of the Ispra centre to Euratom.

to the CNRN's successor, the National Committee for Nuclear Energy (*Comitato nazionale per l'energia nucleare* – CNEN).

Since its founding, the CNRN had prioritised the approval of a comprehensive raft of legislation on the nuclear sector. The intention was to address the complex and sensitive technical aspects of the field, while transforming the committee into a structured nuclear entity with legal personality and financial autonomy, akin to the equivalent institutions in other industrialised nations. However, the approval of such regulations faced substantial opposition, largely due to heated debates on the nationalisation of the electricity sector.

The need to ensure reliable resources and a more modern legislative framework grew increasingly urgent as the committee evolved into a large research institution with high-level technical and scientific assets, managing significant economic resources and employing around 1700 people. Ultimately, the specific legislation required to properly establish a nuclear research entity was separated from broader nuclear law proposals, leading to the CNEN's foundation in August 1960. The CNEN was presided over by the Minister of Industry and administered by a steering committee; Felice Ippolito served as Secretary-General. The annexes to the agreement, referred to in and integral to Law No 906 of 1 August 1960, proved significant.

Annex A provided for a transitional period of 30 months starting from the agreement's entry into force during which Euratom could start deploying scientific and administrative personnel to Ispra. In the first 24 months, personnel numbers could not exceed 1 200.

The Director of the JRC was appointed by Euratom, which informed the Italian government of this development, and took office six months after the entry into force of the agreement. Italian personnel working at Ispra were transferred to Euratom, subject to their consent and that of the CNRN (soon to be the CNEN) and the Euratom Commission. Before the final transfer of the site to the Community, CNEN and Commission delegates compiled detailed inventories of movable and immovable property, indicating its value, and established the terms for cooperation between Italian and Euratom researchers during the transitional period.

On day 181 after the agreement had entered into force, Euratom took over the management of the nuclear studies centre at Ispra. The Director of the JRC coordinated the work of the Italian researchers, who continued to work on the national research programme. Italian personnel retained responsibility for operating the Ispra-1 reactor for two years after the final transfer of the Ispra centre to Euratom.

The experiments to be carried out on the reactor were part of a plan covering at least the four years after the transfer, drawn up by a joint committee of three CNRN-CNEN and three Euratom representatives.

The JRC in Ispra had overarching expertise and, within the scope of Annex V to the Euratom Treaty, it would initially be executing ongoing programmes inherited from the CNRN, in close collaboration with Italian researchers. Programmes focused on neutron physics, solid-state physics, reactor calculations and metallurgy. Additionally, on Euratom's initiative, the Centre worked on documentation and information, specialised training, power reactor technology and research into instruments for use in nuclear reactors and the nuclear industry more generally. The research plan included work on the chemistry of raw and processed materials, particularly that of highly radioactive products, and reactor chemistry.

Immunity from search, requisition, confiscation or expropriation as well as immunity from administrative or judicial coercion without the authorisation of the European Court of Justice applied to the Centre, defined and fenced according to the annex to the transfer agreement, which formed an integral part of it.

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DELLA REPUBBLICA ITALIANA

PARTE PRIMA — Roma - Mercoledì, 31 agosto 1960 — SI PUBBLICA TUTTI I GIORNI MENO I FESTIVI

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SOMMARIO

The front page of the Official Gazette of the Italian Republic of 21 August 1960.

LA COMMISSIONE DELLA COMUNITÀ EUROPEA
DELL'ENERGIA ATOMICA

HA L'ONORE DI INVITARE ____________________
ALLA COLAZIONE CHE AVRÀ LUOGO IL 23 MARZO 1961 ALLE ORE 13,00 AL PALACE HOTEL DI VARESE, CHE SARÀ SEGUITA DA UNA VISITA AL CENTRO DI ISPRA E DALLA CERIMONIA DEL PASSAGGIO DEL CENTRO DAL COMITATO NAZIONALE PER L'ENERGIA NUCLEARE ALLA COMMISSIONE DELL'EURATOM.

Official invitation to the ceremony marking the handover of the Ispra site from the CNEN to Euratom, 23 March 1961.

This annex could be amended by mutual agreement of the contracting parties.
The Italian authorities adopted all necessary measures to prevent disruption to the JRC's operations and ensured external protection; missing fencing sections were completed by the Commission. Inside, the Italian authorities would intervene upon the request or with the prior consent of the Commission to enforce the law and maintain order. Furthermore, the Centre would not be a place of refuge for individuals wanted by the Italian law enforcement authorities; such persons would have to be turned over to the competent Italian authorities upon their request.
At the Commission's request, the Italian authorities exercised their powers to ensure that the centre was supplied with all the necessary public utility services. In the event of any interruption to these services, the authorities would react quickly to avoid disruption to operations. The Commission adopted the necessary regulations to ensure that qualified persons could perform inspections, repairs and maintenance within the Centre.
Official communications from or to the Centre, which enjoyed the same privileges and immunity granted to diplomatic missions in Italy, employed ciphers, couriers, sealed packages and radio. Correspondence to or from the JRC management was considered to fall within the category of official communications.
For the operation of the Centre, the Community enjoyed exemption from direct taxes owed to state and local authorities on assets, income and other properties. Goods and materials needed for the establishment and operation of the JRC were admitted to Italy duty free and exempt from import prohibitions or restrictions and customs duties. Whenever possible, compatibly with good management practices, the Commission procured such products and materials on the Member States' markets.
The exemptions did not apply to goods, materials and consumables for private use. To meet the centre's needs, the Community, without being

subject to financial control, regulation or moratorium, could hold or use foreign currencies, trade in them with authorised banks, maintain foreign currency accounts and trade in funds and securities with authorised institutions, as per the provisions of the Euratom Treaty.

Additionally, the Community could transfer funds, securities and currency within Italy, into or from Italy or into or from any other country, as per the provisions of the treaty. Funds deposited by the Community to meet the Centre's needs in designated accounts retained the value corresponding to the parity in force on the day of deposit with respect to the unit of account provided for in the Treaty.

To benefit from this arrangement, these accounts had to be debited exclusively from Italian lire accounts opened for the Community by the Italian government.

The Italian authorities posed no obstacles to the entry or transit through Italy of Community officials and staff employed at the centre, their spouses and their dependants. However, this was without prejudice to the visa provisions applicable to Community officials and agents who were not nationals of one of the Euratom Member States. The Italian government promptly notified the Commission if it was unable to grant a requested visa. The government also facilitated the entry into and residence in Italy of students and others travelling to the country to help achieve the objectives of the treaty, without prejudice to Italian laws concerning foreigners.

Community staff included in the categories specified in the protocol and assigned to the Centre enjoyed jurisdictional immunity within Italian territory for acts performed in an official capacity, whether verbally or in writing, and they continued to benefit from this immunity after the termination of their functions in the Community. Furthermore, they were exempt from direct taxes on their salaries and from family tax, as per established practices in countries hosting the facilities and personnel of international organisations. The government could request that the Commission provide it with information on the measures and decisions adopted at the JRC concerning safety and public health, particularly with regard to fire prevention and ionising radiation risks. The Commission was to address such requests promptly. If additional safety and protective measures were deemed to be warranted, they were to be adopted jointly with the Italian authorities.

The Commission undertook to update the Italian authorities on a regular basis on radioactivity levels inside and outside the facilities. It was also to inform the Italian government of major new facility projects that could entail risks from ionising radiation, outlining planned protective regulations and measures. If further health and safety measures were deemed necessary by the Italian government, they were to be jointly adopted by the Commission and the relevant Italian authorities before the project was rolled out. The Italian authorities were required to provide their feedback within three months of being notified of the new project.

In the event of an accident threatening public safety, the Ispra site management had an obligation to immediately notify the *Prefetto*, the Provincial fire command and the Provincial public health office, specifying the measures taken. A similar communication protocol applied to any events or anomalies posing a potential threat to public safety.

To protect secret information not covered by Community provisions, the Commission adopted, under its sole responsibility and within the boundaries of the site, measures derived from the Italian law on protection of secrecy. The contracting parties were to consult each other regularly to ensure mutual satisfaction with the Commission's application of the measures in question. Should the government perceive the Commission's application of them to be incompatible with Italian interests, the parties were to consult on the actions to be taken.

The entrance to the JRC site in the early 1960s –
incoming and outgoing vehicles.

The entrance to the JRC site in the early 1960s –
road sign at the entrance to the centre.

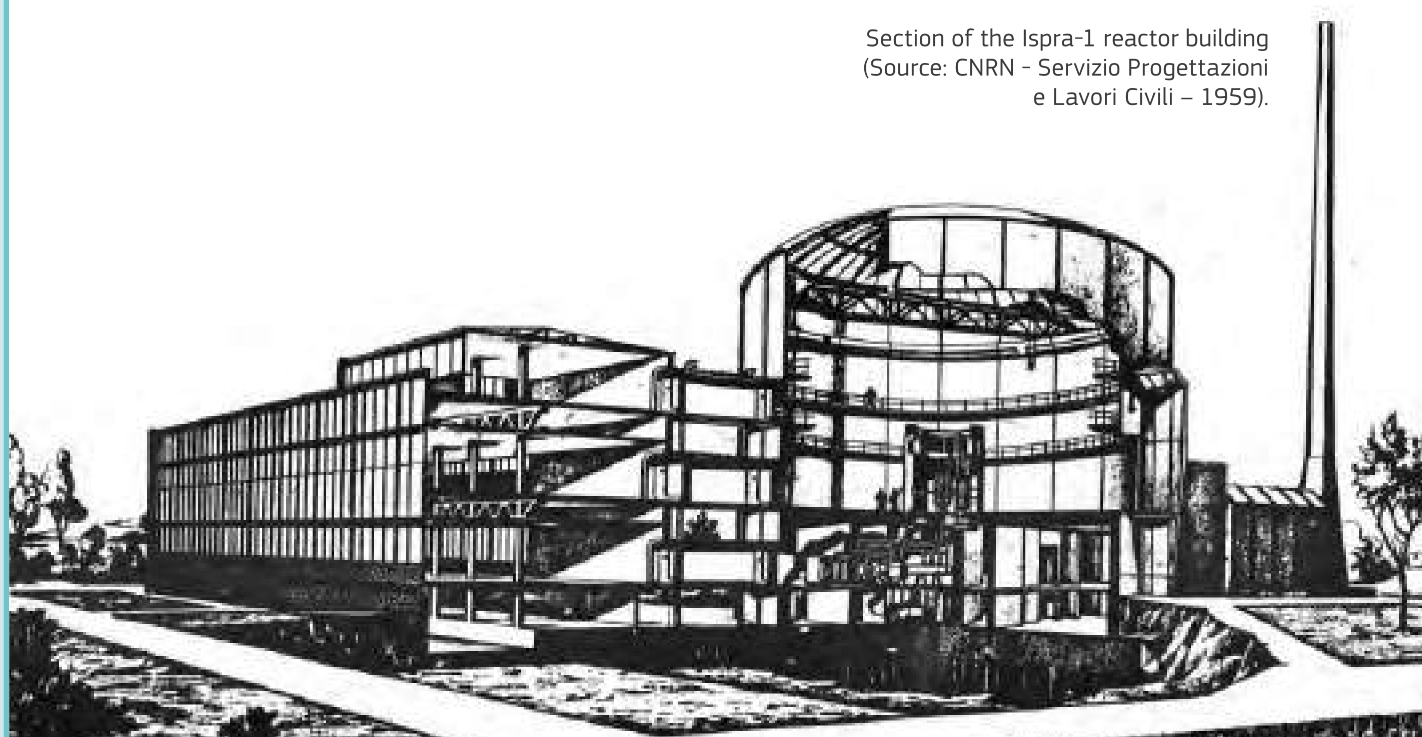
In accordance with the Euratom Treaty, the Italian government considered any violation of the above provisions as a breach of its own protected secrets.
The Commission designated certain individuals to be those needing to have access to and protect Euratom secret information. If a Community official or agent violated Italian secrecy protection measures, the Italian government could request that the Commission withdraw their immunity. The Commission would act in compliance with the provisions of the protocol.
The application of secrecy protection measures to non-nationals of Euratom Member States was to be a collaborative effort between the Commission and the Italian government. Secrecy protection rules could be enhanced by Commission and national security authorities, should the local situation require it.
Regarding the employment of personnel, in addition to standard contract staff as per agreed treaty norms, and staff who would later be subject to a specific statute, the Commission could hire local personnel under Italian employment law. The Commission was solely responsible for applying employment procedures, contractual clauses and working conditions in accordance with Italian law. It was also responsible for applying Italian legal provisions on assistance and welfare, making use of the competent Italian institutions for this purpose, and on safety and health at work. Employment disputes were to be resolved in accordance with Italian employment regulations.
In contracts for the provision of services, the Commission would ensure social security benefits, salaries and working conditions no less favourable than the established working conditions in the region for work of the same nature in the same profession or industry, and it would also adhere to the provisions of the International Labour Organization Conventions. The Commission was to take measures to facilitate monitoring of the contractors' compliance by the Italian authorities' designated representatives.
Significantly, general provisions established the European Court of Justice's exclusive jurisdiction over disputes arising between the Italian government and the Commission concerning the execution and interpretation of the agreement, thereby becoming one of the first examples of the principle of community law supremacy over national law.

Map of the European Community in 1960 (Algeria and French overseas departments not included) (Administrative boundaries: © EuroGeographics © OpenStreetMap).

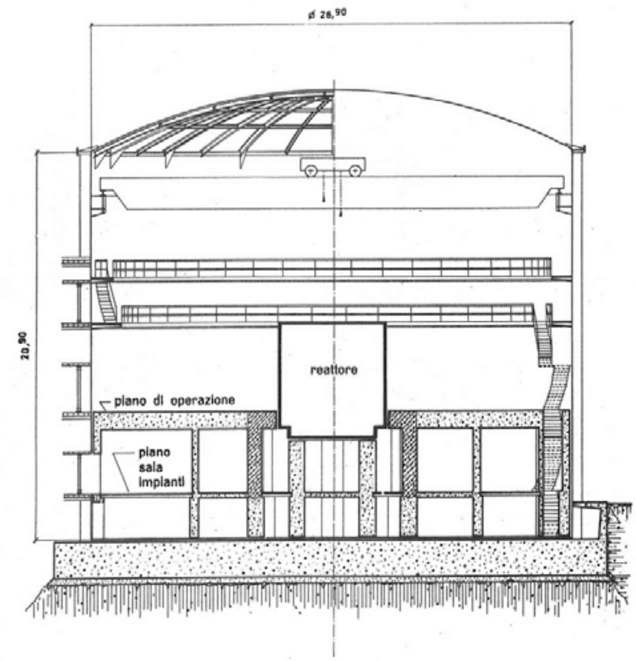
Ispra-1 – the first Italian nuclear reactor

Built in a hilly area formerly dedicated to agriculture and fishing, along the shores of Lake Maggiore, the Ispra-1 reactor reached criticality on 20 November 1959. The reactor building consisted of two separate structures, one cylindrical and the other rectangular in shape, joined at two points.
The cylindrical structure, which housed the nuclear reactor, was made of a hermetically sealed sheet-steel casing supported by a steel profile frame.
The vertical and horizontal structures inside the casing were made of reinforced concrete, forming the three floors of the building.
The services and laboratories annexed to the reactor were housed in a three-storey rectangular building. The basement of this building, limited to the central section only, contained the heat exchangers (the heating system was centralised), the refrigeration plant for the air conditioning system, the accumulator room and other parts of the electrical system.
The cylindrical structure was accessible from the rectangular structure through a pneumatically controlled airtight door at the working area level, through which people and small vehicles (manual or electric trolleys) could pass.
In this way, the interior of the cylindrical building was never in direct communication with the outside.
The plant room was located to the north-east of the building and housed the air conditioning equipment and generators for any future requirements.
Its height corresponded to most of the basement and the entire ground floor.
Here, the hot and cold pipes and the medium- and low-voltage electrical cables were laid in trays below floor level, while the air conditioning ducts were installed in the ceiling.
A single-rail hoist facilitated installation and maintenance. On the ground floor of the reactor building were the control room, the electrical panel room with the necessary services and, on the south-west side, the entrance for staff and visitors.
The first floor housed the study rooms for the preparation and set-up of experiments, the calculation and counting rooms, the chemistry laboratories, the room for irradiated elements (properly shielded), the changing rooms and the health physics rooms for decontamination and personnel checks. This floor provided direct access to the reactor room.

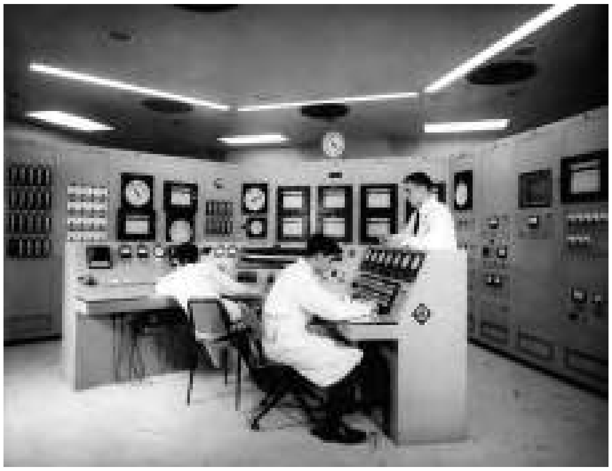
Section of the Ispra-1 reactor building (Source: CNRN - Servizio Progettazioni e Lavori Civili – 1959).



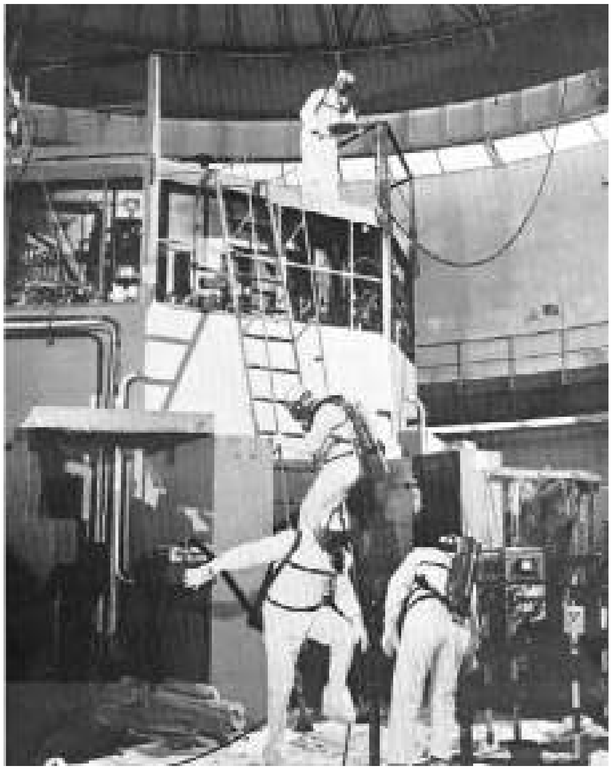
The Ispra-1 reactor was a modified reactor of the CP-5 type. Its operational power was 5 megawatts. It was built by a US company under contract to the CNRN. It was used for nuclear experiments, mainly irradiation for research into solid-state physics, reactor physics and radionuclide production, and for the training of specialised personnel.
The reactor was managed by the CNRN and then the CNEN until 1 April 1963, after which it was taken over by Euratom staff, although most of the Italian operators remained in service. In accordance with an agreement signed with the Italian authorities, the reactor's experimental facilities were shared between the CNEN and Euratom research groups roughly equally, under the supervision of a joint management committee. While the number of experiments installed around the reactor was rather limited in 1963, the period from 1963 to 1967 was characterised by a steady increase in the use of the available irradiation positions.
A few years later, in 1971, the total operating time was 253 days, corresponding to almost 70% operability. Following a reduction in operational staff, this figure dropped to 216 days (59%) in 1972, before the reactor was permanently shut down in 1973.
Ispra-1 was a milestone in the Italian nuclear project, as it was the first reactor established on Italian territory. Its rapid "donation" to Euratom further enhanced its political significance, as well as its technical importance, as it linked the development expectations of the nascent Italian nuclear complex not only to US technology but also, inseparably, to European integration.



Section of the cylindrical body of the Ispra-1 reactor containment area.
(Source: CNRN - Servizio Progettazioni e Lavori Civili – 1959).



Ispra Control Room 1.



Reactor refuelling operations, 1965.

Chapter II

The Joint Nuclear Research Centre (1961-1970)

View of the European School of Varese, 1964.

Chapter II

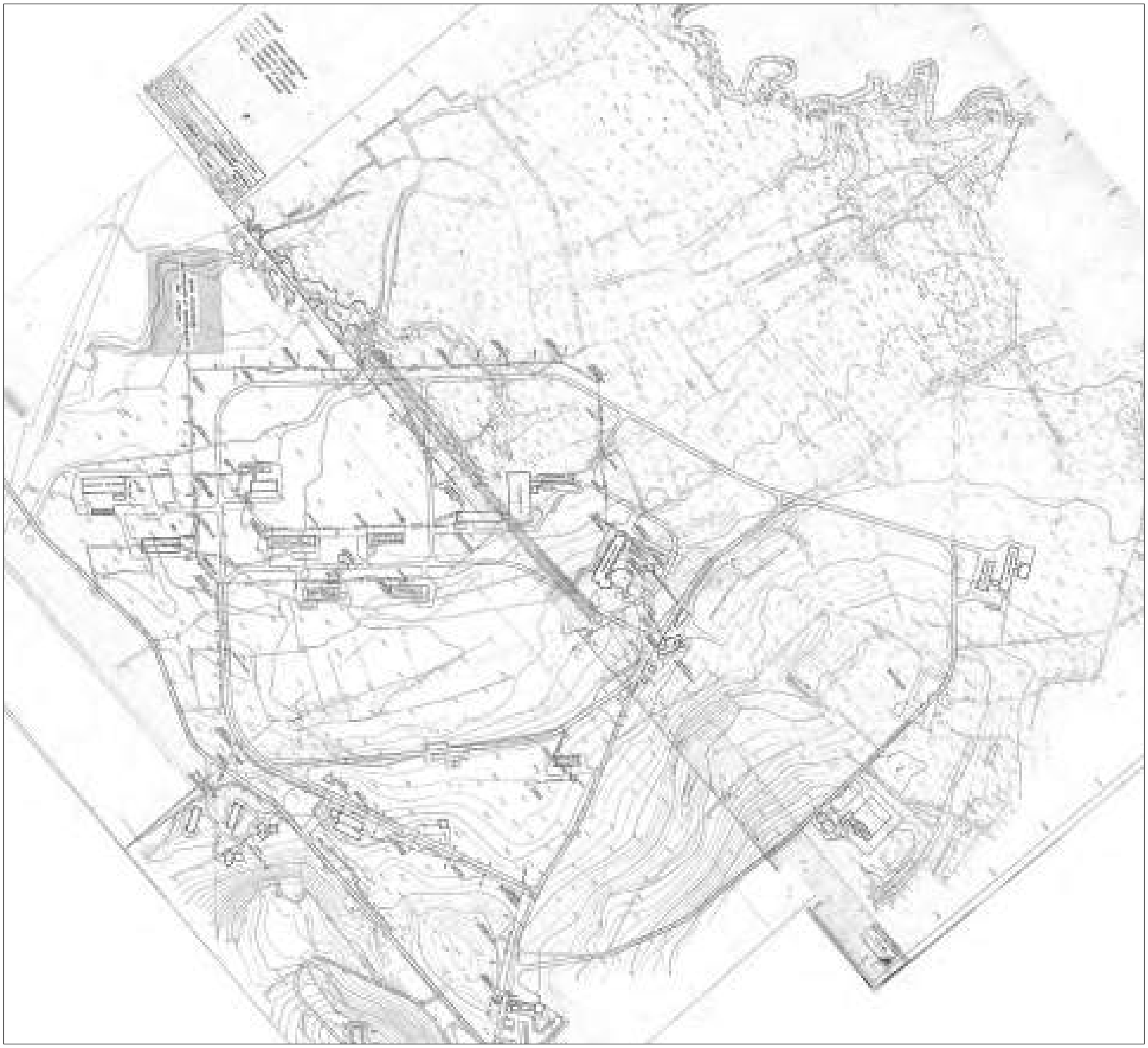
The Joint Nuclear Research Centre (1961-1970)

On 24 March 1961, a headline appeared in the *Corriere della Sera* newspaper: *'Ispra Centre handed over by the Italian government to Euratom'.* The subtitle read: *'The first stone of the European school for the children of the Centre's officials laid in Varese'.* Indeed, the article began with the laying of a large granite block – literally, the foundation stone – on the Miogni hill, where the European school was to be built. It would be the first such school in Italy and the fourth in Europe, following those in Luxembourg, Brussels and Mol (Geel). Moreover, a significant portion of the article was taken up with quoting verbatim the inscription on the granite block. Only at the end were the statements from Commission President Étienne Hirsch, the Minister of Education, Giacinto Pinto, and the Minister of Industry, Emilio Colombo, reported.

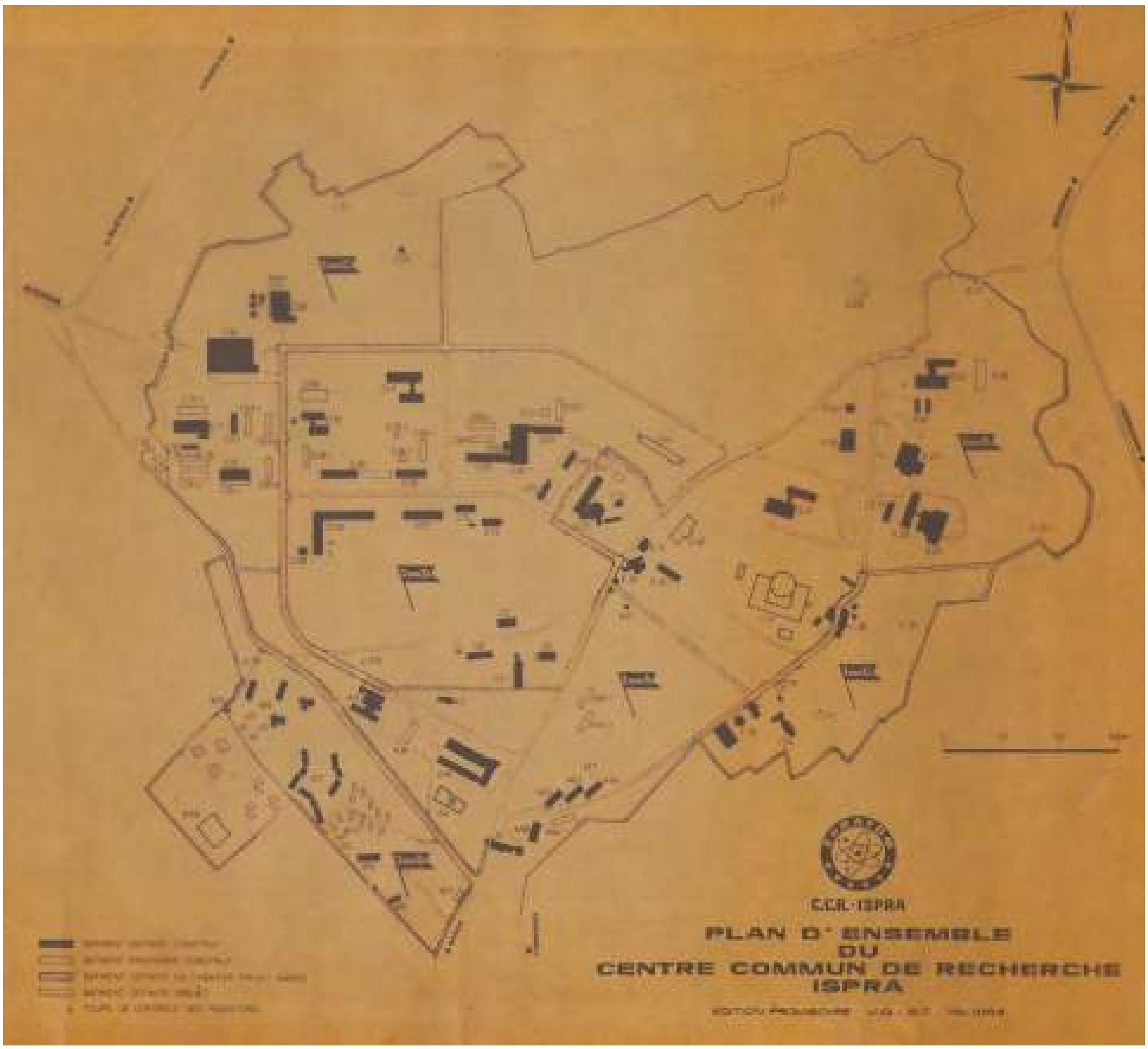
The journalist, aside from following the *genius loci* of his newspaper, had adhered to the chronological order of the ceremonies: the school ceremony took place in the morning, while the transfer of the Centre occurred in the afternoon. There was perhaps a certain degree of discretion regarding the ceremony marking the transfer of the Centre, a significant event in the history of European integration, possibly owing to the controversies surrounding the transfer of the Centre from Italy to Euratom. The decision to start the day with the foundation of the European School of Varese may have been influenced by the high symbolic and practical value that the new institution had for the territory where the Centre's staff would settle. The school represented the future, the generations of the Centre's staff, who would grow up with a European spirit in the Varese area, which would welcome them and make them part of the local community, which, in turn, would be opened up to become an active part of this imagined future Europe.

Ispra was the first and main site among a group of locations hosting the facilities of the JRC. Geel, in Belgium, would focus on nuclear measurements, studying and applying methods and techniques for measuring ionising radiation fields of various types and properties. Spectrometry, dosimetry and microdosimetry of complex fields of neutrons, photons and charged particles were among the site's areas of expertise. Petten, in the Netherlands, would host a high-flux neutron reactor for materials research and the production of radioactive isotopes for medical use. Finally, Karlsruhe, in West Germany, which served as the primary site for West German nuclear research, would also have areas devoted to Euratom work, focusing on transuranic elements, including plutonium.

Despite the growing momentum of the project, the JRC in Ispra faced challenges arising from the establishment of an institution without historical precedent. These were not only issues related to Italian political debates but also dynamics arising from differing European cultures, a recent wartime past and the shared aspiration for a future of peace and prosperity.



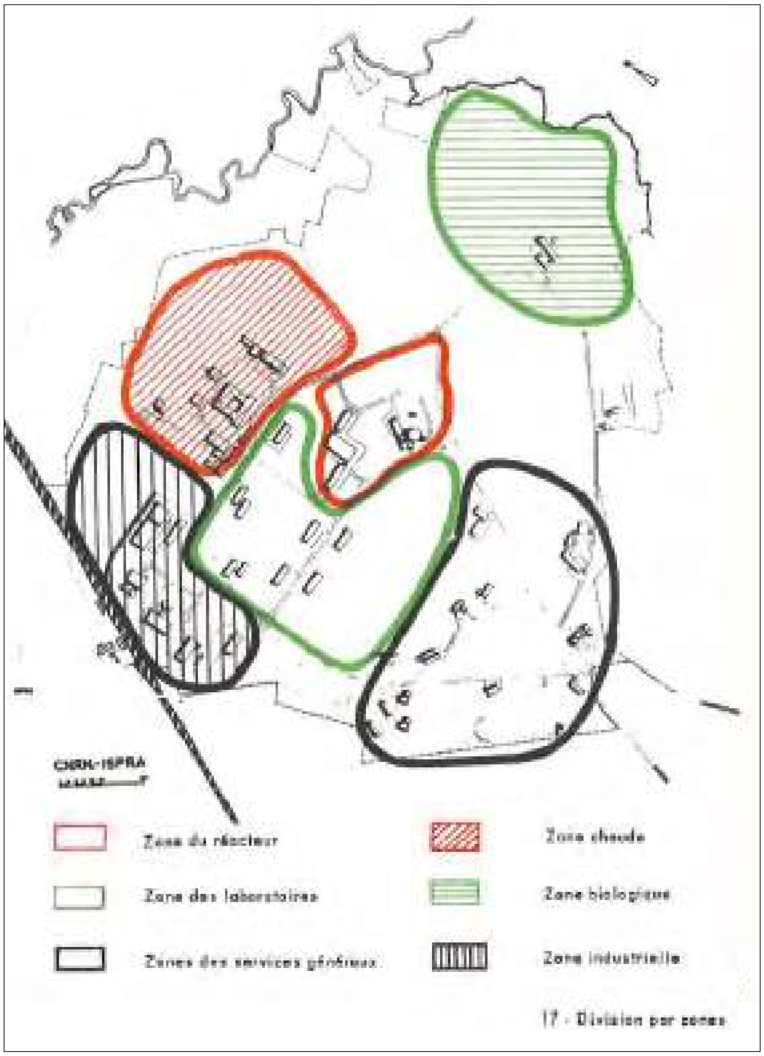
Map of the Ispra site, 1959.
(Source: CNRN - Servizio Progettazioni e Lavori Civili – 1959).



Map of the Ispra site, 1964. The rapid development of the built environment since 1959 is clear.

Gerhard Ritter,
director of the Ispra
Establishment,
1962.

The Commission had appointed the German chemist Gerhard Ritter as the centre's director; he was tasked with managing the Italian staff – and later the Centre itself – until its official transfer to Euratom, while integrating personnel from other nations. A comparison of his biography and that of another key figure at Ispra, Jules Guéron, the Director-General for Research and Training, is illustrative: Guéron, a member of the French Resistance and a participant in the Allied atomic programme; Ritter, subject to denazification measures from 1947 to 1953 for his high managerial role at IG Farben during the Nazi era and among the creators of Sarin gas.
Yet both were central figures in the development of European scientific research, looking forward while acknowledging the past, both pioneering in a novel context that conveyed a sense of total innovation.
Although testimonies collected by Friedrich Geiss for his history of the JRC indicated researchers' difficulties in adapting to the Varese environment, they also reflected the friendly, warm and cordial welcome given by their Italian colleagues to staff from other countries. Initially, French was the main spoken and official working language, and it remained the language used for administrative matters, such as finance, budgeting, and health insurance. Gradually, however, the JRC staff transitioned to Italian, an unmistakable sign of integration into the local area. English would be introduced only later, when the European Community was enlarged in 1973, influencing JRC staff recruitment.
The personnel hired in 1961 exceeded the number stipulated in the original Ispra agreement. By the end of 1961, the staff totalled 960 employees, well above the expected 800; however, after this initial surge, in the following years, the number remained below planned levels. An additional 700 workers from foreign construction companies were present on the Ispra site during these early years. Regarding national distribution, by 1964 the make-up of the JRC staff reflected the distribution of the Community's population among the Member States, with a slight over-representation of Belgians. The coexistence of Euratom research groups and independent Italian groups at the Ispra site between 1960 and 1961 posed no issues. The final absorption of Italian research groups at Ispra into Euratom facilities occurred in January 1962. By the end of 1964, only 60 individuals remained belonging to CNEN, which had replaced CNRN in 1960.
In the designing of the Centre, four types of needs were taken into consideration: the specific



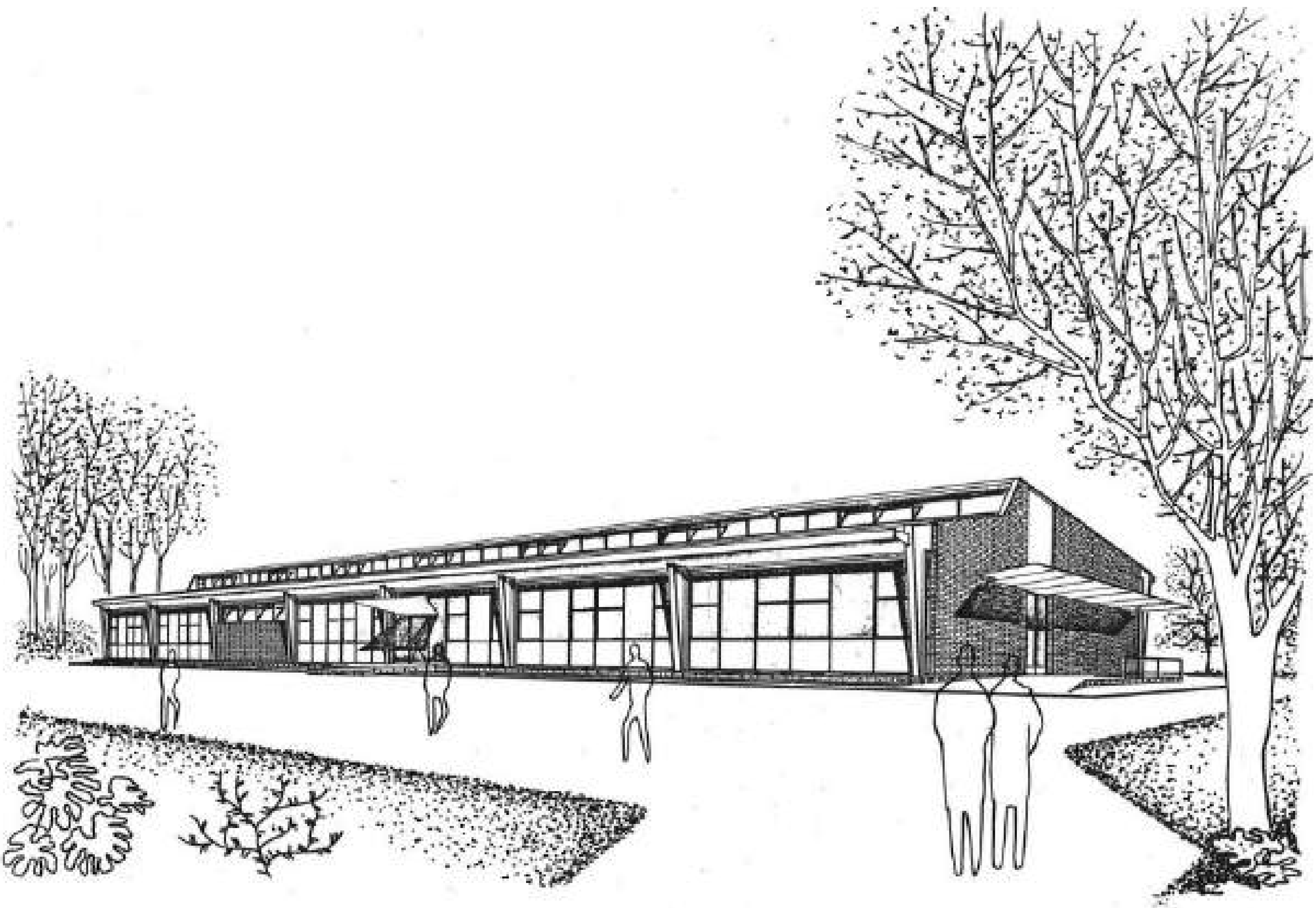
Zoning of the Ispra site by purpose.
(Source: CNRN - Servizio Progettazioni
e Lavori Civili – 1959)

characteristics of the Centre itself and the need for communication between various buildings and groups of buildings, the planimetric and altimetric setting of the territory, the strictly functional nature of the Centre's general services and, crucially, the necessary safety arrangements.
The primary features of the Centre stemmed from the fact that it served as a university-level experimentation and research hub, designed to host the CNRN research reactor, various affiliated labs and general service buildings. Anticipating increased future needs for research facilities and labs of a similar nature to the original ones, a vast plot of land was left completely free, with roads and services arranged to allow unhindered extension in the chosen direction.
Even in the design and organisation of the part of the Centre to be built immediately, an essentially dynamic concept was followed. Consequently, the land was divided into homogeneous areas, each designated for specific uses, rather than designing groups of buildings that would later be difficult to expand or modify. This method solved the problem of building orientation, allowing each area to have its own specific orientation.
Because each zone was homogeneously designed as regards its use, interference between buildings could be avoided, thereby simplifying the organisation of the site plan. This ensured harmonious development within each zone's limits without compromising the specific designs of the structures themselves. It also guaranteed a fairly satisfactory building density, considering the nature of the Centre, as approximately 20% of a total of 1.5 million square metres was allocated to or reserved for buildings.
The planning of general infrastructure (water, sewage, etc.) was also simplified, as the main lines could be positioned at the border of each zone, and their dimensions could be established based on current needs while allowing for future developments. This approach made the natural development of areas through simple adjustments possible. The site plan identified six principal zones, each with its own distinct characteristics and internal organisation: the general services zone, the reactor zone, the radiochemistry lab zone (the 'hot' labs), the conventional ('standard' or 'cold') lab zone, the biology lab zone and the industrial zone.

Each zone's position within the Centre and relative to the other zones was determined by operational needs and requirements in terms of the frequency and directness of communication with the outside world, taking into account the terrain of the site.
Accordingly, the industrial zone was positioned on the western side, where the railway was and connecting tracks could be built.
This ensured rapid and economical fuel delivery for the thermal power station without interfering with traffic within the Centre. Furthermore, thanks to the north–south direction of the prevailing winds, this positioning ensured that the smoke from the power plant would not reach the laboratory areas.
The general services zone was positioned to the south of the site, meeting the road connecting Ispra directly to Milan; here, the hilly terrain was better suited to the construction of administrative, representative and residential buildings each with specific features. Conversely, it was considered that attempts to construct here buildings with more standardised features, such as labs, on this terrain would face significant obstacles, requiring changes to the original project and expensive levelling, and would hinder future expansion.
The hot zone, with the radiochemistry labs, was positioned near the reactor, while the biology zone laid to the east, with ample space for crops, easy irrigation and optimal exposure. Protective buffer land of varying width encircled the perimeter of the site, particularly around the laboratory zone.
The general services zone consisted of the entrance building (housing surveillance and control services, the telephone exchange and the fire service), management offices, technical and administrative offices, a conference room, educational services, the general library and documentation service, health services, the meteorological station, the canteen and the residential quarters (known as the *foresteria*, or 'guest quarters'), hosting staff who had to be available on call.
The reactor zone encompassed the reactor with all necessary operational services, labs for reactor technicians and engineers, and labs and study rooms where reactor physics experiments and calculations were done.
This zone would expand north-north-east, enabling direct communication between the reactor zone and the hot zone.
The hot zone, appropriately protected and segregated from the rest of the Centre, contained hot chemistry and radioisotope labs, water treatment facilities and radioactive waste structures. Few buildings were planned in this zone, permitting future expansion, by increasing the size of buildings under construction, doubling existing buildings or erecting new structures.
The biology labs were sited in a remote location with significant capacity for expansion; the zone included labs, offices, greenhouses, barns and experimental agricultural fields.
The industrial zone comprised metallurgical plants with labs and offices, general and precision workshops, general workshops for flammable materials, the petrol station and the thermal plant.
The layout of the roads within the Centre was based on the overall site zoning, current plans for building and plans for future expansion. The main axis extended from the entrance to the north-east, anticipating the expected direction of the Centre's development. From this axis stemmed roads connecting the various zones: most traffic used these roads. Other internal roads connected buildings within the same zone.
All the roads were relatively wide, regardless of their initial importance: it was decided that their width should not be less than 6 metres, to avoid costly widening works in the event of even a modest increase in traffic; that width was deemed sufficient for the expected traffic, the speed of which within the Centre would be very moderate. Only the smaller local roads and

The JRC guesthouse, 1960s.

pedestrian walkways would be narrower. Gradients did not exceed 2.5%, and curve radii were greater than 50 metres.
Spacious parking areas surrounded each building; where they were not already shaded by trees, new trees were planted.
The types of building, their density and their orientation varied among zones. It was hoped that, by paying attention to these factors, it would be possible to avoid impeding future developments, particularly in *'experimental'* zones where long-term predictions were impossible. The buildings could be more complex where their purpose was precisely determined and their development predictable, while they needed to be simpler in structure and more flexible in size where their use was general and their development unpredictable.
In the general services zone, each building had its own unique design, based on its position and use. Conversely, laboratory areas featured low buildings composed of limitlessly combinable standardised elements.
Special attention was paid to ensuring that it was possible to expand laboratories by joining different elements.
In the industrial zone, the need for larger and more costly structures prompted the construction

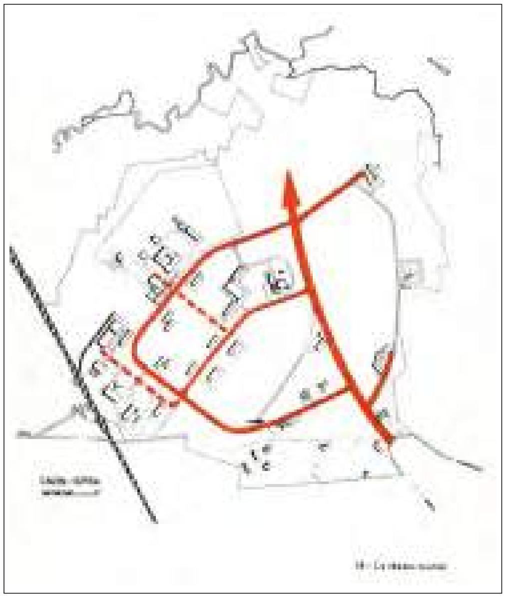


42 - Laboratoire type - Vue d'ensemble

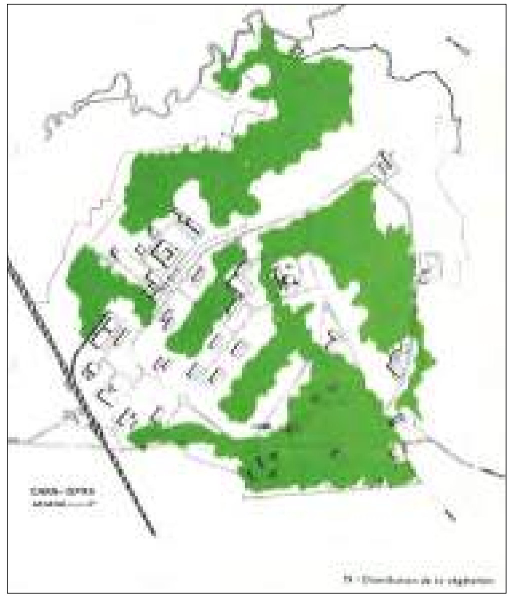
Cl. Org. (B12)

Standard laboratory – overview.
(Source: CNRN - Servizio Progettazioni
e Lavori Civili – 1959).

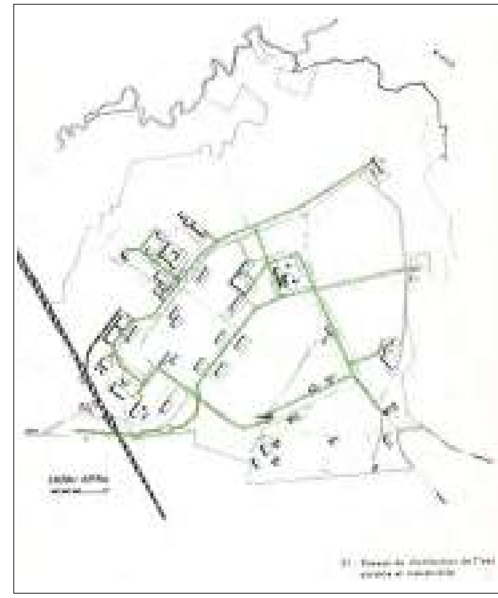
of buildings that were larger than they needed to be at the time, to avoid alterations and expansions before their economic cycle expired. Typically, the main façade of a building was oriented to the north, and rooms requiring constant and uniform temperature and light – such as labs – were placed on this side.
Smaller offices and study rooms, where lighting could be more easily adjusted with Venetian blinds and the temperature could be better regulated, faced south.
Efforts were focused on preserving local woods, for economic, aesthetic and health reasons.
An extensive tree-planting programme was initiated for this purpose. Shrub areas were planted with high-stem trees or replaced with meadows or, in the biology zone, cultivated fields. Moreover, vegetation shaded roads and parking areas near buildings from sunlight.
The electrical supply was designed as a dual primary distribution system with separate lines; this design was chosen for its ability to ensure operational continuity very simply. There was a specific plan for the hot zone, in anticipation of the potential installation of a thermoelectric power plant – namely simultaneous power supply from both the plant and the station. In this way, with an appropriate arrangement of relays, absolute continuity of power supply could be ensured, without interruptions, even if one of the two power sources failed.
To avoid having to modify the standard type of laboratory buildings at a later stage, in most cases the transformer substations were located in isolated buildings.
Medium- and low-voltage equipment was arranged in protective frames to avoid accidental contact. Protection against short circuits was ensured at both medium and major low-voltage supply lines by circuit breakers, limiting the use of fuses to low-power, low-voltage distributors. This approach ensured selectivity in the operation of protective devices – that is, an installation where protective devices intervened only immediately upstream of the damage. The chosen secondary voltage was the standard 380/220 volts, which was considered appropriate in the absence of large motors.
Medium and low-voltage cables were rubber-insulated under neoprene sheaths, housed within shared conduits where possible.
Cables requiring independent routing were laid directly in the ground. Streets and squares were illuminated by mercury-vapour fluorescent lamps mounted on poles about 8.5 metres high.
The average street illumination level was 55 lux.
Initially, the Centre's water supply project involved digging medium-depth wells, on the assumption that the surface-visible silt layer was supported at a moderate depth by an alluvial layer permeated by groundwater.
Test holes soon disproved this hypothesis, and the plan to draw water from wells was abandoned. Attention shifted to nearby lakes, specifically Lake Monate and Lake Maggiore.
Drawing water from Lake Monate would have allowed the Centre to be supplied directly by gravity, as this lake is located at a higher level than the site. However, Lake Monate presented other disadvantages, such as the presence of plankton and algae and the fact that the lake's only emissary, the Acquanegra stream, would have been practically dried up.
The main difficulty, however, was the relatively high temperature of the water, which would need to be used primarily for cooling the Centre's facilities. Consequently, extraction of water from Lake Maggiore was preferred; the temperature was lower (8 °C) and nearly constant year round at a moderate depth (about 35 metres).
Additionally, the chemical composition of the water was almost invariable throughout the year, and the salt content was modest at 35 metres.
Likewise, the presence of algae was constant but at a modest level.
Lake bed surveys revealed no significant anomalies. The laying work was to be carried out conventionally – that is, by submerging a section



Road network. The arrow indicates the principal transit direction.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

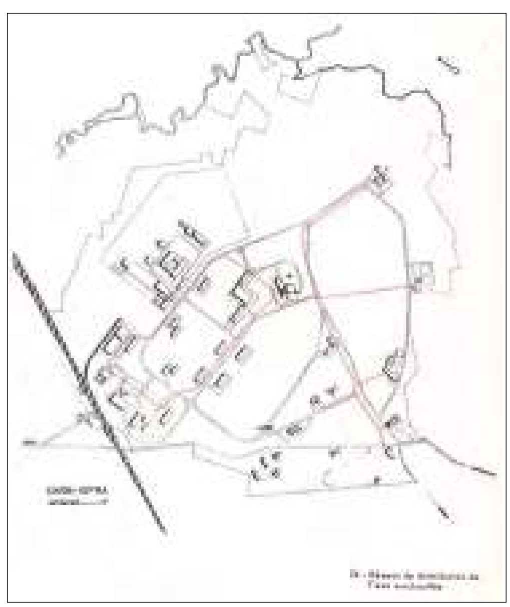


Green areas plan.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

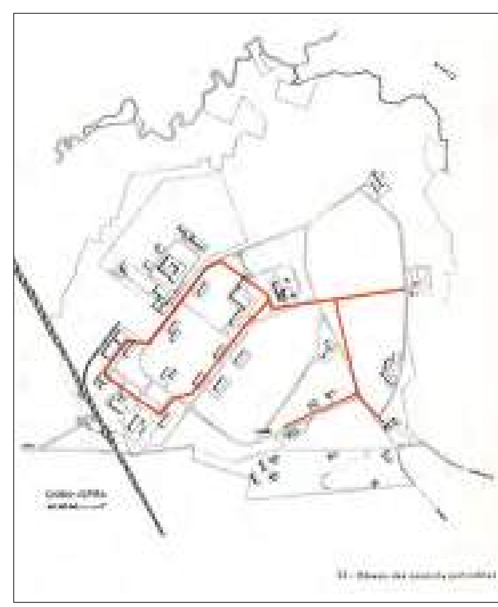


Water network.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

Sewerage network.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).



District heating network.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).



Service tunnels network.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

of pipe about 350 metres long, weighted with concrete blocks to hold it in position on the lake bottom. The water intake sat about 8 metres above the bottom, to avoid impurities or sediment suction. The pipe, anchored to the ground by concrete blocks, would extend to the pumping station, from where the water would be pushed through twin pipes, each 300 millimetres in diameter, to the perimeter of the Centre, crossing roads, private land and the Novara-Luino railway line.

Once inside the Centre, the water was treated with sodium hypochlorite, then passed through pressure filters to remove suspended impurities, including algae. Downstream of these filters, the two pipes connected to the internal distribution network. Essentially, this network consisted of a large loop, crossed diametrically by the system's main pipe, which extended to a 600-cubic-metre reservoir located at the top of the Centre, 244 metres above sea level. Particular attention was paid to the part of the system located around the reactor. The reactor could receive the water needed for its conditioning and cooling systems from four points on the main loop, thanks to an additional element of the network placed around the reactor itself. Water was distributed along the entire route, and any excess was used to fill the reservoir. Another reservoir, of about 250 cubic metres, was used to distribute drinking water across the Centre. This second reservoir was filled through supply pipes after carbon filtering to remove excess chlorine. The amount of water required was calculated taking into account the need to achieve sufficient dilution of the elements to be eliminated before discharge back into the lake. Under no circumstances was the total volume of water discharged to be less than 3600 cubic metres per day.

Alongside the industrial and drinking-water networks, a demineralised water network was planned, to supply all labs handling radioactive substances. About 250 cubic metres of water was produced daily by a centralised facility located in the Centre's hot zone. This system featured valves and bypasses so that it could be shut down as needed. The drinking-water loop, identical in configuration to the industrial loop, was devised to substitute for it in case of failure. Therefore, numerous bypasses were installed at strategic points between the two networks.

To provide drainage for waste water and storm water at the Ispra site, a combined sewer system was created in order to limit the length of the pipes, as the limited slopes would otherwise have required excessively large drainage channels.

All the water was free of solid debris: at the base of each of the buildings served, a biological tank clarified the water before it entered the network's pipes.

Along with waste water and storm water, each building discharged into the sewers a significant amount of water already used to feed its air-conditioning systems. Normally, the water collected was conveyed into a drainage basin, from where it was sent to Lake Maggiore through a seamless steel pipe with a diameter of 400 millimetres, powered by a pump. Since, in the event of heavy rainfall, the capacity of this pipe would be insufficient, the basin was equipped with an overflow device consisting of an ovoid conduit designed to discharge excess water by simple gravity into the Novellino stream at an altitude of 203 metres. This safeguard was put in place following an analysis of the previous decade's rainfall data for Ispra.

Given the small amount of chemical reagents used in the laboratories compared with the significant volume of water circulating in the systems and the consequent dilution, it was not deemed necessary to carry out continuous chemical monitoring of the wastewater flows. However, it would have been possible to perform such monitoring whenever necessary by taking samples from the drainage basin located at the start of the discharge pipes.

All general service networks, such as electrical cables of all types (high, medium and low voltage), telephone cables, heated water pipes for building heating and, where applicable, pneumatic cables, were housed in walkable utility tunnels measuring 1.5 metres in width and 2.3 metres in height. The network of these tunnels could be represented as a loop running along the inside of the roads forming the left side of the road network. From this loop, a branch extended, which then split into two: one leading to the transformer station and the other to the canteen and the building at the entrance to the Centre. Part of the network, particularly the loop, was very difficult to construct, as it was built in water-rich terrain using very specialised techniques. To construct the other part of the network, which had to cross sandy terrain, it was necessary to fully open up the excavations and cast the tunnels using internal and external formwork. The tunnels were built in waterproof reinforced concrete to prevent nearby groundwater infiltration. To lower the water table level below the tunnel floor, a drainage layer of large stones, 150 metres wide and half a metre high, was installed. The maximum slope permitted for the floors of these tunnels was 10%. Access to the tunnels was only possible through the buildings connected to them; therefore, no other access points were planned along the route. The issue of pipe expansion in the network carrying superheated water to heat the buildings had to be studied in detail. Special brackets equipped with axial expansion and deflection devices were installed at intervals to prevent abnormal projections and bends in the distribution pipes. Summer cooling of the tunnels, necessary to dissipate the heat from the electrical cables, was ensured by adequately powered electric fans, which maintained an airflow within the tunnels, directed from bottom to top, thus complementing the natural return flow caused by the elevation difference between the tunnel openings.

The central heating system planned for the Centre consisted of a thermal power plant (to be located in the industrial zone near the railway junction) and a pressurised hot water distribution network that would reach most of the buildings via the service tunnels. The location of the power plant was far from the theoretically optimal centre of the built area it served and lower than the average elevation of the buildings themselves, but it was chosen to make it possible to supply fuel directly via the railway connection: the reduced transport costs were sufficient to offset the increased management costs arising from the location.

Panoramic photograph of Lake Monate.

Aerial view of the industrial area, 1964.

Researchers at work in the Ispra laboratories, 1962-1963.

Researchers at work in the Ispra laboratories, 1962-1963.

Researchers at work in the Ispra laboratories, 1962-1963.

Each building was equipped with a thermal substation, fitted with one or more heat exchangers, which would produce hot water at normal pressure for the building's heating systems, except for some industrial buildings, which were equipped with systems using high-temperature metal radiant panels.
Most buildings were equipped with air-conditioning systems for heating, which could also be used as summer cooling systems, which was desirable given the high temperatures often occurring in the area.
Some laboratories had some ventilated and heated areas and some fully air-conditioned zones; multi-zone air-conditioning systems were widespread. Generally, lake water, available at a temperature of 10-12 °C, sufficed for cooling, occasionally supplemented by chilled water from special refrigeration units.
To avoid wasted installation and management costs, certain buildings, like the meteorological station and the residential buildings, were not connected to the central thermal plant, due to distance, low heating needs or the difference in elevation. Buildings demanding high heat production for other uses – like the canteen – benefited from residual heat from the local plant when heat from the general circuit was unavailable. For the foundations of the buildings, various systems were considered, such as the use of drainage systems for sand and stabilisation measures for silt, but all of these would have required excessively long preparation and execution times.
It was therefore decided to adopt a system that, while less advanced, had the advantage of faster execution: a concrete piling system that would transfer the loads to deeper and more solid and resistant layers of ground.
Considering the very different characteristics of the terrain depending on the area in question, two different types of piling had to be adopted. In sandy and gravelly ground, it was necessary to use drilled piles, as this was the only piling technology capable of penetrating the erratic boulders present in the ground. In silty ground, driven piles were required, as this type of piling technology provided a safeguard against excessive alteration of the natural silt deposit. Reinforced piles with a diameter of 40-50 centimetres were used, driven to a depth of approximately 15 metres and positioned to achieve a layout that was as regular as possible.
Regarding the Centre's urban development plan, which was based on the division into distinct zones according to their intended use, the aim was to construct a series of buildings with structural and architectural characteristics tailored to meet various needs.
They were intended to have three common criteria: relatively short construction periods, high flexibility in the organisation of space and a very low construction cost per unit.
Consequently, prefabricated elements were chosen, and their types and dimensions were standardised as much as possible; lightweight structures were selected where possible to minimise maintenance costs, and centralised installations were used to cut costs. Besides the buildings housing the US-acquired CP-5-type reactor, Ispra-1, the various building types included the cold or standard labs, the biology labs, the industrial buildings, the hot labs and the conventional buildings for general services.
The standard labs were the second most significant type of buildings, designated for research into nuclear physics, radio-elements, solid-state physics, radiation chemistry, reactor physics and calculations, reactor technologies, electronics, servomechanism mechanics and control, metallurgy and general chemistry.
Although the labs all had the same architectural design, groups of buildings were distinguished by colour. Most of the laboratories' support structures and enclosures were metal, so that prefabricated elements could be used; not only did this mean that a laboratory could be assembled very quickly, it also allowed for easy

replacement of parts, modification and expansion, while keeping unit prices low through industrial manufacturing.

The typical laboratory was a rectangular structure about 15 metres wide, with a length of 7.2 metres or multiples thereof.

Ground-floor structures featured double-leaf iron gates connected by double-T profiles, providing lateral structural rigidity and reinforcing the roof. All joints were welded.

The roofs were made of hollow slabs overlaid with lightweight conglomerate insulation. They were coated with aluminium strips, 6-10 millimetres thick and 60 centimetres wide, fixed and linked by anchoring brackets.

Aluminium moulding covered joints and brackets. This architectural choice was shaped by the preference for lightweight design, low maintenance costs and price reduction through mass production of roofing elements. Load-bearing structures were external to both the enclosed spaces and the containment structures (ceilings and walls), conferring remarkable flexibility in the layout of interiors and in the set-up of equipment, which could be adapted to diverse needs without the load-bearing structures needing to be taken into account.

The façades were continuous, consisting of interchangeable elements (1.2 metres long) with profiles made of lightweight alloy. The individual elements could be sills with fixed glass, casement windows or doors. The parapets were made of a double sheet of rigid steel, hot-dip galvanised and painted, and filled internally with an insulating layer of mineral wool.

Each upright contained Unistrut profiles for attaching equipment or pipes. The ceilings, 4 metres high in the northern section of laboratories and 3 metres high in the southern section of offices, were made of 60 centimetre by 60 centimetre sound-absorbing panels in lightweight alloy, also used in the reactor building. Individual panels could be replaced with standard fixtures, such as light fittings and air vents, used throughout the Ispra Centre. The flooring was made of rubber or plastic.

Below the laboratory area, was a basement, to be used as a storage area for service plants, ventilated by grilles in the pavement around the building. The entrance was located at the end of the building, with a ramp allowing carts to access the laboratories. For some laboratories, a freight elevator was also planned.

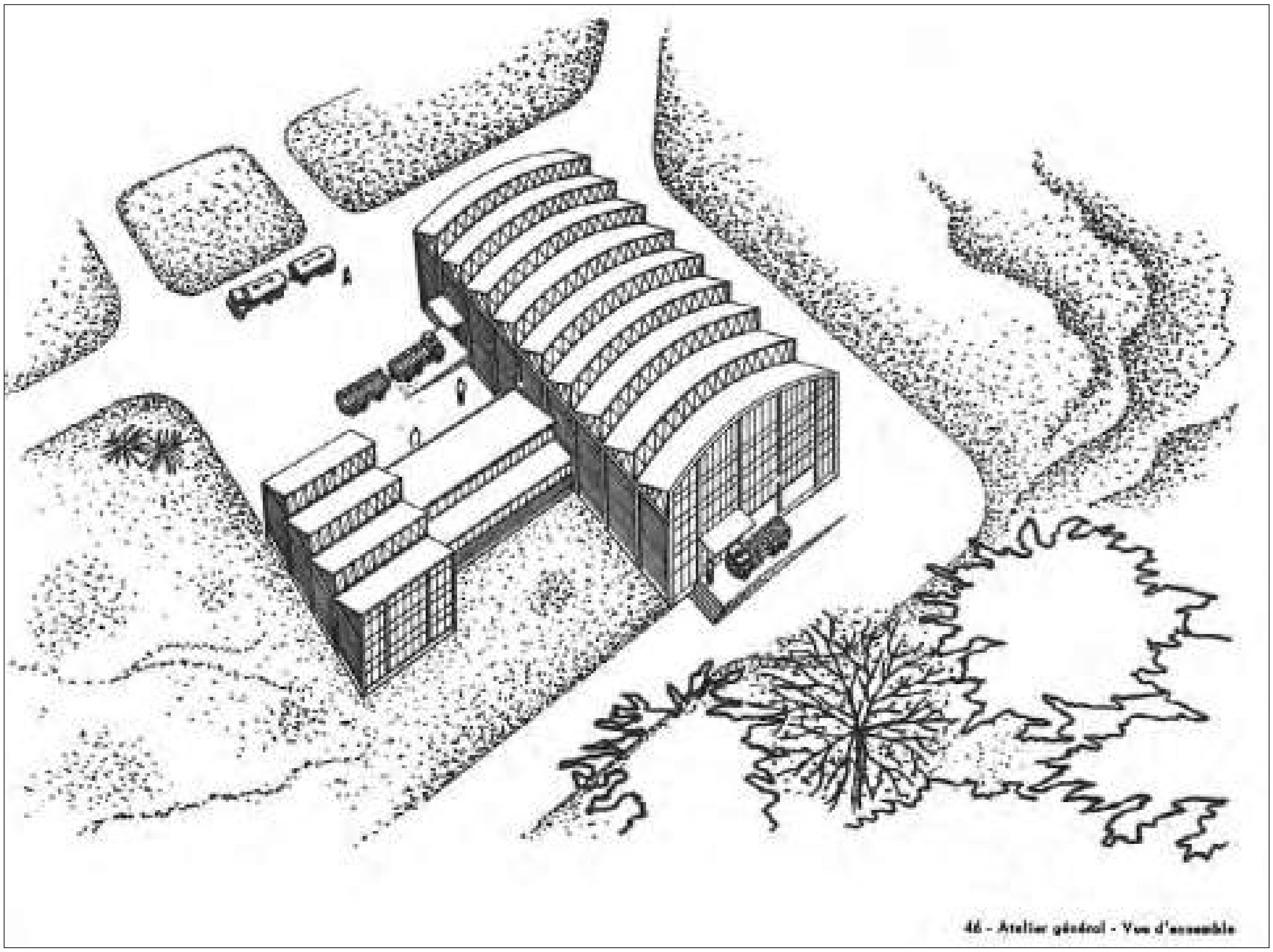
The structures from basement to first floor comprised raw, unfinished reinforced concrete, while the floor was a composite slab with hollow-core decking. The partition walls were chosen with great care. Predicting future needs in terms of space and the exact dimensions of each room was impossible at the time, as requirements were expected to change rapidly and unpredictably. Thus, a system of movable walls was chosen, with 1.2-metre modules, a simple structure and straightforward assembly, to make it possible to adjust rooms during work breaks, in the evenings or at weekends.

The movable wall panels consisted of double steel sheets 8–10 millimetres thick, containing a layer of sound-absorbing material and fixed by lateral compression with special rubber edge seals. Each panel joint held a *Unistrut* profile, like the façade uprights.

Various types of panels were available to suit different requirements. Doors were clad in Formica, walls coated with synthetic paint.

A characteristic laboratory feature was the air-conditioning system for both summer and winter operation, which depended on the thermal power plant and the lake-water distribution network for heating, pre-cooling and humidification. Mechanical refrigeration was autonomously produced by the laboratory.

The other buildings in the Centre were of more conventional design, including the general workshop building, which was made up of three interconnected sections and housed the workshop, the precision workshop and the service area. The first two sections ran north–south, with



General workshop project – overview, 1959.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

openings facing north. The service area was nestled between the main workshop and the precision workshop, connecting them, and was positioned at right angles to them, running in an east–west direction.
In terms of volume, the workshop was the largest section: 63 metres in length, 30 metres in width and about 14 metres in maximum height. The precision workshop measured 21 metres in length, 14 metres in width and 9 metres in height. The service area measured 24 metres in length, 14 metres in width and about 5 metres in height. The general workshop building as a whole consisted of a load-bearing structure made of reinforced concrete with raw beams and pillars, solid brick panels and aluminium frames, having the same characteristics as the buildings in the industrial zone of the Centre.
The type of roof used for the workshop was of notable architectural interest, as it consisted of vaults patented by the *Silberkuhl* company, the same company that provided the reactor building's roof. The structure was made up of very thin reinforced concrete conical vaults

Personnel in front of
the general workshop
during construction,
1962.

General workshop interior,
1964.

perfectly connected to metal arches reinforced with chains; the arches, with a span of 30 metres and a width of 7 metres, rested on reinforced concrete pillars about 10 metres high, built on continuous inverted beams and connected at the top and at mid-height by reinforcing beams.
This structural system was particularly suitable for the workshop, both because of its reduced use of construction materials (a particularly useful quality given the nature of the terrain) and for the possibility of rationally organising the work on site. The overhead cranes suspended from the steel structure could be extremely compact, allowing them to be installed in pairs, each independent of the other, with a capacity of 3 tonnes. When it was necessary to increase lifting power, the cranes could be coupled via simple electrical commands, so that each hoist could move from one crane to the other: with the two hoists on the same crane, a lifting capacity of 6 tonnes could be achieved.
As for the internal layout, the central area, which ran the entire length of the building, was reserved for precision benches, while the two lateral areas, located along the outer walls, each housed a double row of machine tools. The placement of the machines determined the arrangement of the ducts for the various systems, which were laid out in channels under the floor, protected by embossed metal sheets. These channels, five in number along the length of the building, were interconnected by another

five channels running at right angles to them, so that the tightly spaced duct network reached all the areas of use. The ducts were used to distribute water, compressed air, acetylene, oxygen, propane and electricity (the network for the last was explosion-proof).

Heating was provided by an air-heating system, while ventilation was ensured by extractors installed in the keystones of the metal arch trusses, which also served as frames for the translucent plastic sheets that enclosed the workshops. In the precision workshop, the same principle of a metal structure supporting the workshop roof and the crane rails was adopted. Here, however, the workshop had a flat roof, and the crane was a single unit with a capacity of 5 tonnes. Again, the various ducts were distributed through a network of channels under the floor. The pipes passed from the main workshop to the precision workshop through a space in the corridor of the service area. The precision workshop was equipped with an air-conditioning system, whose central unit was part of the service area, which also included a room reserved for offices, another for tools, a locker room with showers and lavatories for workers and an office for the workshop manager.

Among the facilities offered by the Ispra site, the canteen held special interest for its unique role both in the functioning of the site and in the social life of the staff. The canteen was the only place where workers gathered on a daily basis and had the opportunity to mix regardless of the category of work they performed, away from offices and study rooms (which were scattered across numerous buildings). In the canteen, they were able to socialise, establish contact and build relationships, thus contributing to the Centre's successful functioning.

In this regard, all special treatment was eliminated; there were no distinctions in seating arrangements or services, and the focus was solely on creating a pleasant and comfortable atmosphere, enhanced by the careful choice of colours and furnishings. From the transfer of the site, the old system of rectangular tables with many seats, which was economical and made good use of the dining room space but would have created privileges and biases among the different categories of staff, was eliminated. Instead, round tables seating six and square tables seating four were chosen, in a ratio of about 1 to 2.

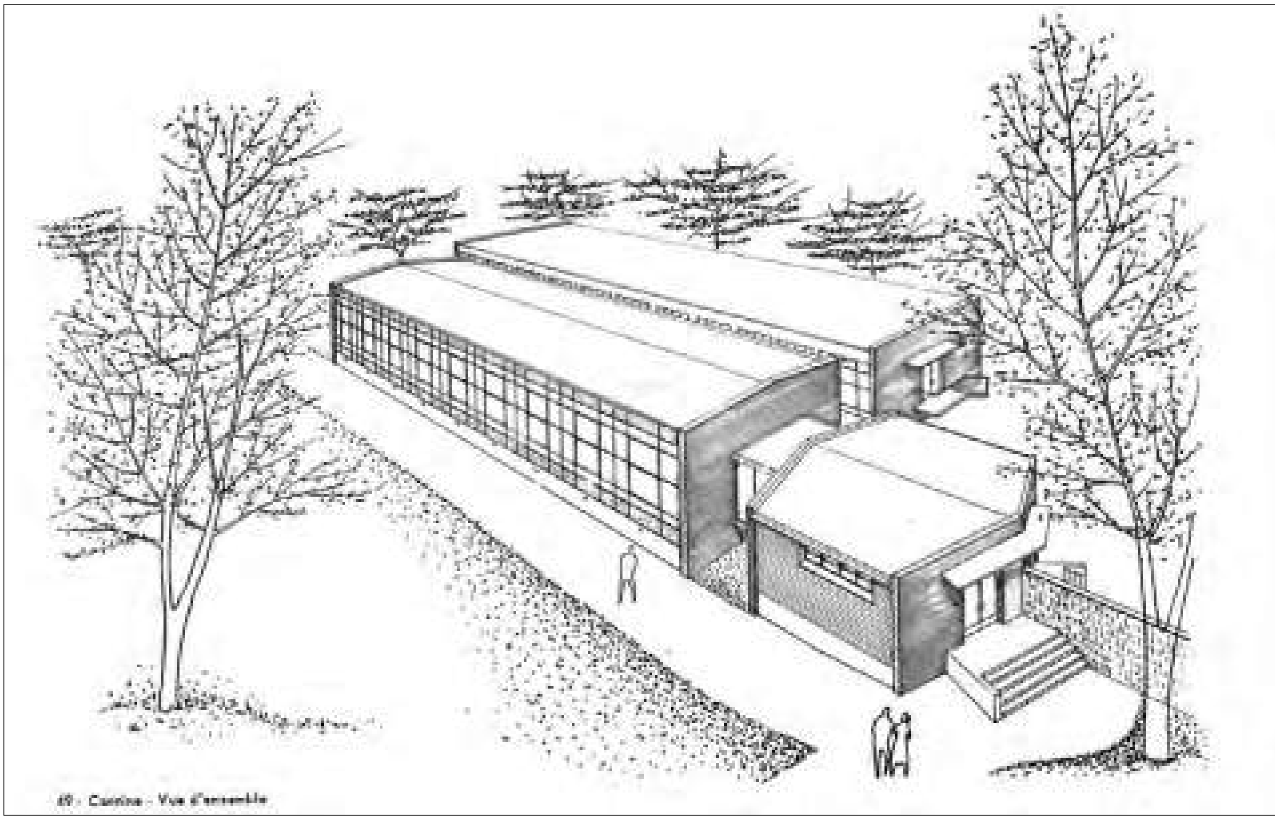
This avoided the need for rows of tables and allowed people to arrange the square tables as they wished. The canteen could accommodate 230 people. Two small dining areas with separate entrances and lavatories were reserved for distinguished guests. Canteen staff, relatively few due to self-service implementation, had a dedicated staffroom.

The building consisted of two rectangular sections: one housed the dining hall, the other the reserved dining rooms, the kitchen, the food storage area, the refrigerators, the thermal plant, the air-conditioning system and all the other facilities. The two sections were connected by a service area; it was of a lower height to minimise lighting and ventilation needs. Next to the dining hall was a polygonal entrance hall containing lavatories and a cloakroom.

The canteen had a flat terrace roof. The exterior was clad in white marble with an exposed brick façade, and the inner and outer frames were made of light alloy; the floors of service areas, including the kitchen, were of white sandstone, while the dining hall floors were of marble.

In planning the site, the canteen was positioned on elevated ground close to the Ispra-Cadrezzate road to give it a pleasant and panoramic setting. Its proximity to the site perimeter was favourable, enabling free movement of people and goods to the service area.

The south-western part of the site was left outside the fence, since only residential buildings and buildings to which unrestricted access was permitted, like the chapel and meteorological station, were located there, and, because it too



Canteen project – overview, 1959.
(Source: CNRN - Servizio Progettazioni e Lavori Civili - 1959).

JRC staff in the canteen, 1962.

was in this area, this meant that the canteen was accessible even on days and at times when the main site was closed. In fact, the entrance hall had dual entrances – one internal and one external to the Centre. Consequently, simply locking the internal door facilitated direct canteen access without the need for the mandatory checks that were customary on entering the Centre. The orientation of the building, with façade of the main hall facing north-north-east, was determined partly by the characteristics of the landscape and the need to avoid direct sunlight and partly by aesthetic considerations, as the best views of the valley in which the Centre was situated and the surrounding mountains could be showcased through large glass windows.

In the original plan, another significant building was intended to house the biology labs.

It was expected that the staff would maintain close ties with the CNRN (soon to become the CNEN), as the planned activities included: monitoring and research on behalf of the Centre's management and in agreement with the CNRN's biology department; the integration and availability of services and technical personnel for researchers from university institutes and industrial research laboratories; and high-level educational activities.

The main features of the plan included separate sections for labs, general services, barns and greenhouses. Planned scientific and technical facilities of general interest comprised an analytical chemistry lab, an organic synthesis lab, a small mechanical workshop and a repair workshop for electrical and electronic apparatus. An organic synthesis lab dealing with radioisotopes (relocated to the hot zone), biological testing facilities using gamma rays and neutrons (located next to the reactor), a library and training rooms were also planned.

In practice, what was originally planned as the biological zone ended up, in the following years, being located immediately adjacent to the nuclear facilities, which led to substantial changes in the construction and intended use of the buildings compared with the original plan. Nonetheless, until the early 21st century, the work done in the buildings maintained a core biological/chemical focus; for instance, they hosted the JRC's first nanobiotechnology laboratories. Other, complementary buildings completed the layout of the Centre.

The entrance building housed security services, an emergency switchboard, fire-fighting services and the telephone exchange.

A peripheral location was selected for these services (rather than a central one, which would have been less expensive) to ensure that they could continue to operate even in the event of a serious accident that damaged facilities or meant that the centre had to be evacuated.

The meteorological station was positioned on a hilltop to the south-east of the site and was equipped for continuous monitoring of the air and atmospheric precipitation.

A very light and bright building, its unusual polygonal layout allowed the control panels to be arranged in an optimal way.

Two different designs were used for residential buildings, to avoid monotony and to take into account variations in terrain.

The rectangular design featured 12 apartments (4 per floor) served by 2 staircases, while the star-shaped design offered 3 apartments per floor, of varying heights. The ground floors of both types held garages, laundry rooms, storage and service areas.

The designs avoided the need for deep excavations – which was desirable due the characteristics of the terrain – and resulted in elevated dwelling spaces that received good natural light without excessive impact on the surrounding wooded area. The central heating system for the residential buildings was separate from that serving the rest of the Centre.

While Ispra took shape in all its aspects, many of which are still recognisable today, the activities for which the Centre had been built were also progressing rapidly. Throughout the period that this chapter covers, the ORGEL *(ORGanique-Eau-Lourde)* programme was the JRC's flagship activity, serving as Euratom's primary blueprint for European integration on nuclear matters. Designed in early 1960, it constituted a distinctive part of Euratom's second five-year plan (1963-1967).

The project entailed the construction of the ORGEL Critical Experiment *(Essai Critique Orgel)* reactor, then the ESSOR (ESSai ORGEL, or ORGEL test) reactor, which was scheduled to enter the critical phase in late 1966. Subsequently, progression to prototype stage would commence, before finally the new European reactor type would be commercialised.

The programme aimed to develop natural-uranium-fuelled, heavy-water-moderated reactors cooled by organic liquids.

Creating this type of reactor would enable the development of an entirely European system for power reactors, with three benefits, listed here in no particular order. First, the system could be managed in Europe, without external assistance: the use of natural uranium fuel, while not ruling out the development of uranium enrichment capabilities in the Community, provided independence from the enrichment complexes of the superpowers, while a plant for industrial production of heavy water could be quickly established in Europe if necessary.

Second, future reactors could be incorporated harmoniously into national programmes, avoiding duplication of efforts. In this regard, the study of the heavy-water lattice for reactor moderation complemented projects undertaken in West Germany and France, thus providing mutual benefits, while studies on organic coolants would contribute significantly to ongoing research in West Germany and Italy.

The third benefit was the use of the combined resources of the six Member States of the Community. The underlying aim of this approach was not only to create a cooperative spirit among research groups but also to induce commercial companies to work in collaboration, which was potentially much more challenging.

Euratom, however, had already achieved some success in two major projects related to ORGEL. One project entailed establishing a Franco–German group – the German company Interatom (Internationale Atomreaktorbau GmbH) and the French company GAAA (Groupement Atomique Alsacienne Atlantique) – to design the ESSOR reactor. Another initiative entailed the full design of a plant generating 250-megawatt electric by a group constituted by the Belgonucleaire, Siemens-Schuckertwerke and Indatom companies – Belgian, German and French respectively.

Euratom's objective was to foster the creation of an ecosystem that could develop optimal technical solutions to achieve the goals pursued by the Community. This ecosystem encompassed the JRC in Ispra, working on the ORGEL programme directly under the Euratom Commission, and national stakeholders involved through contracts executed under the supervision of scientific departments in Ispra, at the Brussels headquarters of the Commission or at other Euratom centres.

By 1961, the construction of ECO, including the installation of its nuclear components, was nearing completion. ECO comprised a low-power critical assembly, moderated by heavy water, to be dedicated to the study of various aspects of fuel assembly under the ORGEL programme. ECO was equipped with a mechanism able to oscillate the central element of the lattice, to study its criticality. The facility made it possible to observe precisely the effects of fuel rod substitution and to study long-term changes caused by replacing sections of the central rod either with synthetic rods simulating the condition of the fuel after irradiation or with a section of rod irradiated in the reactor itself.

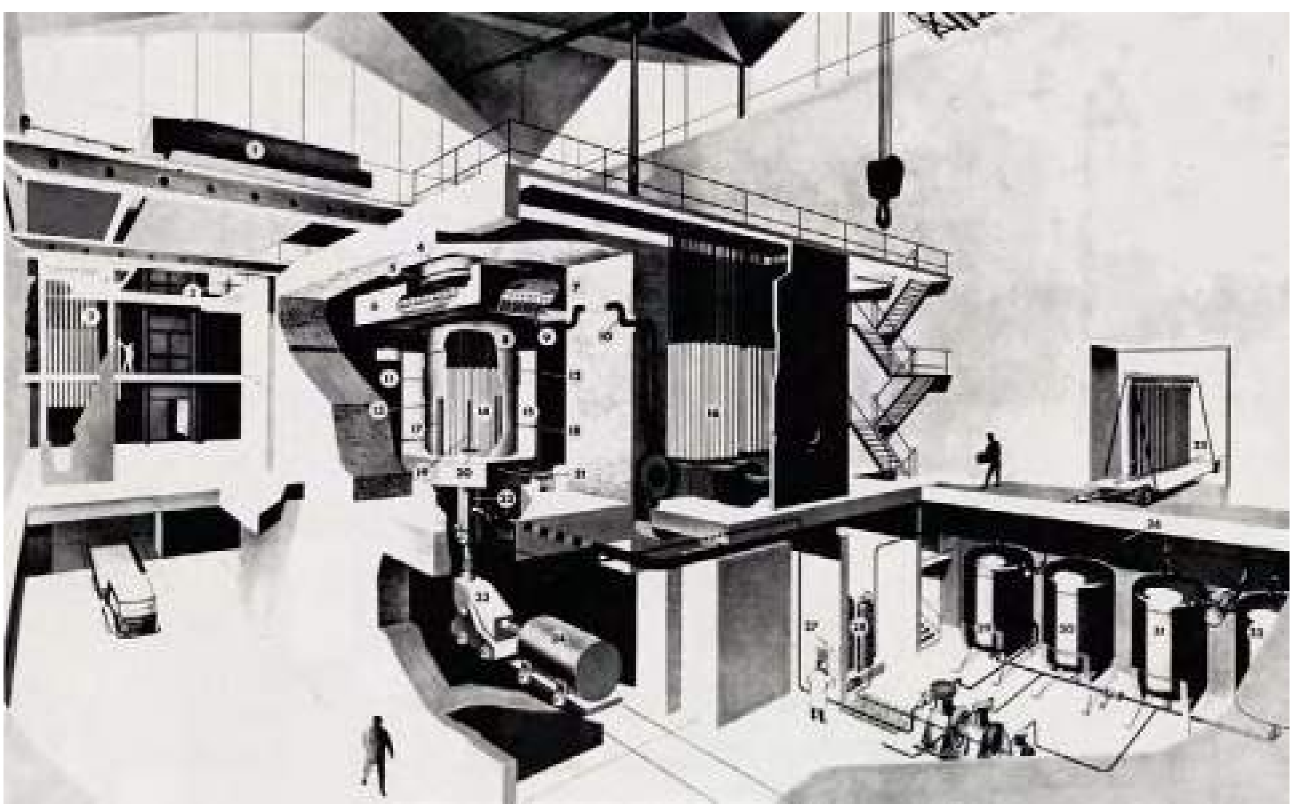
Moreover, ECO allowed for the insertion of a detector to observe the functionality of the reactor under pulse operation, via an electrostatic accelerator. ECO featured notable mechanical improvements on similar types of reactors, namely in the heavy-water circuits, which made it possible to determine precisely the level of heavy-water in the vessel.

The ESSOR buildings encompassed a 45-megawatt thermal power reactor, an extensive active component storage pool and two high-activity labs.

The decision to proceed with the construction of the reactor was taken in October 1962, and civil-engineering works started on 24 August 1963. The reactor was housed in a pressurised vessel 45 metres high, of which 12 metres were underground. Nuclear laboratories (hot labs) were built around the reactor. The consortium of enterprises entrusted with the construction was made up of the abovementioned companies GAAA and Interatom and the Italian company Montecatini. The reactor reached first criticality on 19 March 1967 and full power on 19 June 1969. Researchers also began to explore the possible applications of the ORGEL research in industrial steam generation or water desalination, either separately from or combined with generation of electricity.

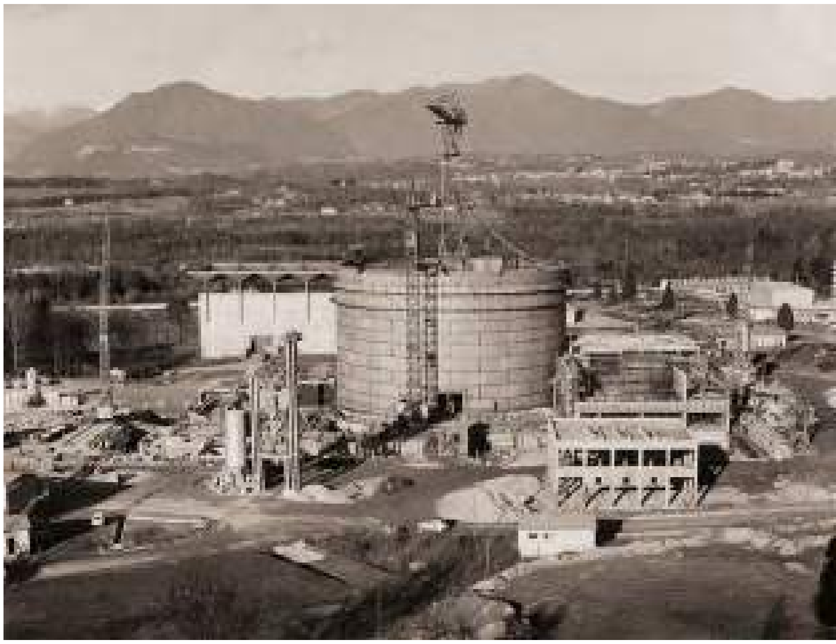
The construction of the ESSOR area meant that the few inhabitants of the small agricultural hamlet of Monteggia had to be relocated. Because of the construction work, a statue of the Madonna located in the hamlet also had to be

A representation of the Orgel critical experiment (ECO) reactor.



The ECO building, 1968.

The construction site of the Essai ORGEL (ESSOR) reactor, 1964.



moved; it was transferred by the religious authorities in a procession to nearby Barza, where it remains to this day. In a highly symbolic gesture, the Centre's management placed a replica of the statue at the entrance to the ESSOR reactor, where it can still be seen.

1963 saw the proposal for the *SOrgente RApida* (fast spring) SORA reactor, a fast periodic-pulse reactor. The neutron flux was not slowed down by a moderator, hence the designation 'fast' as opposed to a 'thermal' reactor; moreover, this occurred with great intensity but only for few fractions of a second, hence 'pulse' definition. The objective of the project aimed at creating a source for neutron beam research in condensed matter physics as well as general neutron physics, using neutron time-of-flight measurement techniques. Preliminary experiments and critical reviews occurred between 1965 and 1968, followed by design optimisation during 1969 and 1970 ahead of prospective SORA construction in the 1970s.

A major milestone in the history of European research was the establishment and development at the Ispra site of the European Scientific Information Processing Centre (*Centre Européen de Traitement de l'Information Scientifique* – CETIS). CETIS exemplified how investments in the nuclear sector could lead to the development of knowledge and technologies instrumental to the programme but not inherently limited to nuclear applications. CETIS spearheaded critical research, chiefly in computation methods and optimal computer use across scientific and administrative settings.

The foundations that CETIS laid paved the way for long-lasting JRC endeavours in which state-of-the-art competence in information technology was instrumental in, for example, advancing the management of remote-sensing data from satellites for environmental and security applications.

The political developments contemporary with the development of the European nuclear programme during its first life cycle may perhaps appear to contrast with the careful rationality that marked the approach to planning the Ispra centre. As the latter neared completion, in the election of 8 November 1960 the Democratic candidate, John Fitzgerald Kennedy, defeated the Republican Richard Milhous Nixon, Vice-President under Eisenhower, and became the US President. Kennedy – the first president born in the 20th century, young, compared with his predecessors, and with a notably dynamic approach to government – renewed the focus on Europe in a similarly dynamic situation.

The French Republic had obtained nuclear weapons in 1960, successfully testing a nuclear explosion, a key element of the strategic-military backbone – *la force de frappe* – driven by the French President, Charles de Gaulle.

Monteggia agricultural community, early 1960s.

Procession for the transfer of the statue of the Madonna.

The Scientific Information Processing Centre (CETIS) building, 1962.

With France joining the club of nuclear powers, de Gaulle pursued an alternative plan for European integration/unification, based on intergovernmental relations without delegating national sovereignty to Community institutions. The initiative started in 1961 and was divided into various phases; it was referred to as *'the Fouchet plan'*, after the French ambassador to Denmark, author of the documents that inspired these efforts to plot a new European course. De Gaulle pursued trilateral relations among France, the United Kingdom and the United States, although the two latter countries were not enthusiastic about the scheme, which eventually failed.

The French President's displeasure weighed on the institutions of the European Community, which received the United Kingdom's first membership request in 1961. The protracted contentious discussion was also shaped by the effects of the Cuban missile crisis of October 1962, sparked by the discovery of a Soviet plan to install nuclear missiles on the Caribbean island. Without exaggeration, the world was on the brink of a nuclear war. The crisis was resolved bilaterally between the United States and the

Soviet Union, excluding Europe, and France in particular, prompting de Gaulle to veto the United Kingdom's membership application during a press conference on 14 January 1963.

The French President's statement became an official government act two weeks later, amid French refusal to sign the Partial Nuclear Test Ban Treaty (PTBT). The treaty was one of the results of the easing of tensions following the Cuban crisis, and it was opened for signature on 5 August 1963, emerging as the precursor of all nuclear armament treaties thus delineating political confrontation dynamics among nuclear-capable states and aspirants.

Despite the difficulties experienced by the six European Community Member States, united under the three treaties (the ECSC, Euratom and EEC treaties) – or perhaps precisely to address such challenges – representatives of the councils of the three Communities decided, on 24 September 1963, to start down a path towards consolidating the institutions. The Treaty of Brussels, also known as the Merger Treaty, established the terms and nature of this new single community and was signed on 8 April 1965, starting a process that would result in the radical revision of the Communities' decision-making processes.

On 30 June of the same year, opposing various proposals under discussion, including the proposal to replace unanimity with majority approval in the decision-making process, French representatives refrained from attending the meetings of the Council of the European Economic Community – soon to be merged into the Council of the European Communities – instigating the *'empty chair crisis'*, with the French seats visibly devoid of the country's representatives. An exercise of veto taken to the extreme, it turned into a boomerang result, as the other delegates endorsed the *'Luxembourg compromise'*. This was of great relevance in the history of the Community institutions, and its consequences would affect the Ispra Centre.

On 8 April 1965, the Six signed the Merger Treaty bringing together the three Communities and establishing a single Council alongside a single Commission. On 1 July, the French government proclaimed the Community 'in crisis', but the Council convened on 26 and 27 July despite the empty French chair, affirming that Council meetings were viable in the absence of a French representative. The Council reconvened on 28 and 29 January 1966 in Luxembourg, adopting a series of resolutions concerning relations with the Commission and adopting majority voting for future deliberations.

Following the Luxembourg compromise, the French government resumed participation in the Community institutions, which were discussing the budgetary consequences of the ratification of the Merger Treaty, as well as a new British application for membership, which was announced on 10 November 1966 to the House of Commons by the Prime Minister of the United Kingdom, Harold Wilson.

The impending challenges faced by the JRC – and particularly Ispra, the largest JRC site – were foreshadowed during the vote on the 1964 draft budget, when Member State representatives presented quite contradictory memoranda. These prevented unanimous agreement on the third Euratom five-year plan – a majority voting procedure still being a distant prospect.

The second five-year plan would end in December 1967, and the Merger Treaty had come into force on the preceding 1 July, yet three years passed without reaching a common vision on the future of European research.

At the meeting of the Council on 8 December 1967, a transitional budget for Euratom was set for 1968 only, and it was halved compared with the request made by the Commission, chaired by the Belgian Jean Rey.

A working group of the Council, coordinated by France, presented a report calling for the Community to begin research collaborations with Member States in the fields of oceanography,

JRC staff demonstration, 1968.

JRC staff demonstration, 1968.

Pietro Caprioglio,
1969.

meteorology, metallurgy, informatics, the environment, modern transports and telecommunications. The budget dispute continued in the Council, intertwined with the discussion on the second application for membership by the United Kingdom, which de Gaulle had again torpedoed during a press conference, on 27 November 1967.
The Vice-President of the Commission, the German Fritz Hellwig, visited Ispra on 28 June 1968; there, the research staff expressed concern about the Centre's fate. The staff at Ispra, who – without exaggeration – most embodied the European ideal, perceived a lack of trust in the very project of unification on the part of the Community institutions.
Their families, attending the European school and participating in social activities, were already experiencing that practice of coexistence among the nations of Europe that was both the origin of the project and one of its ultimate goals. That this held no significance for the Council was, for the staff, one of the first sources of discontent. Added to this, in 1968 labour relations were a significant issue; there were budget cuts and consequent staff reductions, which were met with trade union action. The spark was the non-renewal of the lease for the IBM 360/65 computer, which blocked the work of all those who used its computing programs. On 25 November, a general assembly of all staff was convened, initiating a struggle that led to a strike and the occupation of the Centre by the newly formed Centre Defence Committee.
Outside the Ispra site, the turbulent events of 1968 had already made their mark, and the French uprising in May had sparked a series of protests and street demonstrations that contributed to the resignation of de Gaulle on 28 April 1969, following a referendum defeat for his political grouping.
In December of the same year, the conference of the Heads of State and Government of the Community, held in The Hague, opened negotiations for the accession of Denmark, Ireland, Norway and the United Kingdom.
The international landscape was changing at a much faster pace, deepening the trajectory described in historiography as *la Grande Détente* between the blocs; a key milestone was the Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature on 1 July 1968 and entering into force on 5 March 1970. Nixon had won the 1968 presidential elections, and

Leonid Brezhnev was firmly established as the leader of the Communist Party of the Soviet Union: they were the faces of this phase of international life, during which Europe, in the process of integration, faced crises but also encountered many opportunities to build momentum. In July 1969, the first lay-offs at the Ispra site took place, but the following year, on 17 December 1970, the European Council of Research Ministers approved a general reorganisation of the JRC, committing to a far-reaching programme.

The recommendations of Altiero Spinelli, one of the leading figures of Italian Europeanism, were adopted. In this instance, he acted as a representative of the European Commission, which, from 1 July 1970, was presided over by Franco Maria Malfatti.

The JRC was transformed into a Directorate-General, and the position of Director-General for the entire JRC was established. The Director-General would reside in Ispra, with authority over the other three centres, and would be supported by an advisory committee made up of members external to the JRC and a scientific committee composed of internal staff. The budget for 1971 was thus approved, slowly opening a new chapter for Ispra and the other JRC sites, although unrest did not subside.

The first Director-General of the JRC, Pietro Caprioglio, appointed on 13 January 1971, sought to steer the Centre into calmer waters. The Gordian knot was the ORGEL programme, which the Council had halted on 30 June 1969, freezing its budget. Although its proponents, including Guéron himself, had understood with great regret that the programme would not be resumed, it remained like a dormant machine: technically, it could be restarted, but it seemed destined to be scrapped.

The issue dragged on for the next two years until the Council, on 17 December 1971, decreed the end of heavy-water research in Ispra, opening a phase of conversion to studies on light-water reactors, which allowed the reactivation of the ESSOR reactor for related experiments.

The ESSOR experimental reactor

A crucial step towards fulfilling the primary purpose of the Ispra centre – namely, the development under the ORGEL *(ORGanique – Eau-Lourde)* programme of a 250-Megawatt prototype reactor using natural uranium, moderated with heavy water and employing an organic liquid as the primary coolant – was to test the behaviour of the various proposed ORGEL components, such as its fuel elements and cooling circuit, in an environment with representative neutron fluxes. To carry out the necessary tests, the ESSOR *(ESSai Orgel)* reactor was constructed, a 45-megawatt research reactor using highly enriched uranium, moderated and cooled with heavy water. Following the transfer of the Ispra site to Euratom in September 1960, the decision to proceed with ESSOR was finalised in October 1962.

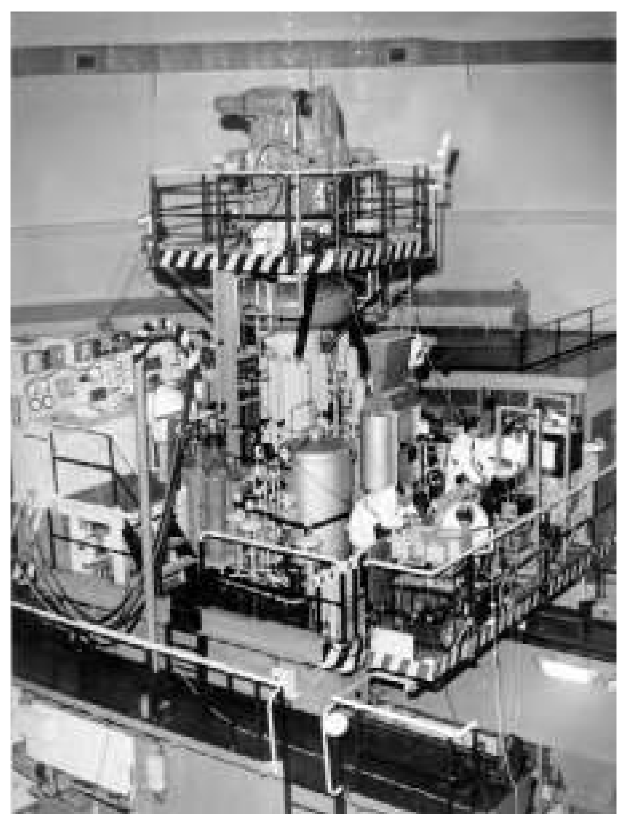
Excavation work on the site began in April 1963, and construction progressed according to plan, culminating in the installation of the reactor within the airtight containment dome, which was 45 metres high and of equal diameter.

The reactor reached criticality, in March 1967 and full power in June 1969.

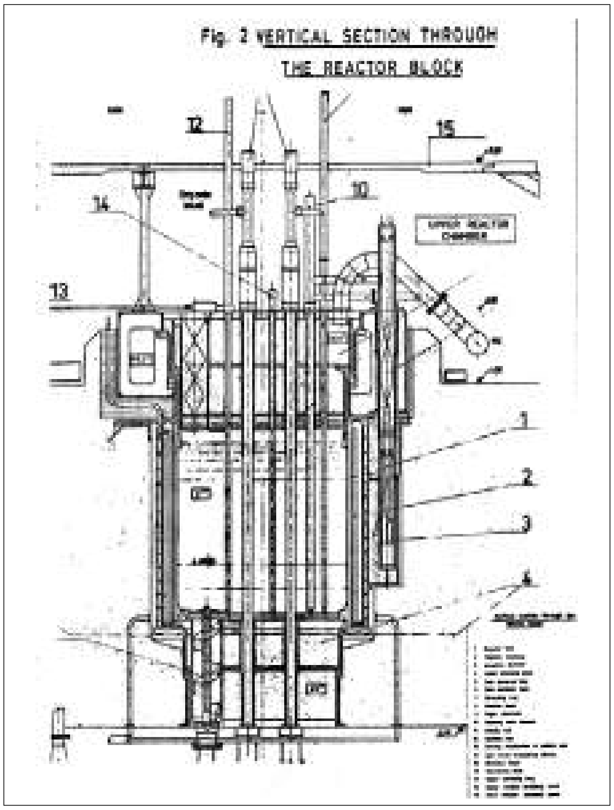
However, by the time ESSOR became operational, Europe's motivation to develop a commercial reactor using natural uranium fuel had significantly waned. Attention had shifted to the concept of using low-enriched uranium, following the American model that operated efficiently with light water serving as both moderator and coolant in pressurised water reactors. For this and other reasons, including political considerations related to the common development of nuclear technology, the objective of building the ORGEL prototype reactor was abandoned by the Commission of the European Communities on 30 June 1969.

As a result, the ESSOR reactor lost its fundamental mission objective, although it continued to serve as a useful research tool in reactor design and in testing components for other types of heavy-water-moderated reactors, such as the Italian CIRENE *(CISE REattore a NEbbia)* concept. By March 1975, the focus of the JRC in Ispra had shifted to ensuring the safety of pressurised water reactors, particularly addressing the risks associated with accidents caused by coolant loss, as would later occur at Three Mile Island in the United States in 1979. In this context, the Super-SARA *(Sperimentazione Avanzata Reattori ad Acqua)* project was conceived, in which the ESSOR reactor would be

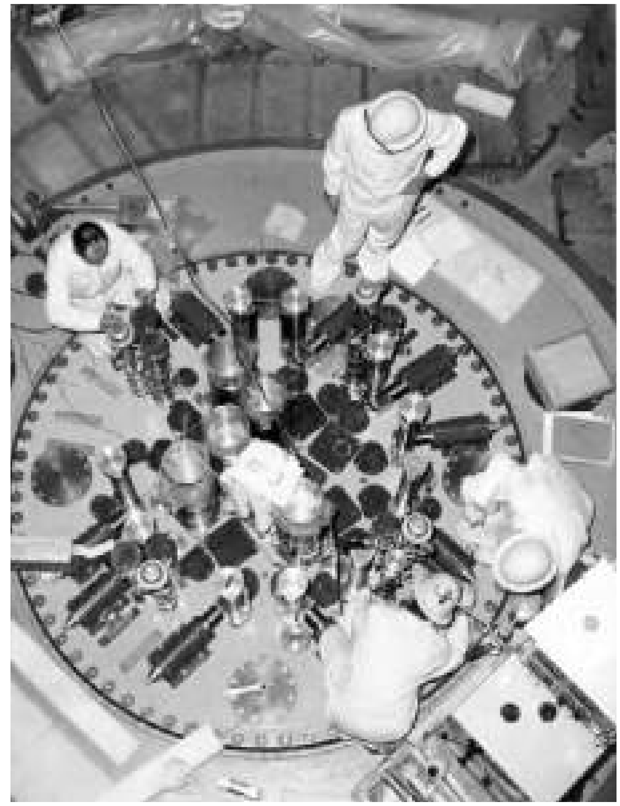
The ESSOR reactor under construction, 1965.



Technicians working on the ESSOR reactor, 1960s.



Vertical section of the reactor block, 1969.



Preparation of a reactor experiment, 1960s.

used to test the behaviour of reactor components in the event of water coolant loss.
The project would have been very costly to implement and might have jeopardised plans for some of the JRC's rapidly developing non-nuclear initiatives, but, above all, it would have entailed operational safety risks due to its very nature. After the green light was initially given to develop detailed plans, the project was independently reviewed by a team of international scientists, who in May 1982 gave a positive assessment, enabling Super-SARA to proceed. However, for a variety of reasons, including escalating costs, the project was halted by the Council of the European Communities in March 1983.

Drums for decommissioning inside the reactor, 2019.

At that point, the ESSOR reactor was permanently shut down and maintained in a safe condition.
In 1999, a decommissioning and waste management programme was launched to progressively eliminate the nuclear legacy at all JRC sites.
This process included the decommissioning of the ESSOR reactor in Ispra, with the aim of restoring its location on the site to its original greenfield condition. The process of decommissioning ESSOR, which is ongoing, is an industrial project that has been carefully planned and is meticulously overseen, with the secondary objective of identifying best practices to be applied in the future decommissioning of commercial power reactors.

The European Centre for Scientific Information Processing (CETIS)

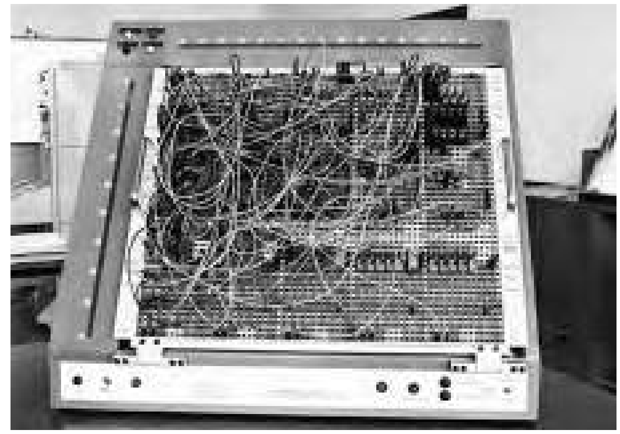
The importance of computer modelling in the design of nuclear reactors was already evident by the late 1950s, and the JRC in Ispra invested significantly in both computing facilities and IT expertise from its inception. Following the invention of the transistor at Bell Labs in 1947, the dream of commercially available general-purpose digital computers became a real possibility.

At the beginning of the 1960s, the JRC decided to purchase an IBM 7090 computer, which used transistors instead of the vacuum tubes of the IBM 700 series. It could execute 100 000 instructions per second and was designed for scientific and engineering applications. It was used in the United States for military applications and by the US National Aeronautics and Space Administration (NASA) to calculate space flight trajectories.

The JRC became one of the very first centres in Europe to have computing capabilities at this level. Even before 1963, three PACE analogue computers, designed to model physical processes, were in use as tools to support nuclear research.

In 1965, the IBM 7090 digital computer arrived, and a new purpose-built computing centre was established, the European Centre for Scientific Information Processing (*Centre Européen de Traitement de l'Information Scientifique* - CETIS). The first step was the transfer of modelling programs from the analogue machines to the IBM computer.

This transfer process was a research project in its own right, and the team in Ispra played a leading role in developing methods that were used in numerous centres in Europe, the United States and Australia.



Installing the IBM PACE computer.

Initially, CETIS was responsible for developing computer models for various types of nuclear reactors, not only for the JRC but more broadly across Europe. A first step was the establishment, by the then European Nuclear Energy Agency (ENEA), created by the Organisation for European Economic Cooperation (OEEC) [1], of its own library of computer programs in Ispra. This library of nuclear codes was supported by a group of experts capable of assisting end users across Europe in installing and using the codes on their own computers.

[1] Forerunners, respectively, of the Nuclear Energy Agency (NEA) and the Organisation for Economic Cooperation and Development (OECD).

Delivery of the IBM 7090 computer.

By 1970, CETIS had expanded its focus beyond the modelling of nuclear reactors, developing methods and techniques for scientific and numerical computing for general scientific and applied mathematical applications, and participating in international projects on the evaluation of numerical algorithms. Codes and expertise in the use of computers for statistics and fluid dynamics were developed and made widely available to government and industrial clients across Europe.

The arrival of two additional computers, an IBM 360/65 and an IBM 360/30, at the end of the 1960s opened up the possibility of exploring non-scientific applications. Among these were machine translation, particularly from Russian into English, and computer-assisted translation. These computers were also used in the administrative and accounting departments of the JRC in Brussels and Ispra for inventory and for managing warehouses, contracts and staff payrolls, as well as the extensive library of scientific publications and books.

Security of the Citizen. The CETIS team also developed new methods for networking between computers. As early as 1970, connections were in place to allow remote terminals distributed across the Ispra site to link to the computers in the CETIS building. The next phase was to connect computers across the different JRC sites, after which networks were created between research centres located across Europe as part of the European Cooperation in Science and Technology (COST) programme. These early networks, based on “packet switching”, paved the way for the development of internet protocols, which enabled CERN (the European Organization for Nuclear Research) to create the World Wide Web.

CETIS was closed in the late 1990s, when technological developments made it more efficient

Programmers at work in CETIS, 1960s.

A programmer checks a magnetic tape.

The CETIS team developed software specifically designed for these applications, which was utilised at the JRC long before the near-universal application of computers for such uses in the government and corporate sectors in the 1990s and beyond.

The work of CETIS on nuclear reactors was later applied to industrial systems in general, supporting the assessment of the safety of the engineering infrastructures on which electricity networks, telecommunications networks and transport systems depend. CETIS’s collaboration with other teams of mathematicians and engineers at the Ispra site led, in 1988, to the formation of the Institute for Systems Engineering and Informatics, which in turn was the forerunner of the Institute for the Protection and

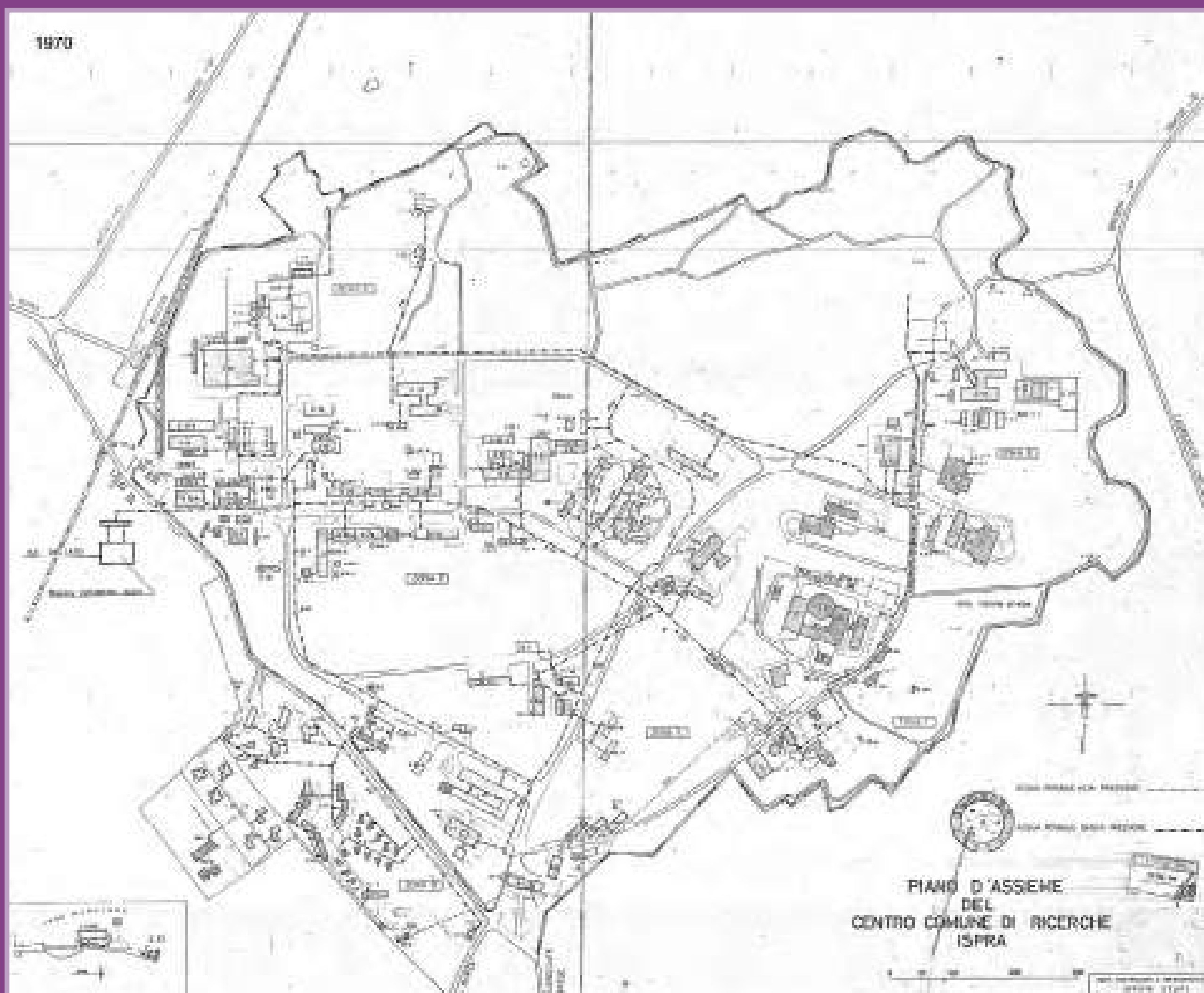
for the various research teams to have their own computing facilities and for administrative services to rely on the IT infrastructure and services of the Commission, managed from Brussels.

Nevertheless, CETIS’s work was fundamental to the development of the JRC, whose current expertise in cybersecurity, artificial intelligence and algorithmic reliability are the true legacy of the experience gained from that first computing centre.

Furthermore, the expertise in scientific data processing and management created by CETIS gave rise to the JRC’s flagship activities in satellite remote sensing and its use for global environmental and security monitoring, which underpin today’s Copernicus programme.

Chapter III

Beyond nuclear: clean energy, safety, and environment (1971-1987)



Site map, 1970.

Chapter III

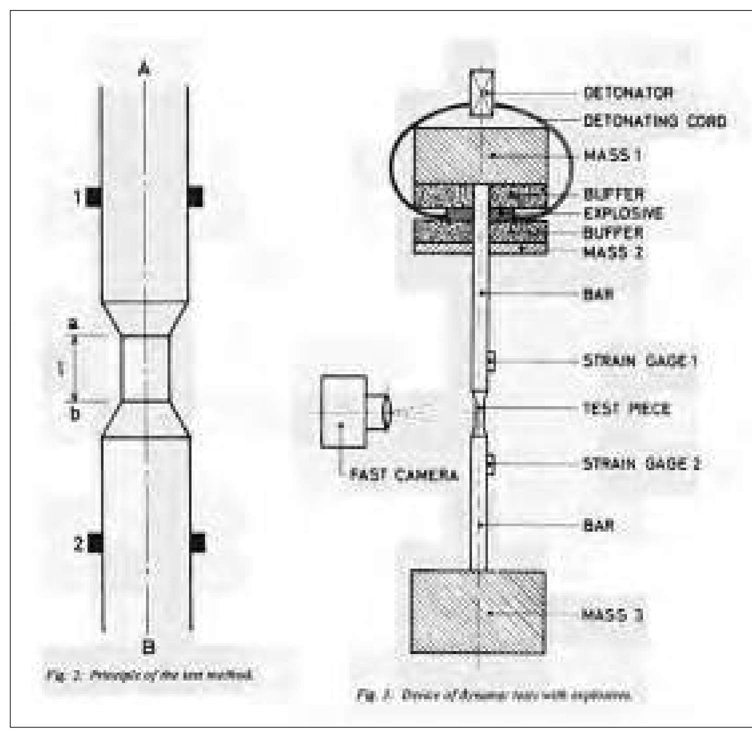
Beyond nuclear: clean energy, safety, and environment (1971-1987)

In line with the general guidelines issued by the Commission, proposals for the future research programme of the JRC were prepared by Director-General Caprioglio and the scientific committee, in collaboration with the general advisory committee, and were presented to the Commission in September 1971 and to the Council that October.

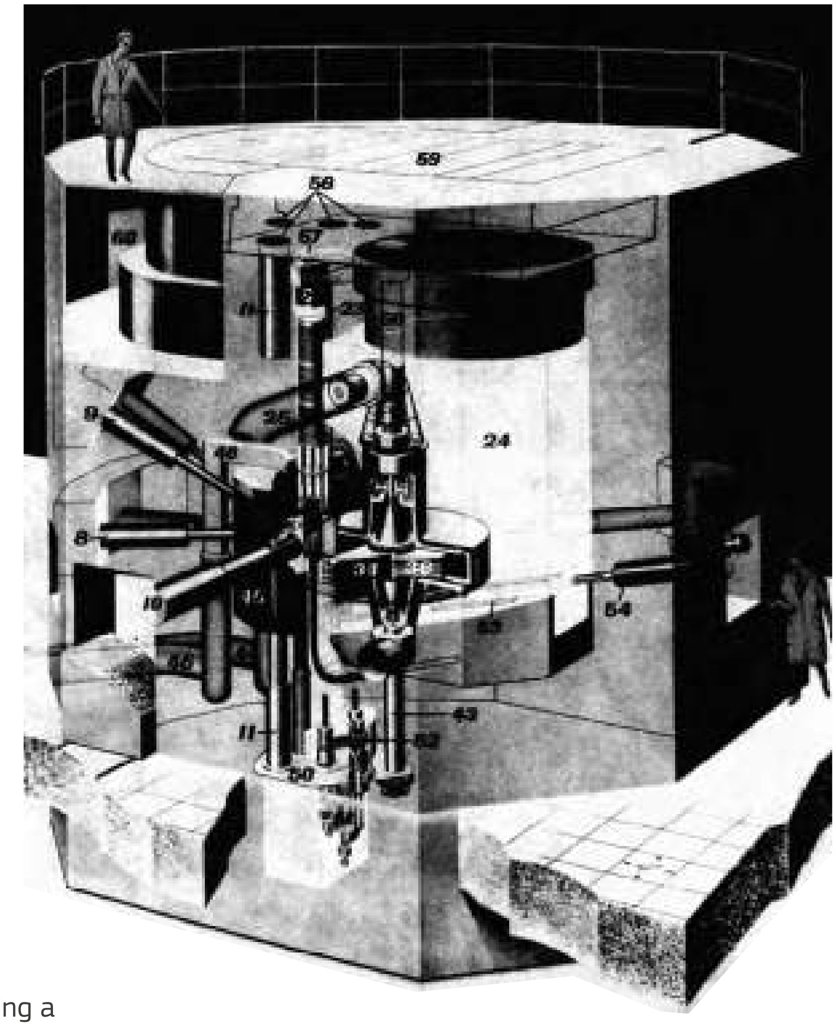
The new programme was to span three years, marking a departure from Euratom's previous five-year planning cycle. The plan for those three years included the termination of the ORGEL programme, with a significant reduction in investment in the development of heavy-water reactors. Consequently, an increase in European public service activities was planned, alongside a diversification of activities into non-nuclear sectors. These sectors were clustered into themes that would shape the subsequent history of the JRC and the Ispra centre. Among these, environmental protection and the production of reference samples and materials stood out.

In the nuclear field, studies on reactor safety were continued, gaining comparatively greater importance than in the past.

These studies covered areas such as depressurisation and cooling incidents, thermal interaction, destructive accidents and the dynamic properties of associated materials, the control of critical structural failures (e.g. in pipes), the reliability of components and mechanical



System for measuring the deformability of a tubular structure under sudden load.



Representation of the SORA reactor.

systems, defect detection using ultrasonic emissions, the development and application of dynamic codes, out-of-pile criticality and the development of liquid control rods.
Similarly, research and development activities in the control of fissile materials were continued, focusing on system analysis, non-destructive and destructive control methods, and identification and sealing techniques. These efforts led to new methods and equipment, which were used in the practical application of nuclear material control, thus providing technical support for the safeguards required by the Euratom treaties and non-proliferation agreements.
The SORA fast pulse reactor project was initially retained. In 1971, following a budgetary decision by the Council, the project was reviewed, and specifications were drawn up to enable industry consortia to submit bids to construct the reactor. During the year, a consortium was awarded the contract and awaited the final decision regarding the commencement of construction.
However, after numerous meetings of the general advisory committee, which continued into the following year, it was ultimately decided to abandon the construction of SORA due to the extremely high costs indicated in the bid submitted by the consortium that had won the contract. As a result, the JRC's programme of work on pulse reactors underwent a thorough revision. In research related but not limited to nuclear power, staff at Ispra explored direct energy conversion through thermionic processes, yielding promising results for other sectors as well, particularly with the development of heat transfer pipes.
A five-year planning cycle was retained for one particular programme, involving the JRC as a central hub in the emerging European teleinformatics network. In fact, although the overall duration of research programming had been reduced, decision-making about the main research lines was guided by a long-term approach, part of a broader strategy for developing and strengthening the Communities.
CETIS continued to manage aspects related to various JRC programmes, as well as those of foreign institutions and industrial companies, and

it worked on software development and numerical analysis. The program library of the Italian National Agency for Atomic Energy (*Ente Nazionale Energia Atomica* – ENEA) tested its new programs on CETIS computers.
Furthermore, in the spirit of international détente between blocs, CETIS developed a system for automatic translation from Russian to English, which was made available to the Communities.
A new area of work for the JRC reflected the emergence of an international political issue with profound technical and scientific implications. A 1968 resolution of the United Nations General Assembly had called for a conference on the human environment to be held within five years. This conference took place in Stockholm in June 1972, approving a declaration of principles. Although not legally binding, the declaration was intended to serve as a reference point for multilateral agreements on environmental matters. That same year, a study commissioned by the Club of Rome – a non-governmental association of scientists, economists and figures from politics and business – and carried out by the Massachusetts Institute of Technology was published. Entitled *The Limits to Growth*, the study report definitively articulated the finite nature of natural resources and heralded a new phase in the perception of the relationship between humanity and the environment. It became clear that economic growth could no longer be assumed to rely on an abundance of resources, nor could growth be pursued without considering the preservation of the environment and the health of human beings.
Research on human and environmental safety was therefore further encouraged by the Commission, which examined the possibility of applying the principles of the standards it had developed on ionising radiation, thanks to the JRC's research, to other, similar risks such as laser rays, masers and microwaves.
Once again, the JRC was assigned a decisive role in setting thresholds.
In the same year, a significant part of the JRC's activities was dedicated to exploratory studies on non-radioactive risks threatening the environment, risks that remain relevant today. Within the framework of a Community action programme for environmental protection, the Commission proposed the development of a common methodology to objectively assess the risks pollutants pose to health and the environment. This methodology would lead to common reference terms for drafting health and ecological standards to be applied across all Member States.
The Council and Commission bodies thus established a common terminology for the various concepts and notions to be used in the methodological study, with priority given to lead, sulfur dioxide, carbon monoxide, nitrogen oxides and pesticides.
This new frontier of Community research grew out of the positive experience of activities in the field of radioprotection, which had been one of the major testing grounds for the political transformation of the JRC into the Commission's in-house research entity.
Indeed, the Community's multiannual research programme on *'biology-health protection'* was based on the results of activities undertaken by the JRC regarding radioprotection issues, such as environmental and food chain contamination, radiotoxicology, food irradiation, personal and workplace dosimetry and epidemiological studies on certain exposed population groups.
The Commission not only directed the research programme towards further objectives stemming from the JRC's research but also incorporated the results into the Community's decision-making process; thus, the JRC provided the essential and recognised scientific basis for fundamental and derived Community radioprotection standards. In this new scenario, Ispra consolidated its position as the pivotal site of the JRC.
The gradual assumption by the JRC of a new role within the European Community's organisation

was not without challenges. While it represented a positive way out of the 1968 crisis, the path forward was still unclear. Among the staff at Ispra, there remained a sense of uncertainty about the Centre's overall future, and the funding of programmes faced constant delays due to political dynamics within the Community.

Within the scope of environmental protection research, the Ispra Centre had begun studying topics such as analysis and monitoring (work on multi-detection systems for organic micropollutants, remote sensing and measurement of pollutants), the migration and effects of pollutants (studies on lead behaviour in the air and water pollution bioindicators) and system models and analysis (a study on eutrophication of an Alpine lake, the development of a new atmospheric pollution model and research into the relationship between energy production and environmental pollution).

Preparatory work was carried out for the creation of a database on industrial chemicals released into the environment.

In the area of reference samples and substances, a user guide for reference substances was drafted, and, with the support of national experts, priority objectives were established for a dedicated programme of work in this field at the European level.

Ispra's laboratories provided technical assistance to the Commission services, actively participated in the certification of reference substances with specific composition and carried out preparatory work for the certification of reference substances for physical and technological properties determination. This set of activities, as reported on by the Commission in 1973, marked a refocusing of JRC's objectives on public service.

Despite these achievements, the JRC as a whole, and especially Ispra, experienced a further reduction in staff.

This reduction was accompanied by the replacement of some officials from the six original Member States with personnel from the new Member States, which formally joined in 1973. On 4 June 1972, the Council of Ministers decided on the definitive cessation of functions for the staff affected by the reduction, a process that was replicated in measures applied from that year onwards to all Commission services.

The accession of Denmark, Ireland and the United Kingdom constituted the first enlargement of the European Community, which saw all Community bodies undertake the necessary procedures to accommodate a change that had until then been only theoretical. This experience would prove valuable in the years to come, as other candidates for Community membership emerged.

In October 1973, one of the tragic chapters of the Arab–Israeli war unfolded, with effects on oil prices and raw material supplies. This made nuclear power production attractive once again, particularly in the promising field of fast breeder reactors, which were plutonigenic, which is to say they produced the plutonium that would fuel them, reducing the need for uranium and, importantly, its enrichment.

Most European countries lacked sufficient uranium resources, at least within their home territories, and at best held them in former colonial possessions, which had begun their long journey towards independence in the previous decade. Uranium enrichment, necessary for its use in reactors, kept Europe dependent on the vast US enrichment complex.

The plutonium route promised a solution to both problems but was pursued through arrangements undertaken outside Euratom and without the leadership of the Community.

The transatlantic link that had enabled the birth of the European nuclear industry was perhaps fraying; it was certainly weaker than it had been at the time of the JRC's founding.

The suspension of the US dollar's convertibility into gold, decided on by Nixon in 1974, marked a new phase in the United States' role in the international system, beyond its obvious

Map of the European Community in 1973
(Administrative boundaries: © EuroGeographics
© OpenStreetMap).

economic implications. This pushed the French nuclear complex, in particular, to develop fast breeder reactors as the only response to dependence on the United States.
What tasks fell to the JRC in this context? Having abandoned the SORA project, the nuclear sector at Ispra turned to research on aspects that could be addressed given the objective conditions the JRC faced and would likely continue to face, namely activities supporting the development of plutonigenic reactors. Thus, a new programme was launched in the field of radioactive waste disposal, involving experimental and theoretical activities on separating highly radioactive waste from spent fuel fission products.

Part of the programme focused on studying the fuel cycle to examine the possibility of actinide splitting through neutron bombardment in nuclear reactors.
However, the primary focus was on developing a self-burial method for the final disposal of nuclear waste – the first step in a line of experimentation in a field destined to become increasingly significant for nuclear technology.
With the aim of launching a new training programme, an analysis of the experience and expertise of the scientific and technical staff at Ispra was undertaken, so that their skills could be used in study sessions and short courses, particularly for postgraduates.

Students attending a course at the JRC in Ispra.

Around 10 such courses were proposed in 1974 to European Community organisations. Other activities were initiated to provide direct support to the Commission services in Brussels, concerning advanced components for computing, nuclear naval propulsion and studies related to the energy programme (on energy needs and power plant locations).

The year 1973 would be remembered at Ispra for two new lines of activity. The first was the start of research on remote sensing of terrestrial resources, aimed at establishing experimental methods, developing calculation methodologies and collecting an initial set of ground data.

This was evidently a strategic area, and the new research put Ispra in competition with the most advanced research institutes.

On this new frontier, the AGRESTE project (on the topic 'agricultural resources investigations in northern Italy and southern France') was launched in collaboration with the Directorate-General for Agriculture, the Directorate-General for Development Aid and various national research institutes.

Its objective was to gather information on agricultural and forestry resources in pilot areas in northern Italy and southern France through aerial and satellite surveys.

The second new area of activity was research on solar energy, in an exploratory programme investigating thermal and photochemical conversion. Working diligently and discreetly, Ispra anticipated the fundamental steps in the sector's development, with solutions demonstrating the efficiency and feasibility of solar energy systems, including the photovoltaic technology we know today. In 1974, the JRC underwent further reorganisation with the appointment of Stelio Villani as the new Director-General and the transfer of the Director-General's office from Ispra to Brussels.

The Director-General was supported by a Deputy Director-General, Jean-Albert Dinkespiler, who also acted as the director of Ispra. The Ispra directorate was divided into six areas, each managed by an area director who assisted the Deputy Director-General in project management and the administration of scientific activities.

Jean-Albert Dinkespiler, 1983.

Map of the Agreste project test sites.
(Source: *AGRESTE project - NASA Technical Reports Server (NTRS)* - https://ntrs.nasa.gov/citations/19780023554).

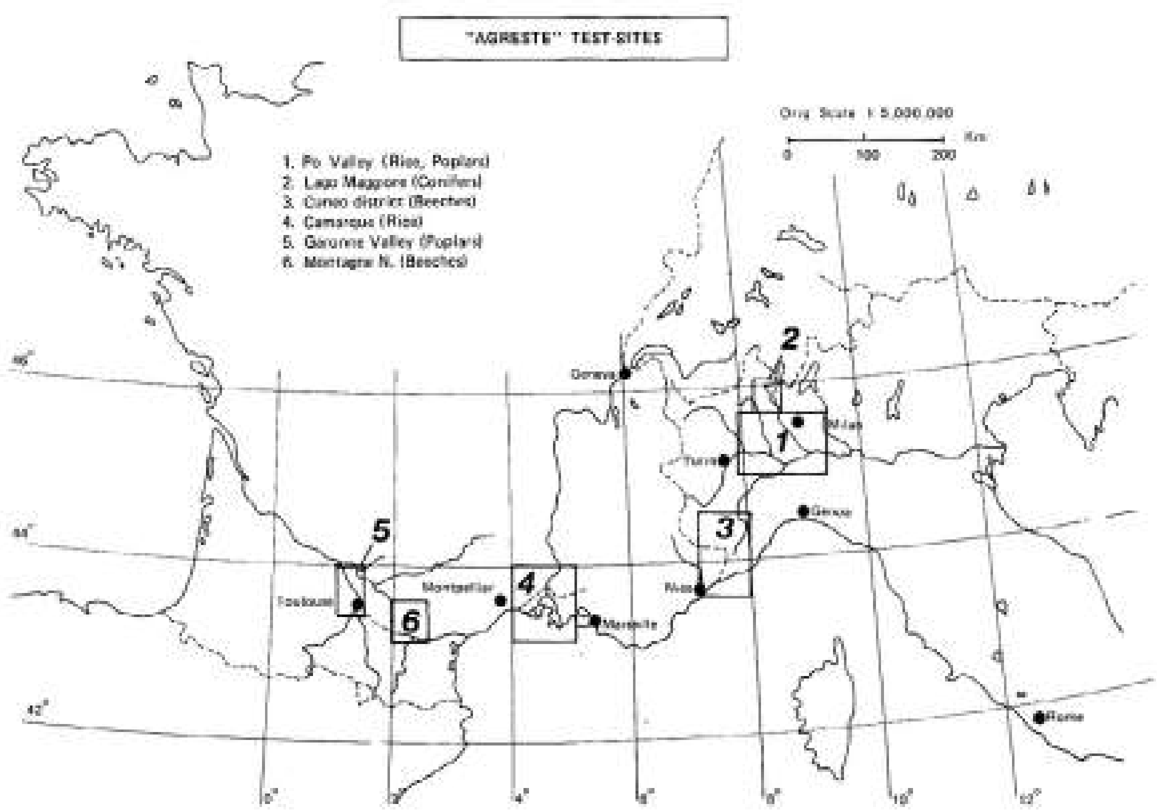


Fig. 1 - Geographic location of the European test sites in Southern France and Northern Italy

JRC employees working in Ispra were included in new training programmes on economics and management intended primarily for Commission staff in Brussels and Luxembourg, and Ispra was also included in information initiatives such as the *Corriere del Personale*, a daily news bulletin for Commission staff, and *Informaphone*, an internal telephone system that provided concise daily news updates in multiple languages on the activities of the European institutions.

In 1974, the Environmental Chemicals Data and Information Network (ECDIN), a further advance in environmental protection research, entered its demonstration phase.
Even on a pilot scale, it represented a unique system providing data on toxic chemicals and their properties. Its usefulness was first demonstrated during the Seveso disaster in 1976, caused by a dioxin leak from the *Industrie Chimiche Meda Società Azionaria* (ICMESA) plant

in the neighbouring municipality of Meda. That same year, significant progress was made in research on remote sensing of terrestrial resources. Ispra gained access to data from NASA's Landsat 2 satellite, enabling the timely provision of precise information on terrestrial resources and giving a considerable boost to research in this field.

In 1975, European détente reached a pivotal moment with the conclusion of the Conference on Security and Cooperation in Europe, first convened two years earlier, and the signing of the Helsinki Accords by the superpowers and all Community Member States. The accords addressed issues that had divided eastern and western Europe: the Soviet Union gained recognition of the inviolability of national borders but accepted the inclusion of points on human rights in the same text.

This marked the peak of détente during the Cold War, after which the quality of East–West relations began to decline.

In the realm of European research, however, the challenges were of a different nature, concerning available resources and the fundamental mission. After months of delay, the Council finally adopted the JRC's three-year programme in July 1977, specifying its activities until 1980 and outlining 10 essential objectives: reactor safety; plutonium fuels, actinide research and nuclear safety; the management of nuclear materials and radioactive waste; solar energy; hydrogen and future energy sources; conceptual studies on nuclear fusion; high-temperature materials; environment and natural resources; measurements, standards and reference techniques; and service and support activities.

The JRC's four sites divided responsibility for the 10 specific programmes according to their respective specialisations.

Karlsruhe focused on plutonium fuels, actinide research and nuclear safety; Petten worked on high-temperature materials; Geel concentrated on measurements, standards and reference techniques; and Ispra played a predominant role in the remaining objectives, making it the JRC's only multipurpose site.

Furthermore, Ispra was considered by the Council as a potential site for the installation of the Joint European Torus (JET), a cornerstone of Community nuclear fusion research. However, after lengthy negotiations, Culham in the United Kingdom was chosen instead. The Ispra centre therefore had to redirect its focus towards a role similar to that in fusion research to that which it played in fission research.

Commissioner Guido Brunner lays the first stone of the JET laboratory, Culham, 1979.
(Source: *Eurofusion JET history page* - https://eurofusion.org/devices/jet/jet-history. Credit: UKAEA).

Both these decisions aligned with the guidelines on a common policy in science and technology developed by the Commission, which centred on four priority areas: securing the supply of resources (energy, raw materials, agricultural products, water); environmental protection; enhancing the global competitiveness of European industry; and improving living and working conditions.

To determine specific actions and programmes to be considered, while avoiding duplication between Community and Member State activities, the Community relied on criteria that acted as a kind of dual selection filter: Community interest and the satisfaction of citizens' needs. In coordinating research activities conducted at the national level, the Commission was to be assisted by the Committee on Scientific and Technical Research (*Comité de la Recherche Scientifique et Technique* – CREST), established specifically for this purpose.

Within this framework, the JRC was recognised as a key instrument for implementing the common scientific and technological policy, thanks to the breadth of its resources and the fundamental importance of its functions.

These included acting as a catalyst for Community-interest actions; providing scientific and technological assistance to both Member States and Commission services; conducting tests in large, centralised facilities on materials developed in Member States; offering Community public services; and contributing to scientific and technological cooperation between the Community and developing countries. A new element had also been introduced into the Community's structure with the first universal suffrage elections to the European Parliament in 1979, which firmly established the Parliament as a third institutional entity with which the JRC would interact.

Regarding the human resources needed to implement the programme's objectives, the new research staff statute became operational in October 1976.

Italian poster for the 1979 European elections.
(Source: *[European Parliament - 40 years of european elections exhibition](https://www.europarl.europa.eu/thinktank/en/events/details/40-years-of-european-elections-exhibitio/20190208EOT03681)* – https://www.europarl.europa.eu/thinktank/en/events/details/40-years-of-european-elections-exhibitio/20190208EOT03681).

Despite the recognition of the JRC's value, a slight reduction in staff was decided on, from 2 340 to 2 260 by the end of 1980. Nevertheless, the JRC played a significant role in its capacity as the Commission's technical assistance body in the International Evaluation of the Nuclear Fuel Cycle (INFCE), initiated in October by US President James Earl Carter Jr, known as Jimmy. The Commission participated alongside 40 state delegations and 3 international organisations. The technical analysis, which continued until early 1980, aimed to minimise the risks of nuclear weapons proliferation without compromising energy supply or the development of nuclear energy for peaceful purposes.

Carter's administration had prioritised nuclear cycle control and an agenda to reduce economic dependence on oil, also highlighting the need to increase alternative energy sources in the United States.

As part of the reactor safety programme, the first tests investigating depressurisation (loss of coolant in the reactor) were successfully conducted in the Light Water Reactor Off-normal Behaviour Investigations (LOBI) circuit at Ispra. The required facility was developed in collaboration with what was then Germany's Ministry of Research and Technology, now part of the Ministry of Research and Education. This demonstrated the full coordination between the Commission's direct actions, carried out by the JRC, and indirect actions entrusted by the Commission to entities in Member States and external to the Community's structure.

This synergy was also evident in the objectives related to solar energy and hydrogen research within the multiannual programme.

For instance, the JRC's work led to the first contracts for the European Solar Test Installation (ESTI), which was particularly important for industry, and to the construction and commissioning in Ispra of the first pilot unit for hydrogen production through a thermochemical process – a world-first demonstration of the value of the work carried out.

In March 1979, the European Monetary System came into force, with the participation of all the Member States of the Community except the United Kingdom. It established the margins of fluctuation allowed in currency exchange rates and introduced a common unit of account, the European currency unit.

That same month, in the proposal for a new four-year programme presented by the Commission to the Council, the priority areas identified for the JRC were organised into six chapters: nuclear safety and the fuel cycle; new energy sources; environmental study and protection; nuclear measurements; specific support for the Commission's sectoral activities; and the operation of large facilities. In addition to intensifying the JRC's research on alternative energy sources, particularly solar energy and fusion, the Commission proposed strengthening the Centre's work on reactor safety.

During the December 1979 session, the Council unanimously agreed to maintain the JRC's staff and financial resources unchanged. Ispra also registered patents, published scientific contributions and hosted meetings of the advisory committees managing JRC programme coordination and national research activities. Several educational courses, known as *'the Ispra courses'*, were also organised, with growing participation from research personnel from all Member States.

It is worth noting the results achieved in the fields of solar energy, health and environmental protection, and informatics.

A particular aspect of the JRC's solar energy programme was the construction of centralised testing and research facilities to evaluate solar components and systems. In 1979, a solar simulator with a large experimental surface and an ageing test chamber were developed and installed in Ispra.

In the field of pollution analysis, research results on the metabolism of heavy metals in laboratory animals demonstrated the general dangers of fossil-fuel-powered plants, a significant finding that would influence future policies up to the present day.

In the field of remote sensing, for the first time, it became possible to determine atmospheric pollution in coastal waters based on chlorophyll measurements, through the European Association of Scientists in Environmental Pollution (EURASEP) project.

Alongside this, a project (TELLUS), launched in collaboration with NASA, organised a measurement campaign near Hanover to explore the use of satellite data for determining soil moisture levels.

In the field of informatics, the activities of the European Informatics Network were about to take concrete shape with the establishment at Ispra of the reference and testing centre for high-level Euronet protocols, a significant milestone in the history of the Community's digitalisation.

In March 1980, the new 1980-1983 multiannual programme, endowed with 511 million European Currency Units (ECUs) for the JRC, was adopted by the Council, marking an important milestone in Community scientific research.

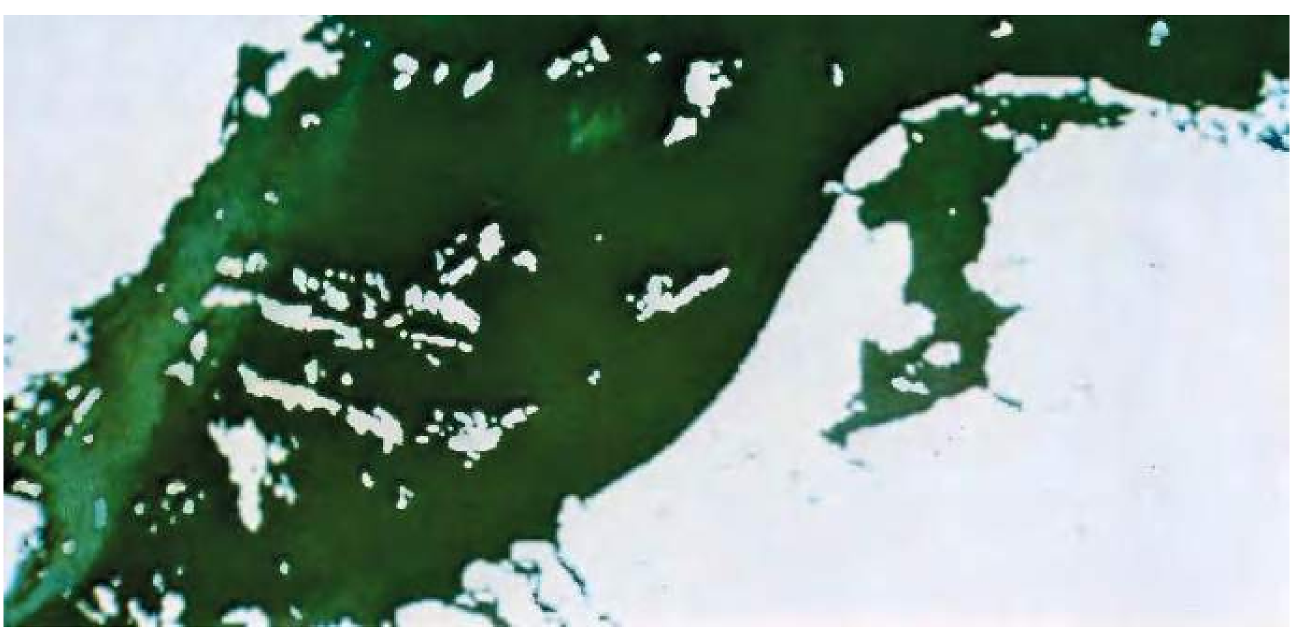
Combining indirect action and concerted action programmes, the new programme highlighted the fundamental importance of a common research policy initiated by the Commission for Europe's future, particularly in the energy sector. As in the Commission's proposal the previous year, the key areas remained nuclear safety, new energy sources and the environment.

Reactor safety took centre stage, absorbing approximately half of the scientific and financial resources. A significant project focused on an in-pile reactor safety experiment, building on the Advanced Water Reactor Experimentation (*Sperimentazione Avanzata Reattori ad Acqua* – SARA) project conducted between 1975 and 1978 as part of a programme sponsored by the Italian government.

By the late 1970s, this had evolved into a Community programme called Super-SARA, an in-pile experiment on the behaviour of fuel in light-water reactors in the event of coolant loss, using the ESSOR reactor. The project was expected to make a significant contribution to international research in this field.

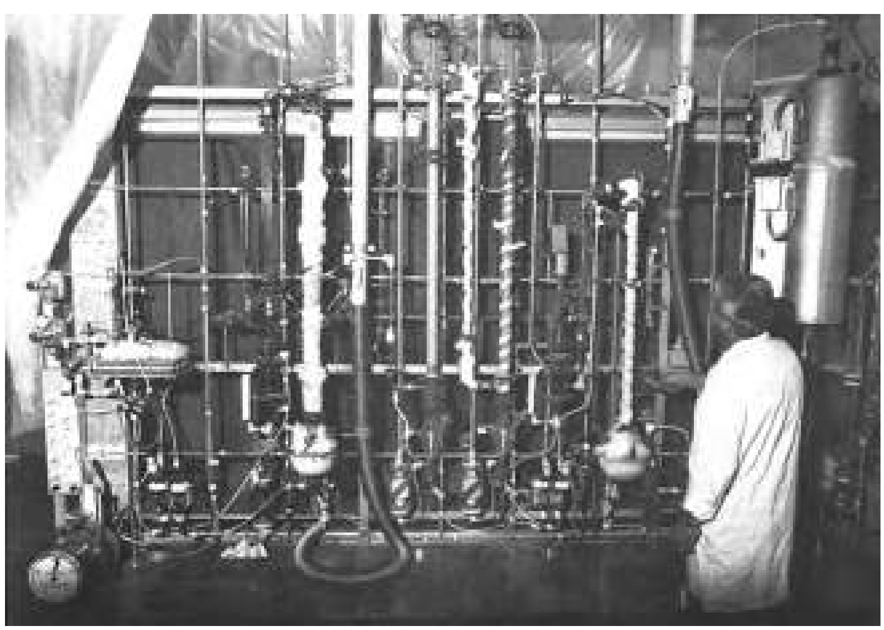
The resources allocated to research on solar energy had doubled, building on the results achieved, and the work included technical assistance to developing countries.

The English Channel between the United Kingdom and the Netherlands (EURASEP project). The light-green area in front of the British coast indicates a high concentration of chlorophyll.



Equipment for
the Super-SARA
experiment.

Laboratory-scale plant
for thermochemical
hydrogen production.

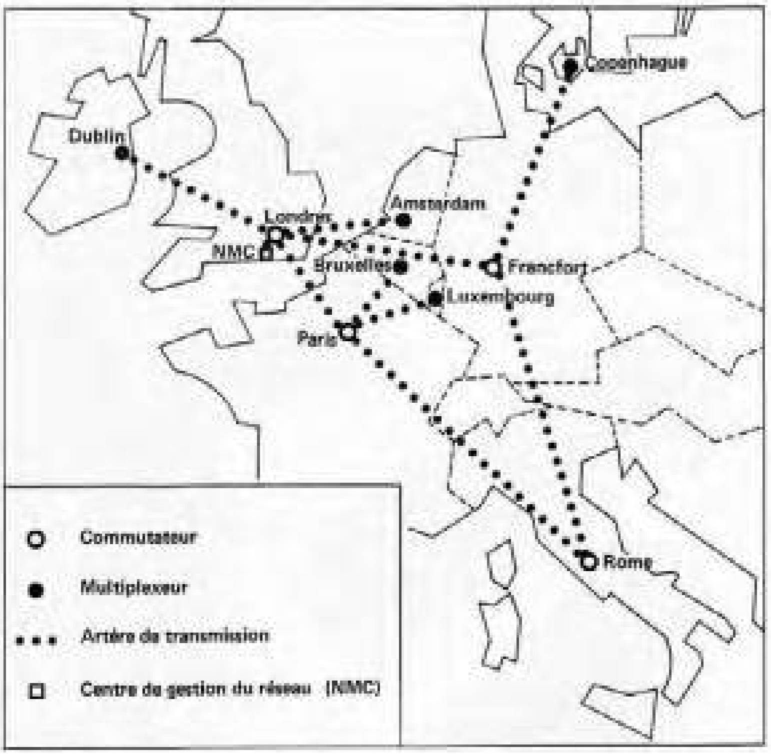


At Ispra, two experimental ageing chambers for solar energy devices and two new facilities for studying underground seasonal heat storage, both in water and soil, were established.
Work on the development of satellite remote sensing continued, while hydrogen research included a study on energy storage and transport. In this latter context, Ispra was coordinating work on thermochemical processes as part of the International Energy Agency (IEA) research and development programme.
Significant progress was made on catalysts, reaction kinetics and construction materials. Within the framework of cooperation with IEA, the JRC coordinated a series of reports aimed at assessing future hydrogen markets.
In the area of reactor safety and the fuel cycle, out-of-pile depressurisation system simulations continued under the LOBI programme, and a testing programme was planned to simulate large or small breaks in the primary circuit of a light water reactor (LWR) using the aforementioned Super-SARA in-pile facility, following the unanimous recommendation of a working group of nuclear safety experts.
The JRC's contribution to safety studies on liquid-metal-cooled fast breeder reactors (LMFBRs) focused on rare but potentially severe anomalous events that could compromise plant integrity.
The 1979 Three Mile Island incident in the United States, the first major nuclear accident caused by coolant loss from a reactor's cooling circuit, underscored the importance of Ispra's activities in this field and the international relevance of Super-SARA.
During these years, nuclear issues resurfaced prominently in public fears with the so-called Euromissile crisis, which ended the period of détente in the Cold War and reopened a phase of intense confrontation between the blocs.
This crisis was triggered by the modernisation of Soviet warheads, which led the governments of the United States and the European NATO countries into lengthy discussions about the significance of and response to this development, with the involvement, particularly in Europe, of civil society.
In December 1979, the deployment of new missiles on European soil was decided upon, and the following years saw the unfolding of the lengthy process of deploying these new weapons. The new US President, Ronald Reagan, who took office in 1981, adopted a confrontational stance in the renewed rivalry between the blocs, while, in the Soviet Union, Leonid Brezhnev, the General Secretary of the Communist Party, was suffering from the illness that led to his death in 1982.
The JRC's activities in the thermonuclear sector were integrated into the broader Community programme on fusion.
Ispra served as a reference centre for the preliminary design phase of the Next European Torus (NET), the successor to JET. Ispra contributed to designing the integration system for the base machine and to solving the issue of the non-breeding blanket using aluminium alloys. Research focused on manganese steel as a potential structural material and on the use of titanium carbide coatings for the machine's inner wall. A cyclotron was built for experiments simulating radiation damage with light ions.
The JRC's work in the environmental research and protection sector was primarily aimed at providing scientific support to Community policy in this field, and it achieved outstanding results. In close collaboration with the indirect environmental research programme, the Ispra and Petten sites worked on the identification and characterisation of toxic and potentially carcinogenic chemical substances and on the compilation of an inventory of hazardous chemicals. As part of this initiative, a large-scale practical experiment definitively demonstrated the absorption by the human body of lead contained in petrol additives.
In the field of informatics, the Ispra site contributed to the development of the Euronet-Diane (Direct Information Access Network for

Europe) network, particularly by making some of its databases available.
A new teleconferencing system was tested, and there was general progress in programming techniques and languages.
In 1981, as part of the restructuring of certain services, the Commission decided to merge, from September, the various services responsible for implementing research programmes into a single Directorate-General, in particular combining the JRC and the Directorate-General for Scientific Affairs, Research and Development.
Regarding the content of the research policy that this reorganisation was aimed to achieve, the Commission presented several new programme proposals in the fields of thermonuclear fusion, raw materials, agriculture and tropical medicine, and medicine and public health.
The Council approved new multiannual programmes in the fields of environmental research, scientific and technical training and molecular biology.
The research results being produced at Ispra were more than encouraging. In the field of remote sensing, pilot experiments demonstrated the feasibility of applying aerospace observation techniques to land use, crop forecasting and combating marine pollution.
This made it possible to calculate, via satellite (Landsat), the areas of rice fields in specific countries, for example Mali, and to produce detailed thematic maps of crops.

Construction of the cyclotron building, 1980.

Aerial view of the plant in operation, the 1990s.

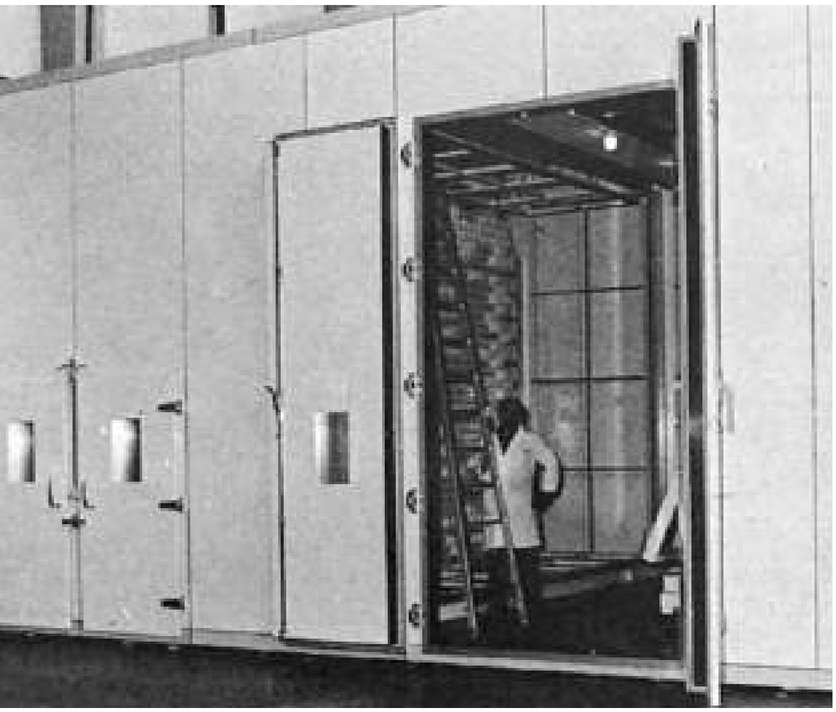


Euronet network configuration, 1980s.
(Source: Technical Division of the Post and Telecommunications Administration of the Grand Duchy of Luxembourg, *EuroNet-Diane: Réseau d'accès direct à l'information pour l'Europe*).

In the field of solar energy, the Eurelios solar power plant was connected to the electricity grid in 1981, new pilot projects for electricity production through photovoltaic conversion were launched, the *European Solar Radiation Atlas* was published, experimental facilities for testing solar heating systems were put into operation in Member States and solar technologies were studied to meet the needs of developing countries. Solar energy research was complemented by studies on geothermal energy as part of the alternative energy research policy. Processes and equipment operating at very low temperatures were developed to enable the economic exploitation of geothermal fluids, and methods for recovering heat from hot dry rocks were tested.

Following the positive example of remote sensing, the *Atlas of Subsurface Temperatures in the European Community* was published.
In the field of hydrogen production through electrolysis, prototypes of advanced electrolyser series were built.
Finally, thanks also to the assistance of the JRC, Community action moved from an initial phase of research and evaluation of energy-saving techniques in different consumption sectors to the first practical applications of these measures.
In 1983, the 1984-1987 multiannual research programme, the first after the 1981 restructuring and the merger of the JRC with the Directorate-General for Scientific Affairs, Research and Development, was discussed.
In the field of solar energy, experimentation continued successfully within the Community and at the JRC: 16 photovoltaic pilot projects were undertaken in 8 Member States, partially funded by Community resources, while Europe's most important testing facility, the European Solar Test Installation (ESTI) in Ispra, became fully operational. It consisted of 4 solar simulators, 10 devices for measuring durability and performance, an outdoor testing facility and a data acquisition system.
The Commission also requested that the Council ensure the continuation of the Super-SARA project, considered of primary importance in nuclear safety research. However, despite a review of costs as the work progressed, a lack of agreement in the Council on the expenditure required meant that the project had to be abandoned in March 1983.
Meanwhile, new developments in European integration were on the horizon, far from Ispra and the JRC, but destined soon to influence their history. In particular, the Council, meeting in Milan in June 1985, highlighted the need to reform the functioning of the Community to establish an internal free market and address political integration, laying the groundwork for the Single European Act, a treaty signed in

ESTI laboratory: the solar simulator under construction.



Single European Act, 1986.

February 1986 and entering into force in July 1987. The framework programme for research and technological development for 1987-1991 was discussed in 1986, after the signing of the act, and its content was influenced by the changes brought about by the treaty.

The central theme was building a true European Community of research and technology and accelerating its realisation: the *'Europe of researchers'*, a term destined to be used long into the future, was born that year.

The Commission increased initiatives for cooperation and scientific and technical exchange in Europe for 1985-1988, involving approximately 12 000 research groups.

At the same time, discussions on the role of the JRC after the Single European Act opened up new prospects for the institution; the aims were to improve its functioning and, above all, to strengthen its ties with other research centres in Member States and in industry.

The debate on the major orientations of the 1987-1991 framework programme intensified in March 1986, starting from a shared recognition of the need for a more in-depth review of the JRC's future and its role in a technological society. The Commission established a group of highly qualified experts tasked with studying the JRC's future responsibilities in industrial research, and they submitted their report in November. Based on this, the Council initiated discussions in December on the future of the Community's entire research arm.

The atmosphere was highly charged; suffice it to say that, following the experts' report, the Commission submitted a proposal to the Council to revise the JRC's 1984-1987 programme for its final year (1987), by, among other things, reducing activities across the entire energy research sector (nuclear fission, new and renewable energies) and strengthening actions in the field of pre-competitive and pre-normative research (e.g. in materials science). The Council made no decisions on this, leaving the issue of

Computer display showing environmental radioactivity monitoring data, 1987.

priorities to be addressed in the broader deliberation on the Community's research programme the following year.

In the background, nuclear energy was stirring up public debate – and no longer only owing to its military uses but also as a result of civilian applications. in April 1986, an accident at the Chernobyl reactor in Ukraine, wilfully downplayed by the Soviet authorities, caused the most severe civilian nuclear disaster known to date.

Following the incident, the JRC in Ispra, drawing on its prior experience, was involved in monitoring atmospheric contamination.

In 1987, the second framework programme for research and technological development (covering 1987 to 1991) was adopted and launched. This was the first framework programme following the Single European Act and served as a medium-term planning tool for the Community's actions over the subsequent period. Although adopted only in September, later than anticipated and hoped for, and funded at a level deemed barely acceptable by the Commission, the framework programme was quickly set in motion.

By the end of the year, the Commission had already presented a series of proposals for specific programmes corresponding to 75% of the total funding. The Council initially adopted five of these programmes: coordination of medical research, which included two important areas, namely cancer and Acquired Immune Deficiency Syndrome (AIDS); the research programme in the fisheries sector; the research and development programme on advanced communications technologies in Europe (RACE); the second science and technology for development programme; and a revised research programme on radioprotection, with a series of post-Chernobyl actions.

Alongside the research programme proposals, the Commission prepared a document entitled *New Perspectives for the Joint Research Centre*, which contained several radical proposals for reform of the JRC aimed at aligning it with the evolving Community context and giving it new impetus to secure an uncontested position within the European research and technological development system.

The Commission's premise was that the implementation of the Single European Act, the adoption of the new 1987-1991 framework programme and the renewal of the current JRC multiannual programme for 1984-1987 presented a unique opportunity to reform the JRC itself. The proposal was based in particular on the conclusions of the aforementioned report by

the high-level group of experts, drafted at the Commission's request.
The goal was to carry out a radical reform of the JRC, firmly anchoring it in the Community system and making it an integral part of the European research and development strategy.
This would enable it to maintain its institutional role offering scientific and technical support for the implementation of Community policies while ensuring greater openness to external stakeholders. While the Commission would remain the primary client for the JRC's work – which did not imply that JRC had an exclusive role on Community scientific questions – the JRC was encouraged to seek other clients. With this in mind, the JRC was to make its specialised, neutral and independent scientific expertise available to national bodies and industries in the Member States through research contracts, service provision agreements, collaborative projects, industry consortia and so on.
Preparatory (i.e. exploratory) research would also be further developed, with the aim of maximising the achievements of studies in a constantly evolving scientific and technological world and supporting Europe's technological strategy.
The JRC's funding would depend only partially on the execution of specific research programmes – that is, on the allocations of funding provided for in the framework programme.
The remainder of the JRC's income was expected to come mainly from clients, who could be internal to the Commission, receiving scientific and technical support, or external to it, clients with whom the JRC would enter into contracts, such as Member States, national bodies or private sector organisations.
The Commission proposed that the most immediate and radical changes should be made at the level of the JRC's operation and management. These changes were intended to represent a clear break from the past, as they were aimed at granting the JRC as a whole greater autonomy and management flexibility.
The Commission intended to create a clearer distinction in the future between programme management and resource management.
Given this, the operational scientific units would be granted greater autonomy and full responsibility for carrying out their assigned tasks at all levels: scientific, administrative and financial. To this end, the JRC would be reorganised into nine scientific institutes: one at each of the three sites in Geel, Karlsruhe and Petten, five at the Ispra site (where the original organisation of projects and departments by discipline would be abolished) and the last at a location yet to be determined (see appendix 2).
This internal structural change was to be accompanied by a substantial reform of the advisory structure, particularly by strengthening the powers of the JRC's Board of Governors, abolishing the Scientific Committee at the Directorate-General level, and streamlining specialised advisory structures, which would be limited to one committee for each scientific institute. Things were changing in Europe and the world, as the new General Secretary of the Communist Party of the Soviet Union, the young Mikhail Gorbachev, in power since 1985, was determined to resume dialogue with the Europeans and Americans.
In 1987, he formalised his leadership's vision in a book entitled *Perestroika – New thinking for our country and the world*. Both the intended and unintended effects of Gorbachev's changes soon began to materialise.
At Ispra in that pivotal year, there were undeniable successes in nuclear research within the centre's specific areas of competence.
Regarding the management of radioactive waste, around 100 research contracts were concluded, falling under the third Action Programme for Research (1985-1989).
A technical-scale test facility for alternative methods of radioactive waste treatment, named PETRA (from 'Process Evaluation and Testing for Radwaste management'), was constructed and

Training exercise for Euratom and IAEA inspectors in the Pre-PERLA laboratory, 1989.

installed in three hot cells of the ESSOR reactor complex. In the field of fissile material control, the first laboratory for characterising uranium and plutonium samples, named Pre-PERLA ('PERLA' derives from 'Performance and training Laboratory'), was completed, aimed at developing non-destructive measurement techniques and equipment for safeguards.
Furthermore, the first training course for International Atomic Energy Agency (IAEA) and Euratom inspectors, responsible for verifying non-proliferation safeguards, was held at the new Pre-PERLA facility.
In light of these achievements and in a rapidly evolving context, the political issues raised in the 1987 document regarding not only the activities but also the very structure of the JRC came to the fore, leading to a radical reform of the institution, while everything seemed to be changing in eastern Europe.

Map of the European Community in 1987
(Administrative boundaries: © EuroGeographics
© OpenStreetMap).

The European Solar Testing Installation (ESTI)

In the transition of the JRC from nuclear to non-nuclear research, the decision taken in the early 1970s to focus research activities in the energy sector on the production of electricity from solar energy through photovoltaic cells proved to be particularly far-sighted.

According to Eurostat, photovoltaics have been the fastest-growing renewable energy source in the EU over the past 15 years.

In 2008, electricity from photovoltaics accounted for less than 1% of total consumption, but by 2023 the figure was 9%, with a steady rise expected in the years to come.

The launch of solar research at the JRC coincided with the 1973 oil crisis, triggered by the sudden increase in crude oil prices arising from the embargo imposed on certain countries by the Arab nations adhering to the Organisation of the Petroleum Exporting Countries (OPEC) following the Arab-Israeli war of October that year.

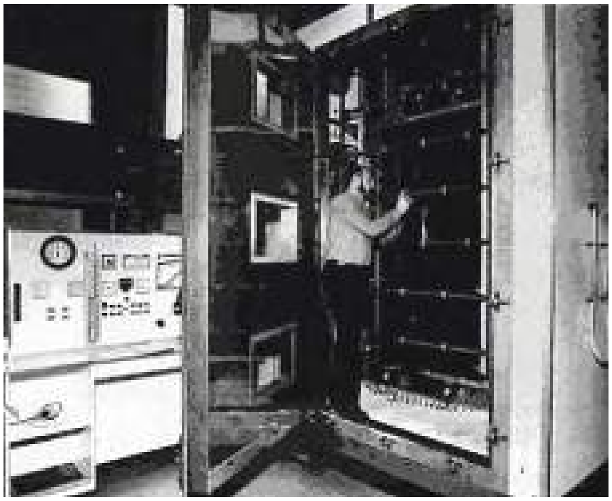
In this context, the JRC at Ispra initiated a four-year programme on solar energy, studying the potential of both thermal and photovoltaic conversion and the use of solar energy to produce chemical fuels such as hydrogen. At the time, photovoltaic cells were very expensive and inefficient, and the initial objective was to study how to concentrate solar energy onto a narrow row of cells using optical systems, particularly a large Fresnel lens.

However, it soon became clear that the greatest potential of the JRC's work in this area, given the fragmentation and heterogeneity of the European industry in this sector, laid in improving the development and standardisation of measurement procedures for solar collectors.

In 1976, the 'solar house' was built, facilitating the installation of panels at different angles to the sun and enabling accurate measurement of their performance throughout the day, taking into account the sun's upward and downward movement in the sky over the year depending on the seasons, and, over longer periods, the potential progressive degradation of the panels.

This project was further expanded in 1978 with the official opening of ESTI, which remains fully operational to this day. The testing programme established in those early years was essentially divided into two phases. First, it was necessary to measure the efficiency of photovoltaic panels in converting light into electricity. This measurement was carried out in indoor laboratories, in a dark environment shielded from light.

The solar house, 1976.



Weather-related ageing chamber,
ESTI laboratory, 1980.

The panels were then carefully exposed to highly calibrated light sources simulating sunlight, and their electrical output was measured with precision.

The second phase of testing assessed the durability of the panels in realistic environments.

The panels were exposed to the elements across all seasons for an extended period, after which they were tested again to verify their conversion efficiency and its gradual decline over time at a rate dependent on environmental conditions. By the early 1980s, the ESTI laboratory consisted of two types of facilities: simulated sunlight projectors for performance measurement, referred to as LS (Light Simulators), and equipment for qualification and ageing tests, referred to as AT (Ageing Test Facilities). The latter included

Photovoltaic panels on the ELSA building's southern façade.

ESTI: outdoor field test of a spectroradiometer, 2021.

systems for thermal cycling of photovoltaic modules, ageing chambers in corrosive atmospheres and ultraviolet light, and mechanical stress equipment to simulate the effects of rain, wind, snow and hail.
In the following decade, the JRC in Ispra began to provide practical demonstrations of the potential of photovoltaic panels. In 1996, the entire south façade of the large building housing the European Laboratory for Structural Assessment (ELSA) was covered with a series of panels with a nominal peak power of 21 kW, cutting edge for the time.
From the 2000s onwards, the JRC maintained a policy of developing photovoltaics as a source of renewable electricity, installing panels on all its major new buildings. In order to assess the potential electrical power of a new photovoltaic system, it is necessary to know the characteristics and the likely intensity of solar illumination at the chosen location, taking into account the orientation of the surface on which the panels are to be installed, such as the roof of a building. ESTI is responsible for managing the algorithms and data required to perform the necessary calculations and for making them easily accessible online to any potential user, including businesses and citizens.
Looking back at the development of the JRC's activities in the field of solar energy, it can be concluded that they have served as a model for many other initiatives undertaken since then to support the functioning of the EU's single market. In this role, the JRC has not been, and still is not, responsible for evaluating all the products available on the market. Instead, it is tasked with researching and developing the experimental procedures and protocols to be used by testing bodies to issue CE certification (indicating that the product conforms to EU standards), thereby ensuring fair competition for companies and safe, standards-compliant products for citizens.

The JRC and nuclear safety: the LOBI and FARO experiments

At the beginning of the 1970s, it became evident that pressurised-water reactors (PWRs) would become the main pillar of commercial nuclear energy production in Europe. PWRs use slightly enriched uranium as fuel, light water as the primary coolant and moderator, and a secondary circuit of light water as a coolant for power generation.

With the development of PWRs, interest naturally grew in the research necessary to ensure the safety of this type of technology, including the issue of guaranteeing the safe shutdown of the reactor in the event of a loss of coolant.

This issue came to the forefront following the Three Mile Island accident near Middletown, Pennsylvania, on 28 March 1979, when a cooling system valve failure combined with operator error led to a partial meltdown of the reactor core due to excessive residual heat. This remains the most serious accident in the operational history of a commercial nuclear power plant in the United States.

Although the release of radioactive material was very limited and had no detectable effects on the health of plant workers or the public, the subsequent analysis of the chain of events led to radical changes in emergency response planning, reactor operator training, human factors engineering, radiation protection and many other operational aspects of nuclear power plants.

In this context, the JRC found a new and fruitful role for its teams of experts in the nuclear field.

From the development of new reactor concepts and prototypes, the focus shifted to conducting large-scale experimental research to ensure safety through accident prevention.

The new focus was on using innovative experimental facilities that did not require fissile or radioactive materials but instead simulated key conventional components or actual reactors and were, therefore, entirely free from any risk of accidental nuclear release. The “Light Water Reactor Off-normal Behaviour Investigations” (LOBI) project ran from 1974 to 1991. Partially funded by a contract with the West German government, it focused on simulating German-designed PWRs.

The Three Mile Island nuclear plant.
(Source: *US Department of Energy image via Wikimedia Commons* - https://commons.wikimedia.org/wiki/File:Three_Mile_Island_(color).jpg).

The LOBI test facility.

Using a scaled-down model of the coolant piping of a commercial reactor and specially developed computational codes, it was possible to study the impact of both a sudden loss of primary coolant due to a sudden pipe failure and small but persistent leaks in the piping.

The results of the LOBI project were immediately relevant to industrial research groups and government bodies responsible for licensing in the Member States and the United States.

For this reason, the project was expanded in 1984 and continued until 1991, completing around 70 tests and producing over 600 reports and peer-reviewed scientific publications. Furthermore, the JRC's expertise in managing the risk of steam explosions proved relevant for non-nuclear plants operating with high-temperature cooling circuits, thus attracting significant interest from a much broader audience of industrial safety experts.

The other major experimental project focusing on reactor safety was the Furnace and Release Oven (FARO) project, which was active from 1980 to 1998. It was launched in direct response to the Three Mile Island accident and studied the controlled management of nuclear fuel core meltdown.

Some simulation experiments conducted elsewhere, which used aluminium oxide to simulate actual nuclear fuel, were not convincing due to the different chemical and physical properties of the molten material. Instead, the FARO experiment used natural depleted uranium dioxide, consisting of low-activity uranium-238 obtained as a by-product of the enrichment process, with physical and chemical properties essentially identical to actual reactor fuel.

FARO used an electric heating system to raise the temperature of a 100-kilogram mass of depleted uranium oxide to around 3 000 °C, thus simulating the overheating and meltdown of the core.

In this way, the facility enabled researchers to determine how materials of different thicknesses and shapes could be designed to safely capture and cool the molten material, avoiding the risk of severe environmental contamination.

As with LOBI, FARO produced highly useful experimental results, which were extensively applied in the design of 'fail-safe' reactors.

When the FARO project ended in 1998, the team leader moved to the French Atomic Energy Commission in Saclay to ensure that all the lessons learned were optimally and efficiently transferred to the next generation of commercial reactors. In the context of the transformation of the JRC and the loss of centrality to its work of the ESSOR reactor in the early 1970s, the decision to focus nuclear safety research in Ispra on large-scale facilities without high-activity nuclear materials proved to be an extremely efficient way to achieve significant results in a short time.

By completely eliminating the complexities associated with licensing and managing nuclear reactors, this approach allowed an entirely new series of experiments to develop and progress at a significantly faster pace and with relatively limited staff.

The new facilities, combined with state-of-the-art computer modelling, were key to enabling the JRC in Ispra to survive as one of Europe's leading nuclear research organisations even after the end of the ORGEL programme.

The FARO experimental facility.

The JRC and environmental protection: the origins

In 1970, the Commission appointed a group of ‘four wise men’ to provide advice on the future of the JRC’s activities. One of their recommendations was that the JRC begin research activities in the field of environmental protection.

This suggestion, which was very forward-looking, came at a time when concern about environmental degradation had been gaining public attention for several years. In 1962, biologist Rachel Carson had published the book *Silent Spring*, an investigation into the effects of DDT and pesticides in general on the environment. The book is considered the manifesto that heralded the environmental movement, and Carson’s was one of the first dissenting voices against the prevailing narrative of the time, which focused on the opportunities provided by technological progress, paying far less attention to its unintended consequences.

Faced with concerns about chemical pollution, the JRC possessed relevant expertise, stemming from its monitoring of radioactive contamination and from its study, in the field of organic chemistry, of refrigerant materials as part of the ORGEL experiment. The recommendation of the group of experts prompted the JRC to leverage some of this expertise in the field of environmental monitoring.

From that point onwards, this type of research has been developed in many forms and contexts, providing significant technical contributions to EU environmental legislation. It remains a fundamental part of the JRC’s activities to this day.

The JRC’s first environmental protection programme was launched in 1972 and continued in subsequent years with a series of direct actions complementing indirect research projects funded by the Directorate-General for Scientific Affairs, Research and Development, or DG XII. These direct actions included research projects on air, water and soil pollution, particularly from heavy metals, including lead in petrol.

On 10 July 1976, a serious industrial accident occurred at the ICMESA *(Industrie Chimiche Meda Società Azionaria)* plant in Meda, causing the release and dispersion of a dioxin cloud over several municipalities north of Milan, particularly Seveso.

Logo of the Major Accident Hazards Bureau. (MAHB)

Following the accident, the Italian government established a special office tasked with gathering evidence to determine responsibility for the incident and assessing the efficiency and cost-effectiveness of decontamination measures. The special office asked the JRC to host an analysis laboratory equipped with suitable instruments and, given the hazardous nature of dioxin, subject to strict safety procedures, already tested for handling nuclear material.

The experience gained following the Seveso accident enabled the JRC to play a key role in supporting the preparation of Directive 82/501/EEC on major-accident hazards of certain industrial activities, better known as the Seveso I Directive. This support activity continued with the implementation of the directive and its updates, ultimately leading in 1996 to the creation of the Major Accident Hazards Bureau (MAHB), which tracks industrial accidents and provides learning opportunities for managing such events based on past experiences worldwide.

Meanwhile, in 1988, the Environment Institute was established, strengthening the JRC’s environmental measurement activities on air, water and soil pollution, which were later complemented by forest monitoring activities to study the impact of wildfires, deforestation and tree pathogens.

An important example of the JRC’s environmental laboratories in Ispra is the European Reference Laboratory for Air Pollution (ERLAP), which carries out detailed measurements of harmful air pollutants and pollutants of emerging concern. This activity gathers the data needed to design both European policies and broader international conventions and to monitor their impact. ERLAP also develops and validates innovative measurement techniques and organises quality assurance programmes for the national reference laboratories of EU Member States.

ERLAP was established in 1994 in response to the Member States’ need for an independent EU laboratory to address issues related to air pollution monitoring. Since 2008, ERLAP has been formally recognised as the Commission body responsible for organising European quality assurance programmes for air pollution measurements, in line with the requirements of Directive (EU) 2024/2881 on air quality. ERLAP is now a specialised and fully accredited laboratory that focuses on the harmonisation and standardisation of measurement techniques, conducts measurement campaigns in

areas of particular interest, analyses the chemical composition of toxic and carcinogenic compounds in air pollution and develops reference and equivalent measurement methods to support the implementation and development of European air quality policy.
A key aspect of ERLAP's role is the development of good practices using its local measurement station, the European Commission Atmospheric Observatory, located at the JRC site in Ispra.
The observatory, which monitors both toxic air pollution and greenhouse gas emissions, is part of two European research infrastructure networks and has measured toxic air pollution since 1985 and greenhouse gas emissions since 2007. It was significantly enhanced in 2017 with the construction of a new 100-metre-high tower at Ispra, featuring measurement platforms at 40, 60 and 100 metres above ground level. A station of the JRC observatory, located in the Mediterranean forest of San Rossore near Livorno, is used to measure the gas exchange flux between the forest and the atmosphere, which is crucial for understanding and predicting the potential beneficial impact of tree planting on climate change.
The standard measurement protocols developed by ERLAP and other JRC environmental laboratories, such as those for monitoring water and soil pollution, today provide essential support for the implementation of EU environmental legislation. This is another example of how the forward-looking decisions made in the early 1970s regarding the future role of the JRC in Ispra continue to bear fruit even half a century later.

Inter-laboratory comparison exercise at ERLAP.

Observation tower at the European Commission Atmospheric Observatory, 2019.

Chapter IV

A new perspective: completing the Single Market and supporting innovation (1988-2000)

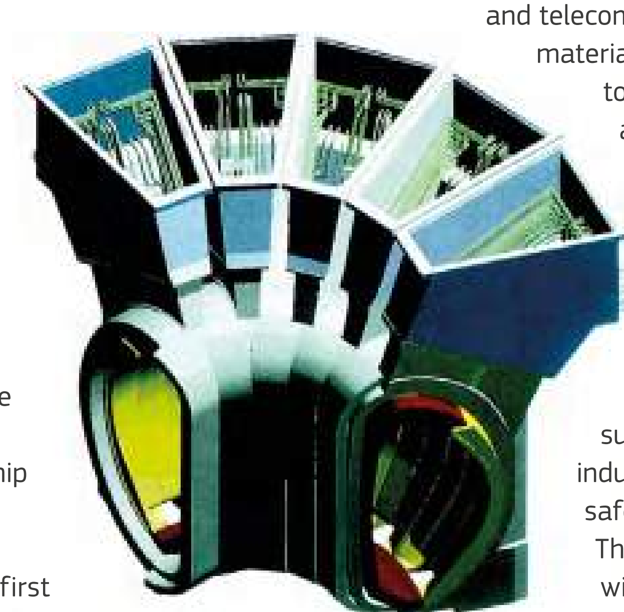
Aerial view of the site, 1985.

Chapter IV

A new perspective: completing the Single Market and supporting innovation (1988-2000)

The world was on the brink of a momentous transformation – the adjective could not be more fitting in this context. As often happens at such historical crossroads, the magnitude of the change was barely perceived at first.
However, upon closer examination, it became evident that an additional step towards the pacification of the European continent was being discussed and proposed by all the governments and observers of the Community.
The underlying forces and profound dynamics that were stirring uncontrollably within societies and political systems were so powerful that they defied easy interpretation.
The end of the Cold War can be seen as coinciding with the end of the bipolar system – that is, an international system composed of states aligned, to varying degrees, with either the Soviet Union or the United States and those that pursued wavering paths of autonomy without managing to form a third bloc (the Community did not fall into this latter category, although it had certainly become more robust and outward-looking following the Single European Act).
Thus, the end of the Cold War can be viewed not as the outcome of a clash between communism and capitalism, but, rather, as a transformation of the international system that occurred between 1987, when the great tension between the two poles definitively eased, and 1992, when the Soviet bloc ceased to exist and the United States began to entertain unipolar ambitions.
The treaty on the elimination of intermediate-range and shorter-range missiles (the Intermediate-range Nuclear Forces Treaty (INF), signed on 8 December 1987, not only resolved the Euromissile crisis but also marked the conclusion of the final chapter of the Cold War, as proxy wars in Africa began to fade away through sheer inertia.
Thanks to the treaty, the General Secretary of the Communist Party of the Soviet Union, Mikhail Gorbachev, was able to allocate greater resources to his reform programme – *perestroika*, literally 'restructuring' – aimed at introducing civil and political liberties in the Soviet Union, with obvious repercussions on all the people's democracies of central and eastern Europe.
Research and technological development were not immune to the changes that were under way. Within the Community, the effects of the Single European Act continued to be felt in the field of research. The implementation of the 1987-1991 framework programme for research was proceeding at a very brisk pace. Among the 10 new research programmes adopted by the

Commission was a new fusion programme, which symbolised, in the realm of scientific research, the political expectations regarding this new era for the international system and the new research programme of the JRC.
The year 1987 witnessed the historic signing of the International Thermonuclear Experimental Reactor (ITER) agreement on nuclear fusion research by the Community, Japan, the Soviet Union and the United States; the agreement confirmed the Community's central role in this sector, as the research facility was to be established in Europe. The JRC, more modestly, revised its activities and functioning within its research programme.
The context in which these new decisions were made reflected a new relationship between European institutions, which led the Commission to adopt the first report on the state of science and technology in Europe. This report was prepared at the request of the Parliament, which had called for the introduction of a regular reporting practice on the subject. The aim was to provide a factual and objective survey of the state of research and technological development.
The report thus served as a reference document for debates within and between the Community institutions, enabling discussions on Europe's needs in the field of science and technology and how to address them.
The first report highlighted the Commission's significant investments aimed at reducing the gap between it and the United States and Japan by increasing research and development spending to improve industrial performance through innovation. However, other gaps existed within the Community, where West Germany, France and the United Kingdom accounted for three quarters of total research expenditure, and disparities between regions within Member States were stark. The Commission identified five major strategic research sectors of particular economic interest to the Community: information and telecommunications technologies, materials technologies applicable to manufacturing, aeronautics, biology and biotechnology, and energy. Attention also continued to be paid to the topic of quality of life and the environment, addressing research needs in areas such as ecology, health, and industrial, road and nuclear safety.
The entire JRC was tasked with focusing specifically on three major policy themes, even before engaging in the corresponding research topics: contributing to the realisation of the single market, strengthening safety and the prevention and management of accidents, and monitoring and protecting the environment. Meanwhile, the JRC's scientific and technical support activities for the Commission services represented its direct contribution to the Community's major policies in areas requested by the Commission itself, such as agriculture, environmental protection, industry, energy and regional policy.
The distinction between work on the major themes identified by the Commission and



Computer model of a section of the Next European Torus (NET), created in Ispra for integration, assembly/disassembly and maintenance studies of systems through remote management.

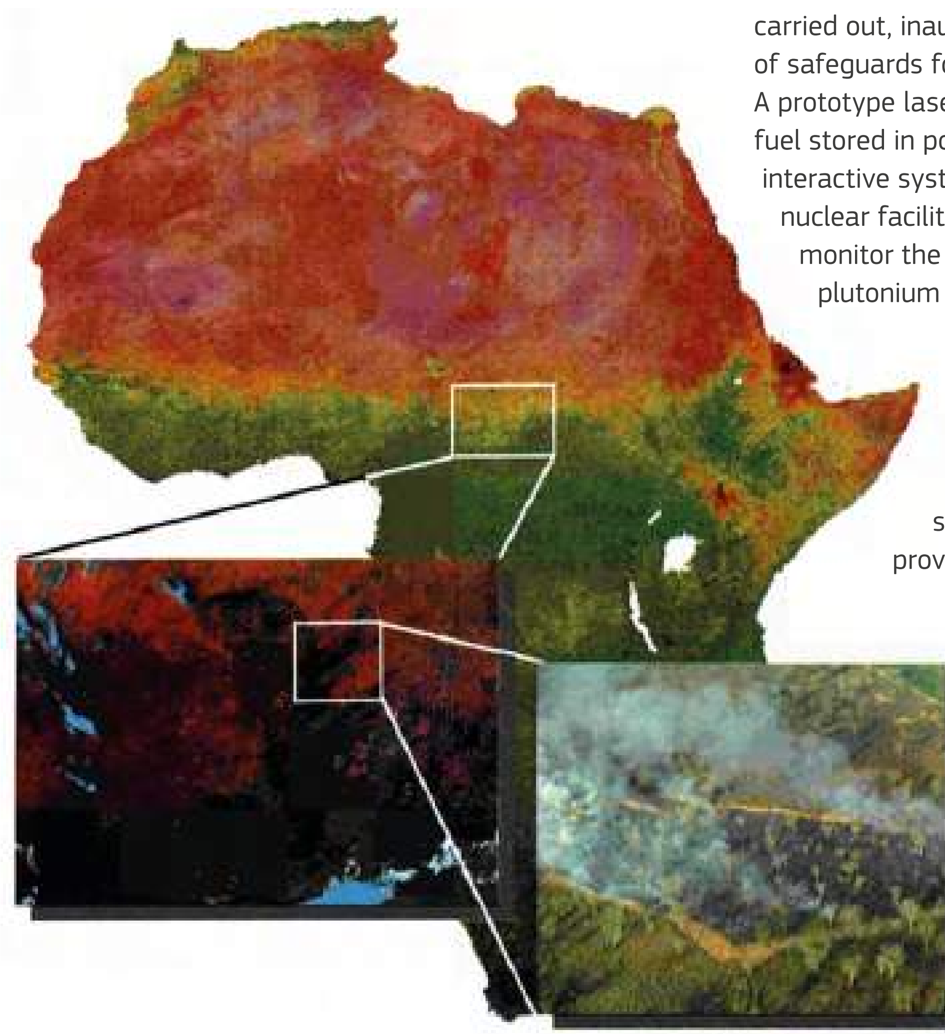
support activities for policy development might appear subtle, but, in practice, it was a significant indicator of how the JRC's functions were organised. The major themes could be defined as strategic interests and were developed into programmes that could be traced back to the approach to the ORGEL programme – that is, they were activities conducted directly by the JRC because they had been deemed priorities by the Commission. Support for policy development, on the other hand, was more specific, tailored to the natural novelties that the European political process had to address; in essence, it involved providing a scientific and technical basis for the legislative and regulatory activities of the European institutions, where necessary.

To enable the JRC to carry out these tasks, the Commission introduced measures that implemented a profound reform of the Centre, taking into account the responsibilities it was expected to fulfil as part of the Community's research and technological development strategy. The aforementioned reform of the Centre's structure, with a reorganisation into various scientific institutes endowed with broad autonomy in both research and administrative and financial matters, also entailed changes in management, including streamlining consultation structures and strengthening the role of the JRC's Board of Governors. Finally, the organisation of personnel was reformed, allowing greater flexibility in allocating human resources to various activities and providing increased opportunities to host visiting researchers and fellows and staff seconded from national centres.

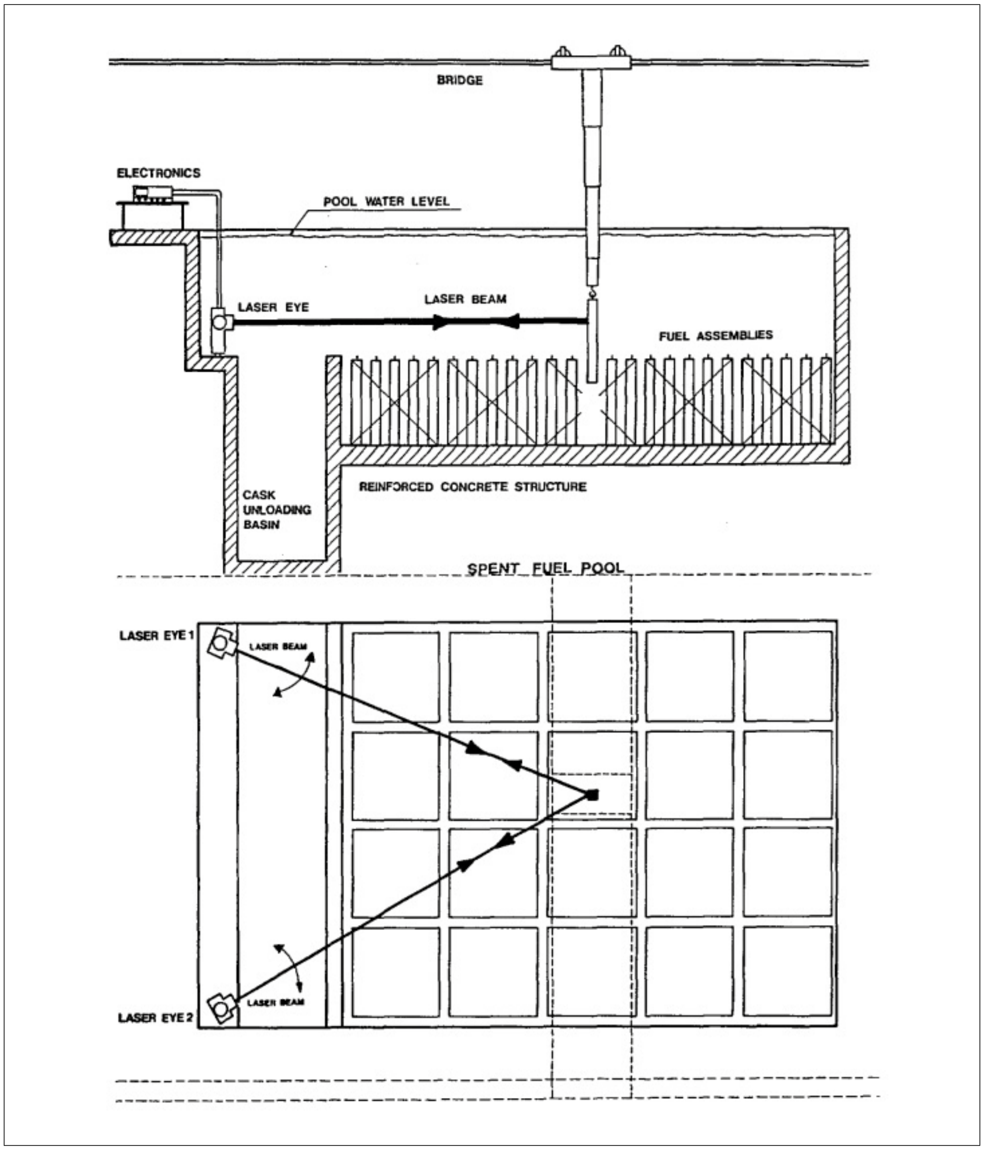
Floating multi-analysis apparatus for assessing limnological data (MAFALDA) on Lake Orta, during the monitoring of a cleaning operation, 1988.

In Ispra, research programmes in the fields of industrial risks and remote sensing were expanded. In the former area, a comparative study of various risk analysis methods was developed, and work continued on the development of the Ispra Risk Management Support System (IRIMS) and the construction of the Facility for Investigating Runaway Events Safety (FIRES) for the study of chemical accidents. In the area of remote sensing, Ispra received and began processing a series of data from NASA concerning the tropical African region, aimed at analysing vegetation dynamics.

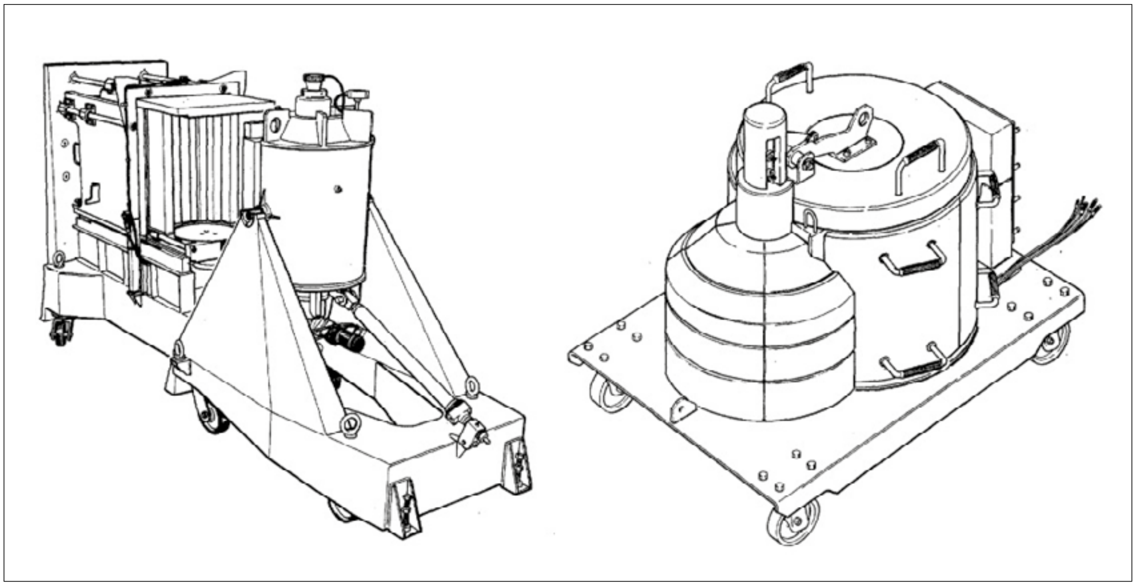
This analysis was intended to study, in particular, deforestation phenomena, which were already emerging as an environmental risk by that time. A new marine detection experiment was also carried out, again aimed at environmental monitoring, specifically focusing on oil spills on the Dutch continental shelf in the North Sea.
In the field of nuclear fission, while work continued on physical and chemical phenomena related to the migration of radionuclides in the geosphere, research activities on the stability and safety of waste disposal in deep ocean sediments were concluded.
These activities were conducted as part of a joint project with the Nuclear Energy Agency of the OECD. At the Pre-PERLA facility, the first measurements on large plutonium samples were carried out, inaugurating a new phase in the field of safeguards for and control of fissile materials. A prototype laser surveillance system for nuclear fuel stored in pools was developed, and an interactive system simulating the operation of nuclear facilities was designed and tested to monitor the characteristics of a typical plutonium fuel fabrication plant.
Since the second framework programme was drawing to a close, 1989 was also dedicated to the preparation of the next one, the third, which would be strongly influenced by the provisions of the Single European Act.



Biomass remote sensing: continental, regional and local combustion activities in the Africa savannah-forest transition area.



Plan of the system for monitoring the storage of nuclear fuel in pools.

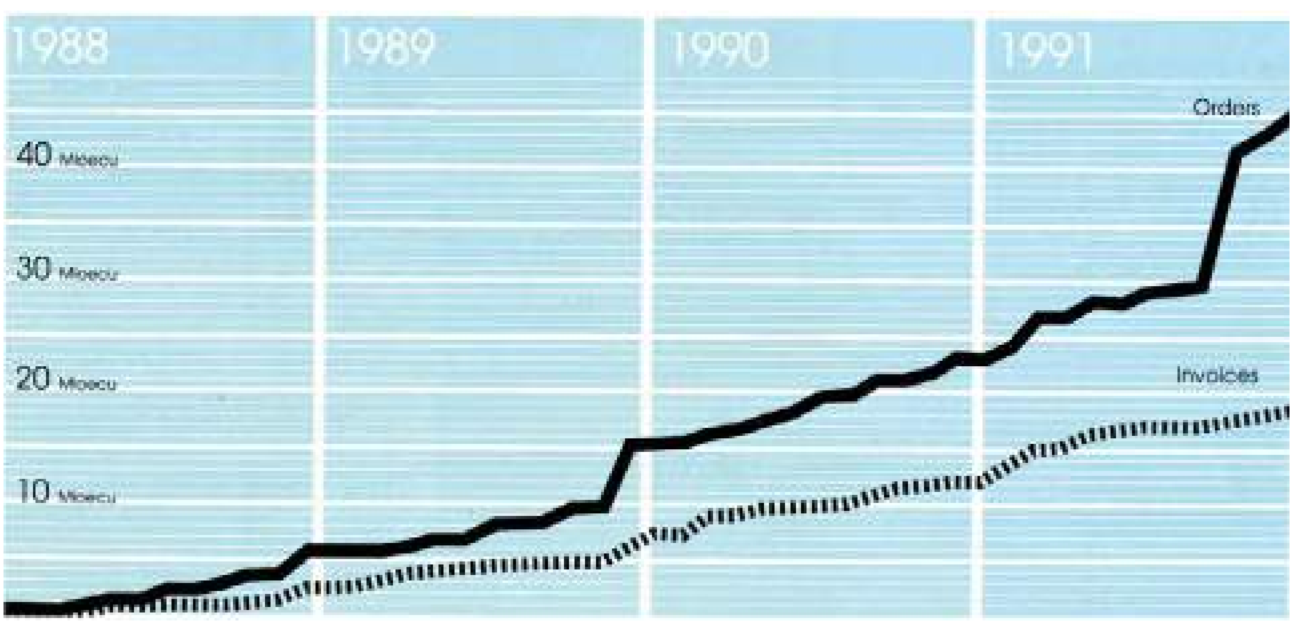


PHONID (Photo Neutron Interrogation Device) units 3 and 4 for the non-destructive analysis of samples containing plutonium.

A process of reflection on and in-depth analysis of European needs in the field of research and the specific nature of Community action in this area was initiated.
This process involved the Commission and its various advisory bodies, as well as the Council, the Parliament and the European Economic and Social Committee.
The analyses and viewpoints of the scientific community and the industrial sector were also integrated into the process.
This reflection was informed by the report on the state of science and technology in Europe, produced by the Commission the previous year, which guided the decision-making process in the Council and Parliament.
This new approach led to the formulation, in August 1989, of the third framework programme for 1990-1994, based on three principles: maintaining a multiannual perspective, essential for providing researchers with appropriate budgets allowing for flexible and thus more dynamic planning; increasing the amounts deemed necessary for actions enabling the Community to address new challenges, in line with the financial perspective characterising the Single European Act; and concentrating actions, which implied reducing the number of specific programmes. The Council opened the debate on this proposal, eventually forwarding a draft framework programme to the Parliament, which gave a favourable opinion.
While the framework programme was being discussed, Europe was undergoing significant change. Gorbachev's reform programme implied the end of Soviet control over the people's democracies of the Warsaw Pact countries. In these countries, the great transformation of 1989 began, with the first free movement across what had been the Iron Curtain. Hungary opened its borders with Austria on 27 June 1989, thereby allowing East German citizens, who could move freely within the Warsaw Pact countries, to cross just as easily into West Germany.
On 9 November of the same year, the Berlin Wall was finally brought down.
The formulation of the third framework programme unfolded while the reform of the JRC, as outlined during the previous year, was being implemented. Nine institutes were created, distributed between the Ispra site and others: the Central Bureau for Nuclear Measurements, the Institute for Transuranium Elements, the Institute for Advanced Materials, the Institute for Remote Sensing Applications, the Institute for Environment, the Institute for Systems Engineering, the Institute for Safety Technology, the Centre for Information and Electronics Technology and the Institute for Prospective Technological Studies.
The first three were located in Geel, Karlsruhe and Petten respectively. All the others were established in Ispra, which thus retained its character as the only multifunctional centre.
Following this reform, the Council formally gave the JRC permission to make its facilities, equipment and expertise available to third parties, in both the public and private sectors, for remuneration. This was an important step, which, in a sense, definitively closed a chapter of the Centre's history, one during which it had moved towards non-nuclear research and reduced the role of nuclear research in its work.
The new framework programme, launched in 1990, declared a strong commitment to research in the field of general-interest telematic systems, of which Ispra had been one of Europe's main incubators. The framework programme aimed to interconnect the various networks existing in the Member States, creating what the Commission described, in a colourful metaphor, as *'a true European nerve system'*. This system was deemed essential to complete, or at least consolidate, the internal market, enabling the efficient management of information flows following the abolition of border controls, with obvious effects in the customs, transport and social security sectors.

Complementary to these investments were the efforts to enhance human capital and mobility provided for in the framework programme; this greater mobility was made possible by the prospect of border abolition.
Indeed, a specific line included in the framework programme established training grants, particularly for young researchers, which would promote high-level mobility in leading centres, networks and specialised facilities.
This multiannual planning initiative aimed to involve around 5 000 researchers, offering them opportunities for training and intra-European – that is, international – mobility.
These initiatives stemmed from a transformation that had been under way since 1985, when the Schengen area was established – a zone of free movement without internal border controls, defined in June 1985, when the Schengen Agreement was signed by Belgium, West Germany, France, Luxembourg and the Netherlands. In the same Luxembourgish town of Schengen, in June 1990, Italy also signed the convention abolishing border controls.

One of the essential features of the debate and policy on European integration – the free movement of goods and people – became a reality in the year when the German Democratic Republic ceased to exist and its territory came under the jurisdiction of the Federal Republic of Germany. All citizens of the former democratic republic thus transitioned from the area under the Warsaw Pact to the Schengen area.
Amid these changes, which intersected with various research programmes, the importance attributed to the environment was reaffirmed. The environment was no longer confined to a specific programme but had become a cross-cutting element of all Community research.
At the same time, a regulatory dimension of research developed at the European level in the field of biotechnology.
As with the environment, the aim was to strengthen the preliminary scientific and technical knowledge necessary for the development of common legislative standards that could be adopted by the various Member States.



Financial revenues for JRC from third-party work in 1988-1991.

For the JRC, the task was to assess the first year of the reform's implementation. In 1990, two institutes with complementary interests were merged: the Institute for Systems Engineering and the Institute for Information Technology and Electronics. Following this unification, the eight institutes that made up the JRC increased their operational and financial independence in carrying out their activities.

These activities were grouped into four sectors: the framework programme (institutional research), support to Commission services, exploratory research and work for third parties. Particularly in the second sector, demand for assistance to the Commission was particularly high that year. Indeed, several multiannual agreements were signed involving the provision of continuous and long-term support services for Community policies.

The share of work for third parties had also increased if compared to the total activities of the Centre, although it had not yet reached the levels anticipated in the Commission's projections. Nevertheless, the JRC received warm appreciation from its clients for the quality of its work, and it formalised a series of arrangements with Member States that would serve as the basis for executing future third-party work.

At the same time, in 1990, each institute thoroughly reviewed its strategy for the coming period, with a view to adopting a common overall action plan for the JRC in 1991.

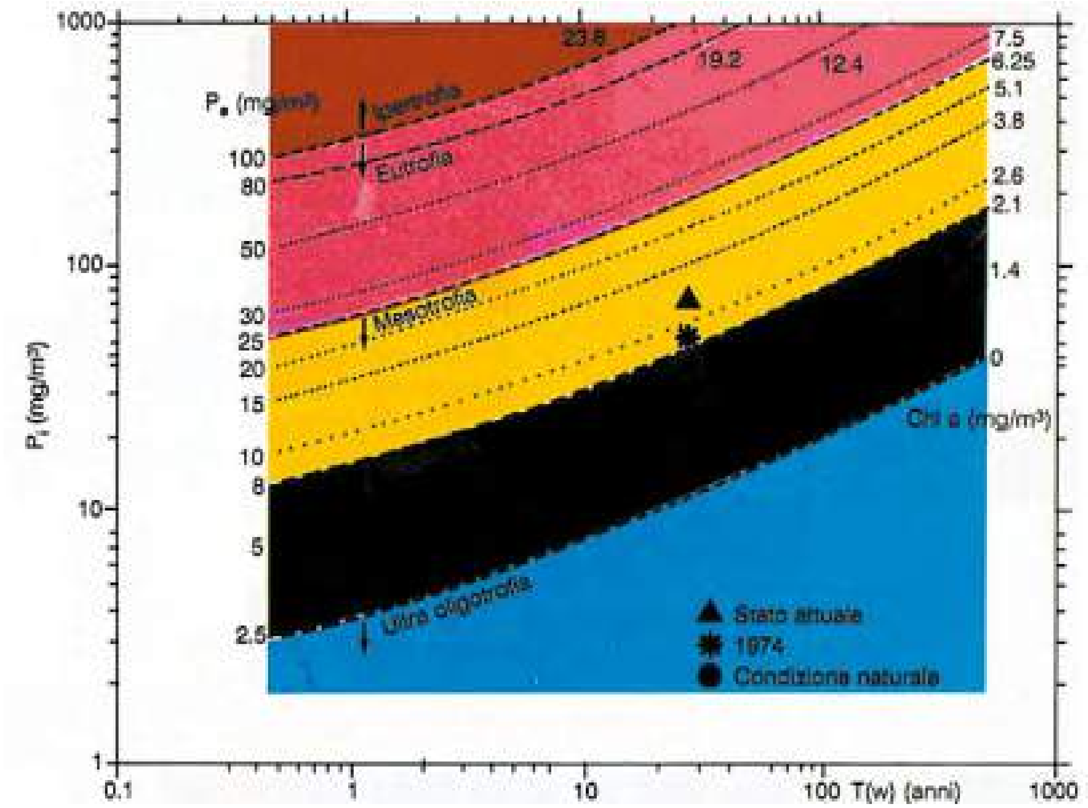
An example of this more autonomous approach was the international consortium involving several major European research organisations in the field of research and technological development of materials. This consortium was promoted by the Institute for Advanced Materials, distributed between Ispra and Petten. The consortium, named E-Mark, aimed to provide European industry with a framework for launching large-scale projects in the materials sector. As part of an initiative on the standardisation of advanced ceramic materials, carried out in collaboration with European organisations in the field, the institute also initiated several pre-normative research projects.

In May 1990, the Commission adopted a new four-year proposal for research and technological development in the environmental field. It was divided into four areas: the Community's participation in international research on global change; environmental technologies and engineering; research on the social and economic aspects of environmental issues; and integrated research projects on large transnational programmes requiring an interdisciplinary approach. In December, the Council expressed broad agreement on this proposal, which anticipated several elements that would come to dominate the scientific research agenda in the years to come.

Meanwhile, at Ispra, the Institute for Environment initiated a study on a new spectrophotometric method for assessing the concentration characteristics of various pollutants present in atmospheric aerosols. In the field of water quality, it is worth noting that the institute completed work on the environmental condition of Lake Garda.

There was some interconnection between the activities of the Institute for Environment and those of the Institute for Remote Sensing Applications, which that year developed a neural network approach to interpreting remote sensing images that could be used for marine and terrestrial observation. Additionally, it began the development and construction of the European Microwave Signature Laboratory (EMSL), a collaborative effort between the JRC and Siemens. The laboratory, inaugurated on 3 April 1992, would enable radar measurements of natural elements or manufactured objects within a large anechoic chamber.

Today, the EMSL offers a wide range of testing capabilities in the field of radio frequencies, supporting the Galileo project, standardisation and regulation of radio spectrum matters.



Evolution of the trophic state of Lake Garda from 1974 to 1989.

In the energy sector, the JRC reform resulted in a reorganisation of the various research topics, and in the solar sector the JRC shifted its focus to the final stages of a potential production process for solar plants. For instance, the Institute for Systems Engineering undertook a study on the degradation of amorphous silicon photovoltaic modules under light exposure through simulated sunlight exposure and extended the measurements and models of the solar spectrum to low-insolation conditions.

In the area of reactor safety, the Institute for Safety Technology continued the Furnace and Release Oven (FARO) project studying post-incident heat removal and fuel–coolant interactions in nuclear reactors.

Regarding the management and disposal of radioactive waste, the Institute for Environment conducted studies on the migration of inorganic contaminants in groundwater following a potential leak from a geological repository. Particular efforts were dedicated to developing non-invasive speciation methods and quantitatively describing retention mechanisms. The impact of this research became evident in December 1990, when the Council adopted conclusions on objectives, standards and criteria for radioactive waste disposal.

Research in the field of fusion, also focused on safety, continued, with the Institute for Safety Technology advancing the construction of the European Tritium Handling Experimental Laboratory (ETHEL), a laboratory designed to study the propagation of tritium in materials with the aim of ensuring the safety of new fusion systems such as JET.

The Institute for Prospective Technological Studies at Ispra published two studies, on *"Science and the Greenhouse Effect"* and on *"Technological Responses to CO_2 Issues"*. The institute also launched a series of studies on future trends in the air transport sector and contributed to preparatory discussions on the JRC's strategy to the year 2000, publishing three studies on the scientific and technological outlook. The goal of the end of the millennium had entered the lexicon of Community research policy. In 1991, the eight JRC institutes continued to strengthen their operational and financial autonomy, consolidating their roles in the four main areas of activity (the framework programme, support to Commission services, exploratory research and work for third parties). Meanwhile, the work on nuclear fusion achieved a significant milestone in the JET programme, whose reactor produced significant quantities of energy for the first time using a deuterium–tritium plasma.

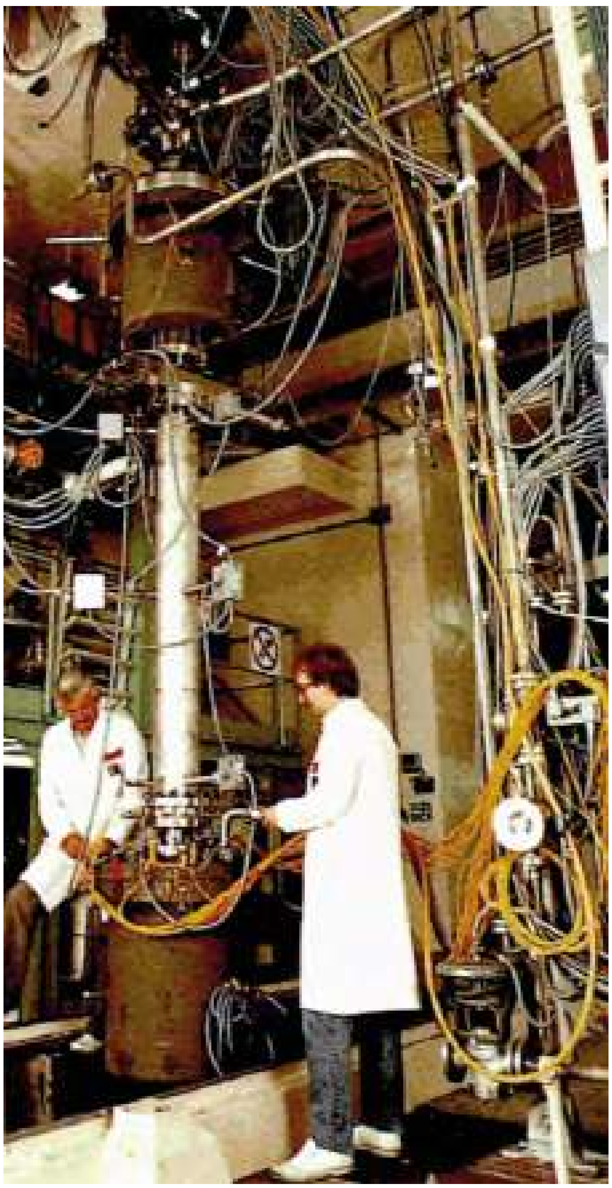
The number and size of JRC projects in support for Commission services and third-party work continued to grow, particularly in the fields of advanced materials and actinide research.

Its long-term plans for the period to 2000 led the Commission to develop proposals for the JRC centred on continuing the four main areas of activity. Regarding specific research programmes, the Centre contributed to achieving the objectives of the third framework programme in the fields of industrial technologies and materials, measurements and testing, the environment, nuclear fission safety, controlled thermonuclear fusion, and human capital and mobility.

As for scientific and technical assistance to the Commission, it was proposed to improve client–contractor relationships by signing multiannual rather than annual contracts.

The Institute for Environment applied a stochastic model to investigate the issue of pollutant migration in soil.

Furthermore, it launched an initial experimental campaign for the study of microphyte toxins in the Mediterranean. The Institute for Safety Technology completed the construction of the PETRA pilot plant in 1991, designed for the study of alternative methods for treating radioactive waste. The Institute for Prospective Technological



FARO experimental plant, 1990.

Studies published research on topics such as the competitiveness of the European space industry, energy supply for high-speed railway networks and Japan's technological response to environmental challenges.
A study was published on the technological and economic outlook for industry in relation to the environment, and work began on developing an information and documentation system to support observation and scientific and technological evaluation activities.
In 1991, the Soviet Union entered a rapid and irreversible crisis. Gorbachev was ousted in a coup aimed at restoring the old regime, which instead accelerated its ultimate collapse.
The Warsaw Pact had been dissolved, and the countries of central and eastern Europe turned towards the Community.

The PETRA experimental plant, which enabled the testing of slag treatment processes on high irradiance fuel.

In February 1992, the Treaty on European Union, or Treaty of Maastricht, was signed, establishing the three pillars of the EU. According to the treaty, the EU was founded on the European Communities (the first pillar), complemented by two other areas of cooperation (the second and third pillars): the Common Foreign and Security Policy (CFSP) and Justice and Home Affairs (JHA).
The legislative and oversight powers of the European Parliament were strengthened with the introduction of the co-decision procedure and the extension of the cooperation procedure.
Under the new treaty, the Parliament acquired the right to invite the European Commission to present a legislative proposal on matters that, in its view, would require the preparation of a Community act.
Furthermore, the entire Commission became subject to the Parliament's vote of approval.
The treaty also established the criteria necessary for a country to join the EU. Attention was directed eastwards towards the countries likely to apply for membership.
In April 1992, the Commission submitted a communication to the Council and the Parliament entitled *'Research after Maastricht: Assessment and strategy'*.
Based on the observation that it was necessary to improve the competitiveness of European industries in high-tech sectors and address persistent weaknesses in the European scientific and technical system in the field of industrial research, the Commission proposed reorienting research activities to enable the EU to achieve an objective reiterated in the Treaty of Maastricht: strengthening European industrial competitiveness. In addition to traditional research activities, the Commission suggested focusing efforts on several general-purpose technologies with significant impacts across various sectors, through projects deemed as prioritary from the technological point of view and involving a range of skills and disciplines to address major industrial challenges.

In the same month, the Council adopted a resolution covering all the activities of the JRC. It reaffirmed the JRC's Community character and its role in consolidating Europe's scientific and technological foundations.
In Ispra, the Institute for Environment was implementing a new European project to study biogenic emissions in the Mediterranean region *(Biogenic Emission in the Mediterranean Area - BEMA)*, aimed at assessing the quantity and transformation of certain chemicals emitted by vegetation and their role in the formation of ozone in the lower atmosphere. That year saw the launch of many new laboratories and research facilities.
A new reference laboratory was established to facilitate the harmonisation of measurement methods to support the implementation of the air quality directives through comparative exercises, while the Institute for Remote Sensing Applications inaugurated the EMSL. Another significant development was achieved by the Institute of Safety Technology, which in October inaugurated the 'reaction wall' of the European Laboratory for Structural Assessment (ELSA), the large facility dedicated to studying the behaviour of buildings during earthquakes. In the field of nuclear safeguards, the PERLA laboratory became operational, dedicated to providing training in non-destructive investigations. In the area of nuclear fusion, the Institute for Safety Technology completed the construction of the ETHEL laboratory, which, however, was never put into operation.

The signing of the Treaty of Maastricht, 7 February 1992.

In parallel with the opening of the new laboratories, in 1992 the JRC in Ispra launched a project aimed at the general modernisation of the site. The objective was to upgrade the existing infrastructure to the most advanced energy and environmental standards, while keeping the interventions within acceptable cost limits. The idea was to create a project that could serve as an example and demonstration for all research centres that had reached a certain degree of obsolescence and required modernisation. The initiative became known as *EcoCentre* Ispra and was funded by resources specially allocated by the European Parliament, in addition to the research budget.

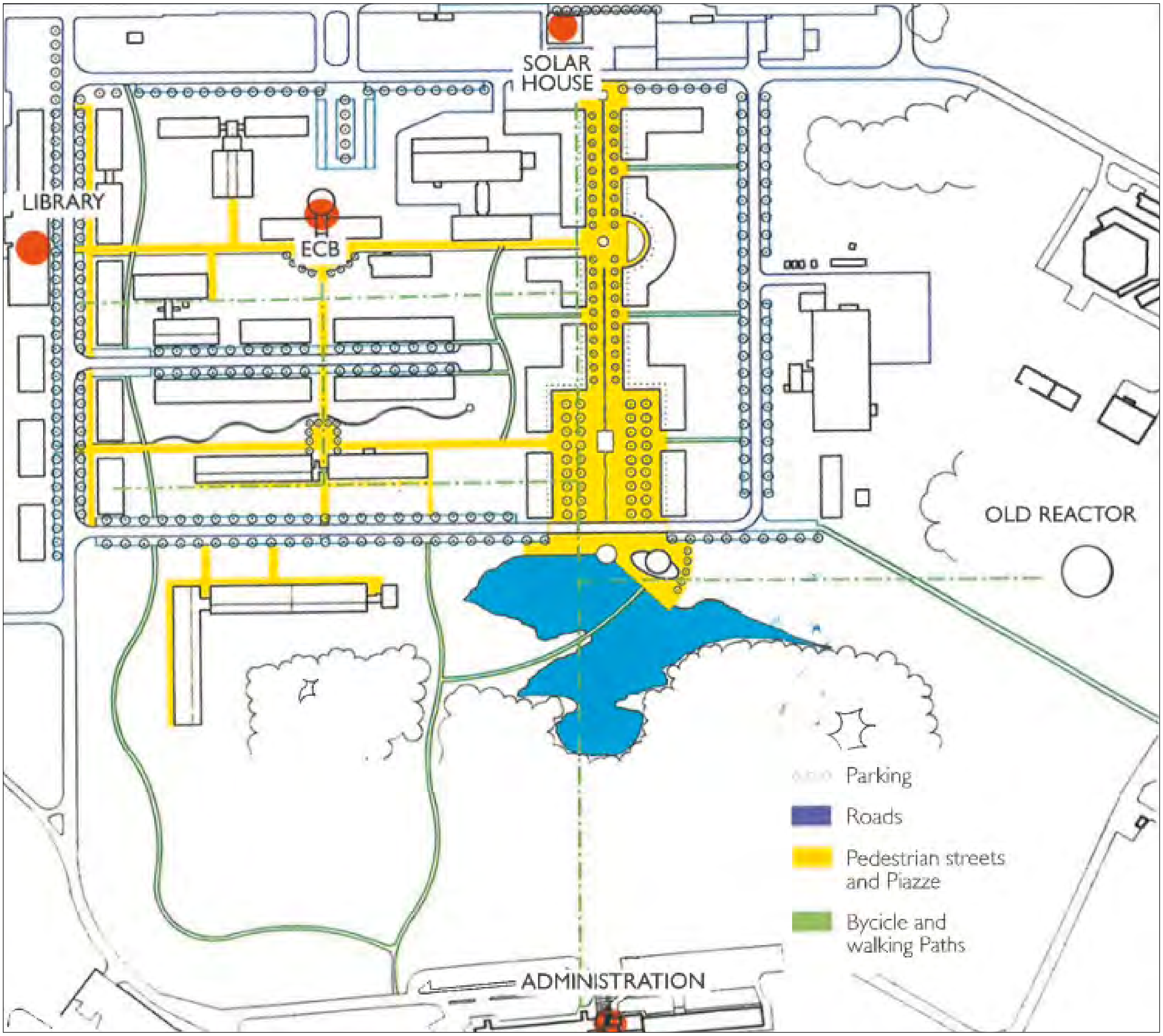
The PERLA laboratory for nuclear safeguards.

From a construction perspective, the activities under the *EcoCentre* project included both new buildings and significant renovation works. These included the construction of the photovoltaic façade of the ELSA building and the renovation of the ESTI pavilion, the canteen, the administration building and the central warehouse. The site development plan, gradually refined between 1992 and 1996, reached its final form with the integration of several new buildings into a *'dense zone'* located in the area identified in 1959 as the laboratory zone. Among the new buildings was the headquarters of the European Centre for the Validation of Alternative Methods (ECVAM), formally established on 29 November 1991. In the years to come, ECVAM would play a crucial role in promoting advanced expertise in the fields of animal and human biology, laying the groundwork for the subsequent development of JRC activities in the health sector. Additionally, the dense zone housed the European Chemicals Bureau (ECB), the precursor to the current European Chemicals Agency (ECHA), which was established in 1993 to carry out and coordinate scientific and technical work in support of EU legislation on chemicals. The new complex also included an amphitheatre with approximately 200 seats. Finally, two three-storey buildings, known as *'the twins'*, were constructed, primarily intended for offices and allocated respectively to the Institute for Environment and the Institute for the Protection and Security of the Citizen. These buildings were oriented to form a square, which, in the designers' vision, was to become a meeting place for the new scientific *polis*. In the plans, the square was bordered to the south by an artificial lake and was extended northwards by a wide pedestrian avenue leading to the solar house. Neither the lake not the avenue was ever built, but these buildings, later modernised, remain an important part of the built environment of the site to this day.

Ispra EcoCentre:
overview.

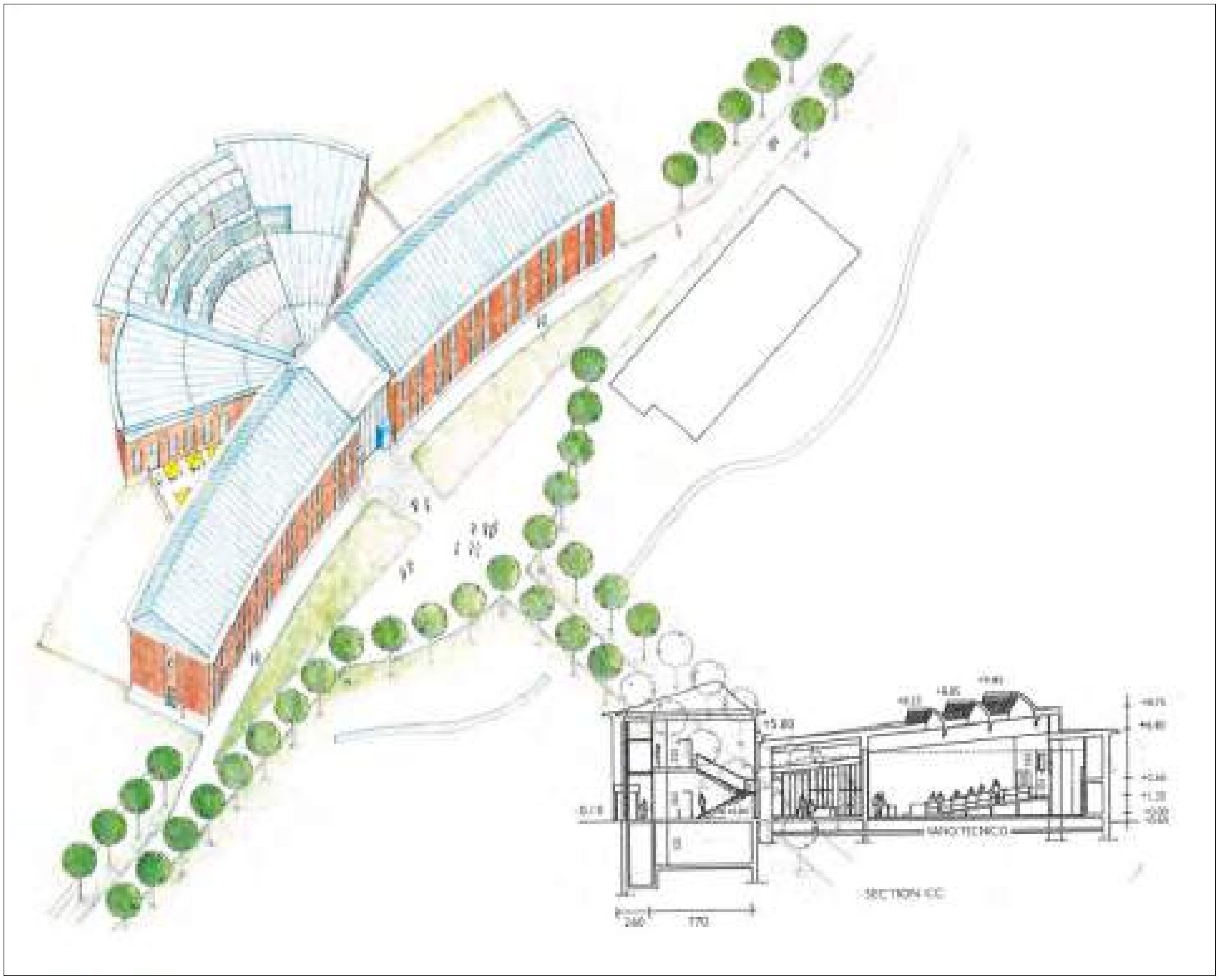
The genesis of the *EcoCentre* project can be understood by considering that the Ispra site's management felt obliged to manage its environmental impact responsibly, deeming this particularly important for a research centre conducting studies in the environmental field.

However, as the centre had been built during a period when there was little interest in energy and the environment, it produced significant quantities of pollutants such as carbon dioxide and sulfur dioxide, both on site and indirectly at the power plants of the national electricity



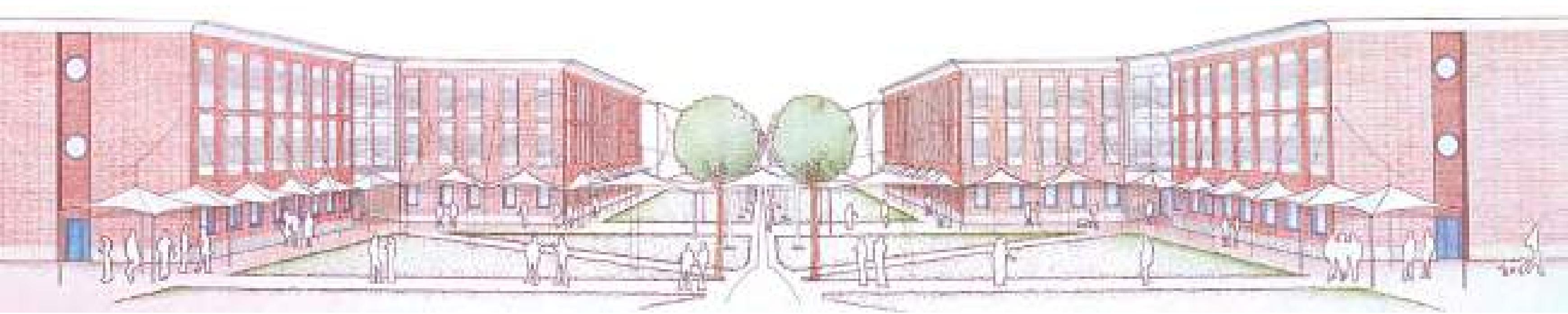
Ispra EcoCentre: detailed
plan of the *dense zone*.

authority, where the electricity consumed by the Centre was generated. The *EcoCentre* project thus aimed at several objectives: reducing Ispra's environmental impact, both locally and globally, by constantly increasing the amount of green areas compared with anthropic areas within the Centre, decreasing the level of pollutants in all gas and liquid emissions, reducing the quantity of such emissions and improving energy efficiency in buildings and facilities.
To achieve these objectives, the *EcoCentre* relied on a master plan that would designate the area



The ECB building and annexed amphitheatre.

Drawing of the buildings demarcating the main square and the beginning of the main avenue.



where each new construction would be located and included a building code specifying the standards required for all new buildings to ensure low energy consumption and the use of non-polluting materials.
A series of activities was also planned, worth noting as they anticipated a future that would later be realised, or at least aspired to, in the Member States.
These included monitoring all energy flows and major emissions through detailed measurements and supervision across the entire site; drawing up and investing in an environmental and energy-saving action programme; investing in a programme to construct new low-energy buildings to replace old, irreparable ones; installing a co-generation plant for the production of heat, cooling and electricity; and improving the efficiency of the wastewater treatment plant by separating grey water from black water before it entered the plant. The project also aimed to encourage walking and cycling instead of car use, by creating pedestrian-only roads; in addition, low-emission service vehicles were gradually introduced. Furthermore, an IT system was created to ensure that both management and staff were informed of progress made on the project.
One of the main goals of the site development plan was to manage the Ispra site's land and vegetation in an ecologically and aesthetically sound manner. The management was naturally aware that it would take years to implement the master plan, but, from its launch onwards, all measures taken were to aim in that direction. In particular, the following objectives were to be pursued: designating artificial and natural areas; interconnecting green areas to form a network of biotopes; protecting and enhancing the existing natural landscape; conserving and supporting existing ecosystems; arranging open and wooded spaces; and promoting biodiversity.
Another necessity for the development of the urban plan was the drafting and approval of a set of ecological standards to measure all the objectives set.
To advance the implementation of these standards, two areas of activity were proposed. The first concerned the management of surface water. The master plan outlined a system for draining and discharging surface water, based on the topography and characteristics of the different designated areas. Rainwater and cooling water were to be collected in three main artificial watercourses leading to sedimentation basins, from which they would be channelled, via overflow systems, into natural waterways flowing into Lake *Maggiore*.
The quantity transported depended on rainfall and the flow of cooled water.
The system could be implemented through several actions in line with the overall project, but, before proceeding, it was necessary to check that the water flow capacity was sufficient by comparing it with the maximum load calculated based on Ispra's meteorological data.
The second activity concerned landscape development. For the green areas of the *EcoCentre*, the most important development goal was to provide a wide variety of liveable spaces suitable for flora and fauna, thereby achieving a broad diversity of species.
The master plan proposed numerous appropriate methods and measures to achieve this goal. Since improving the biotope network was the fundamental strategic objective, everything depended on the different habitat needs of animal and plant species and could not, therefore, be generalised in the abstract. However, certain points in the biotope network could be identified, such as areas bordering water bodies and forest edges.
As a first step in implementing the network, detailed plans for some of these areas were to be developed.
This would involve defining the species, from planting schemes to the final establishment of grass cover, shrubs and trees. The scheme would

then be implemented in selected prototype areas and validated over a period of at least one year. In summary, the proposed landscape development in the *EcoCentre* project would be less costly than constructing buildings but could achieve significant results only if all future interactions, large or small, were consistent and aligned with the overall concept. In this case, all infrastructural activities related to the landscape would need to be controlled to ensure their compliance with this condition: for example, tree felling would need to be accompanied by landscape improvements, and new construction work would need to comply with the plan through concurrent reduction of paved areas. To reduce the total paved area, such reductions would always have to exceed the area occupied by new buildings, roads and associated parking spaces. Once again, the site's planning and architecture took on a programmatic character, reflecting the JRC's political and scientific objectives. In a context entirely different from the 1950s, the management of the Ispra site explored the possibilities not only of sustainable urban planning in terms of consumption but also of translating into the anthropic space of a research centre the knowledge on biodiversity and the protection of the natural environment. The human presence, no longer subject to the the relocation constraints typical of the early days of nuclear research, became concentrated in the dense zone, facilitating contact and collaboration among researchers, while also promoting sustainable mobility.

Footpaths and
green areas.

While ideas of renewal and aspirations for a more liveable world, characteristic of that historical period, found their tangible representation in the *EcoCentre* project within the Ispra context, discussions were taking place elsewhere to imagine the future of a Europe no longer divided by the Cold War and to chart a course towards it.

In October 1993, the first European Science Summit was held in Brussels. Organised by the European Parliament, the event brought together over 600 scientists, research leaders and representatives of European industry for a series of conferences and discussions on the future of research in Europe.

The following month saw the first European Week for Scientific Culture, targeting the general public and aiming to raise awareness of issues related to the development of scientific education and culture in Europe. Meanwhile, the inclusion of scientific and technological institutions from the former Warsaw Pact states and the former Soviet Union was one of the priorities in drafting the fourth framework programme. And 1993 also saw significant recognition of the European University Institute (EUI) in Fiesole, near Florence in Italy, the realisation of an idea proposed in the Euratom Treaty, which, alongside the College of Europe in Bruges, took on new importance for the project of higher education in Europe.

The Parliament approved the fourth framework programme in April 1994, while the Commission developed the guidelines to structure the debate on the coordination of research policies and activities in Europe. Participating in this debate was the newly created European Assembly of Science and Technology, a forum for dialogue between the scientific community and industry at the European level. Composed of 100 leading scientists and representatives of industrial research, it was intended to serve as a new advisory body to the Commission on scientific and technological matters.

Within this framework, however, the role of the JRC remained unchanged; it continued to operate under the principle of the Commission as both contractor and client.

In 1994, the Institute for Prospective Technological Studies was relocated to Seville, in line with the principle established for the creation of the JRC after the Euratom Treaty. Spain, which had joined the Community in 1985 along with Portugal, had requested to host a JRC site.

The institute was moved on the eve of a further significant enlargement of the new European Union, which in 1995 saw the accession of Austria, Finland and Sweden.

That same year, the Institute for Systems Engineering and Informatics developed innovative environmental technologies to enhance industrial reliability, particularly in the transport of hazardous substances. Additionally, the institute managed the Community Documentation Centre on Industrial Risk (CDCIR) and the Community Documentation Centre on Biotechnology Safety and Regulations (BIOSAFE). The Institute for Environment continued its studies on air, soil and water pollution, as well as indoor pollution (mainly due to radon), and on the role of natural and artificial aerosols in global warming. The activities of the Institute for Remote Sensing Applications focused on developing advanced earth observation techniques, establishing the Centre for Earth Observation (CEO), and providing technical support to the newly established European Environment Agency (EEA).

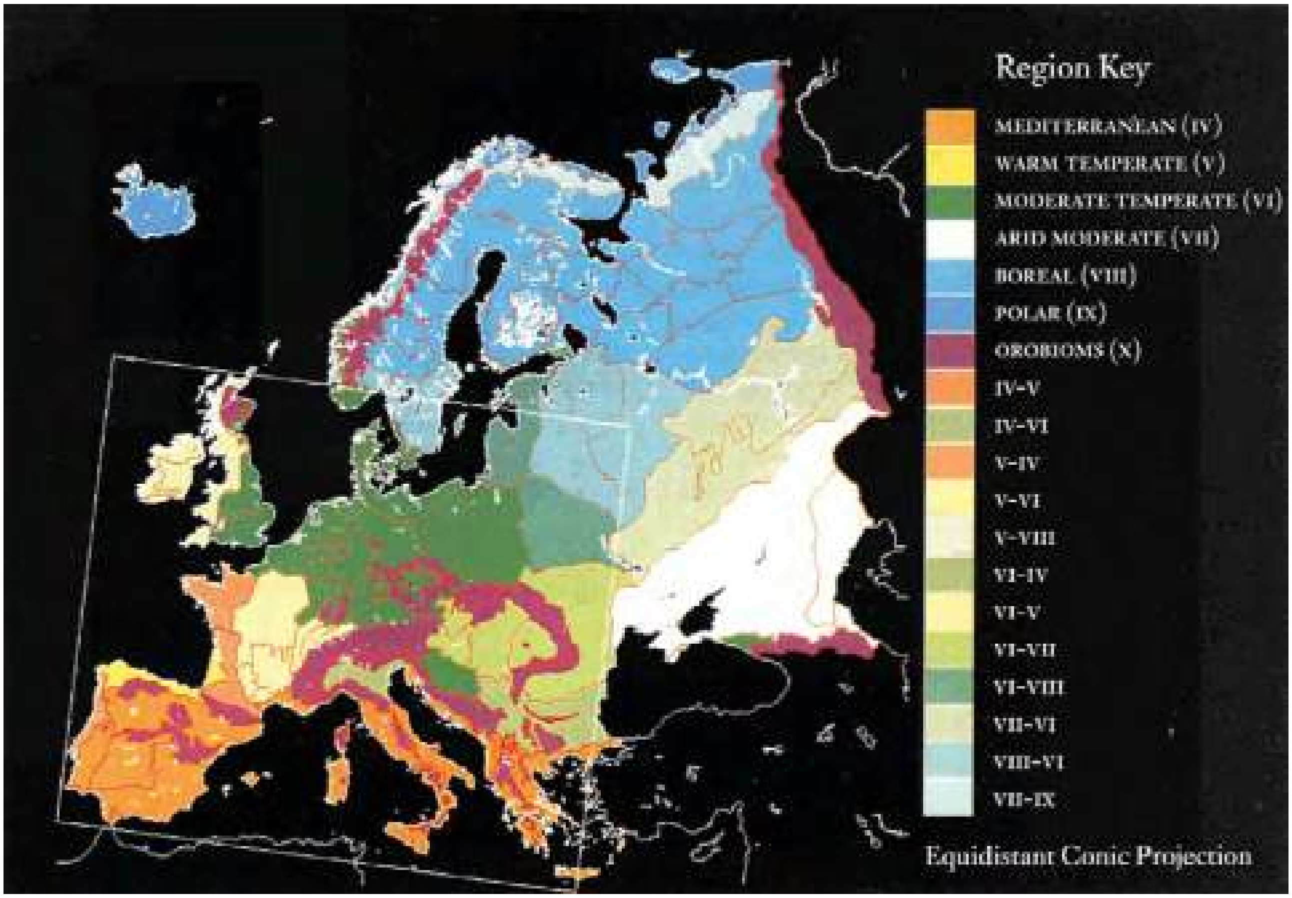
The same institute provided statistical data based on satellite measurements, particularly to assess agricultural production (MARS Stat) and verify the compliance of cultivated areas with the levels set by the common agricultural policy (MARS Cap).

In July 1996, the Commission adopted a communication entitled *'Inventing tomorrow: European research at the service of the citizen'*, aimed at initiating a period of reflection on the fifth framework programme.

A research project on transmissible spongiform encephalopathies was launched due to the so-called mad cow disease.
Since the previous year, the JRC had grouped its activities into two areas: nuclear and non-nuclear. This approach reflected the rationale inherent in the European integration process, which saw earlier treaties, such as the Euratom Treaty, remain in force, being incorporated into the new European Union. To enable the JRC to continue its activities under the best possible conditions, the Commission decided to reorganise it, once again transforming it into an autonomous Directorate-General and merging two institutes in Ispra.

This led to the creation of the Institute for Systems, Informatics and Safety, combining the former Institute for Systems Engineering and Informatics and Institute for Safety Technology. This brought the number of JRC institutes to seven, distributed across the existing sites plus the new site in Seville.
In 1998, to strengthen its role in providing scientific and technical support to Community policies, the Commission reorganised the JRC once more, creating a new Institute for Health and Consumer Protection in Ispra. The implementation of the two specific programmes, nuclear and non-nuclear, remained unchanged. The JRC thus consolidated its role as a Commission service – that is, as the Commission put it, a point of reference in science and technology for the EU.

Centre for Earth Observation: categorisation of Europe's forests, 1995.



Collecting a sample for DNA extraction.

Thanks to its privileged position in the policymaking process, it operated in the common interest of the Member States while remaining free from specific commercial or national interests. To fulfil its mission effectively, the JRC relied on a unique combination of facilities and expertise that transcended national borders. Furthermore, the JRC's networks enabled it to promote scientific collaboration and expand the knowledge base available to the entire EU.

As further evidence of this role, in 1998, researchers at the Ispra centre demonstrated the validity of an analytical method for identifying genetically modified agricultural products, including maize and soya.

The fifth framework programme was launched in 1998 and – unlike previous programmes, which had organised research activities by scientific and technological discipline – it focused on research efforts on 23 main socioeconomic themes, referred to as 'key actions', such as health and the environment, ageing, and clean and renewable energy.

Aiming to establish a clear connection between research and society, the fifth framework programme sought to enable EU citizens to benefit more directly from research results, starting with job creation and the improvement of living and working conditions. Moreover, the inclusion as participants in the programme of 10 candidate countries in central and eastern Europe, Cyprus, the European Economic Area countries and partner countries such as Israel and Switzerland brought the number of countries with full access to the programme to 31.

The JRC's activities within the non-nuclear framework programme developed along three main lines: serving the citizen, improving sustainability and supporting European competitiveness. Within this framework, the newly established Institute for Health and Consumer Protection was to play a fundamental role. Its activities were primarily directed towards verifying the authenticity of food products, establishing anti-fraud measures and using nuclear facilities for medical purposes.

The same institute provided scientific assistance to the Commission on several specific occasions, including ensuring the quality of measures implemented in national laboratories in the wake of the 1999 dioxin crisis in Belgium, when significant amounts of polychlorinated biphenyls were found in animal products, particularly eggs and chickens, which then entered the human food chain.

Meanwhile, the Geel institute provided the necessary reference methods and materials to validate these measures, encouraging the establishment of improved certification procedures and quality control measures.

The new vision for European research was also expressed in February 1999 through the Commission's communication entitled *'Women and science: Mobilising women to enrich European research'*. This initiative had the dual objective of fostering debate and the exchange of experiences among Member States on national initiatives aimed at increasing women's participation in research and developing a

JRC researcher performing food safety analysis.

coherent strategy to do so within the fifth framework programme. The Commission set itself the goal of achieving 40% female participation in expert committees and programme evaluation groups.

The European Parliament also aligned itself with the spirit of the initiative, urging the Commission to take further measures to address the insufficient presence of women in scientific fields. By June 2000, it had even considered integrating the gender dimension into the specific programmes of the fifth framework programme. This was a period of significant transformation and dynamism.

In January 2000, the Commission adopted the communication *'Towards a European research area'*, which envisaged a borderless space for scientific activities where resources could be better utilised to create jobs and enhance Europe's competitiveness.

The initiative pursued two specific objectives: to strengthen the coherence and, consequently, the impact of research activities conducted in Europe and to reconcile European citizens with science and technology.

Within this framework, the JRC was offered a potentially pivotal role, linked to its ability to contribute to the creation of EU systems of technical and scientific reference.

Just over a year later, in April 2001, another communication, entitled *'The mission of the JRC in the European research area',* would redefine the JRC's priorities. It was established that, given the JRC's finite resources and the impossibility of its being proficient in all scientific and technical fields, it would need to focus its activities on specific areas of expertise and targeted horizontal support activities.

The three pillars of expertise that would shape the JRC's future directions were: food, chemicals and health; environment and sustainability; and nuclear safety.

A series of horizontal competences would support and complement these pillars, including the production of reference materials and measurements and the development of risk management tools aimed at enhancing public safety and security in a broader sense, including anti-fraud efforts.

In reaching these conclusions, the Commission once again relied on the analysis and recommendations of a group of independent experts, as described in the next chapter.

Map of the European Union in 2000
(Administrative boundaries: © EuroGeographics
© OpenStreetMap).

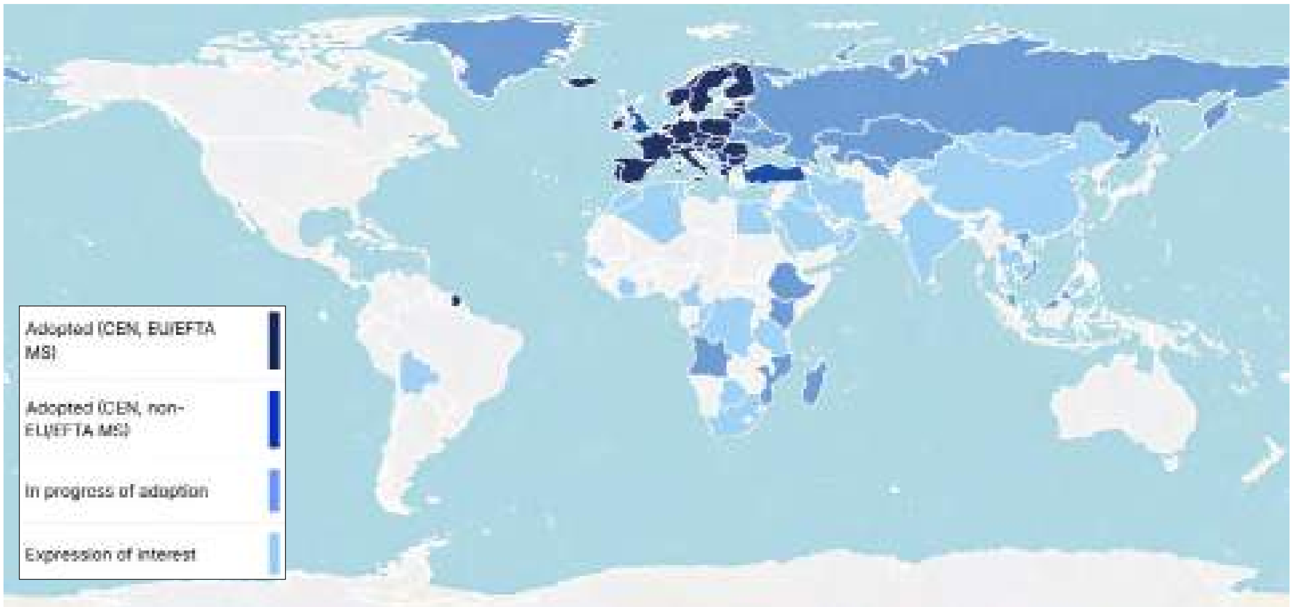
The European Laboratory for Structural Assessment (ELSA)

Earthquakes pose a serious risk in vast areas of the EU and worldwide.
Their impact, both in terms of loss of human lives and disruption to commercial and social activities, is often dramatic; as earthquakes are largely unpredictable, it is generally impossible to evacuate at-risk areas before they occur.
Among all natural hazards, earthquakes are therefore among the most significant; however, their toll in human lives can be significantly reduced through appropriate preventive measures.
Since high-intensity earthquakes are normally infrequent, structures can be designed to withstand them and still maintain stability, thus saving lives, albeit accepting potentially significant levels of damage. This, however, complicates the predictability of the structures' response and the evaluation of safety margins. To increase predictability, experiments on realistic-scale structures simulating high-intensity earthquakes are needed.
In the early 1990s, the JRC in Ispra built ELSA, a research infrastructure capable of subjecting full-scale or even life-size building models of up to four storeys to simulated seismic events.
This contrasts with the approach used in many other laboratories, where a shaking table tests models 10 or 20 times smaller than real structures, providing results that are far less reliable and difficult to extrapolate to real buildings.
The heart of ELSA is a 16-metre-high, 21-metre-long reaction wall, with two reaction platforms covering a total surface area of 760 square metres, enabling full-scale samples to be tested on both sides of the wall. Powerful actuators can apply forces to a building analogous to those occurring during an earthquake, making it possible to evaluate exactly how and where the building fails depending on its design parameters and construction materials. The control system for the actuators was designed in house to perform highly complex seismic or cyclic tests while collecting data from more than 200 sensors distributed across various parts of the sample.
The unique data obtained from the experiments conducted at ELSA are essential for the development of the Eurocodes, the European standards for construction design, with which national regulations are aligned.
In the EU, buildings must be constructed to standards that ensure earthquake resistance based on the

View of the ELSA building under construction, 1991.

Preparation of an experiment in the ELSA plant, 2019.

characteristics of the territory where the building is located. The legal requirements to ensure these construction standards are met in practice are specified in the Eurocodes. These set out both seismic and fire safety standards for buildings and other civil-engineering structures, which can be adopted into the regulations of Member States.
The first European building standards date back to 1992, with a complete set established in 2007 and a new generation scheduled for publication in 2026.
The JRC plays an important role in maintaining and providing public access to these standards, which are fundamental to the single market, ensuring public



Interest in the Eurocodes globally (Source: JRC, based on Webtools + © EC-GISCO + Leaflet | © OpenStreetMap contributions © EuroGraphics © UN-FAO for the administrative boundaries, *Eurocodes use outside EU/EFTA Member States* https://eurocodes.jrc.ec.europa.eu/en-eurocodes/use-outside-euefta-member-states#worldwide-interest-in-the-eurocodes).

safety and fostering greater competition among Member States.

Many non-EU countries have also adopted or are in the process of adopting the Eurocodes.

Besides the 27 EU Member States, the 4 European Free Trade Association (EFTA) countries and the United Kingdom, the Eurocodes have been adopted or are in the process of being adopted in 9 other countries whose national standardisation bodies are full members of the European Committee for Standardization (CEN), as well as in 13 countries with other affiliation statuses within CEN.

A total of 36 further countries, including China and India, have expressed an initial interest in adopting the Eurocodes.

ELSA remains the second-largest facility of its kind in the world. Since its inauguration in 1992, it has been visited by many prominent political figures, including the President of the Italian Republic, Carlo Azeglio Ciampi, on 22 September 2000.

Since then, ELSA has expanded its scientific activities to include studying the safety of structures under terrorist attack using experimental and computer modelling techniques.

Furthermore, ELSA is used to study the application of new construction technologies to improve building safety. Since 2017, ELSA's facilities have been made available to universities, public bodies and industry within the EU under specific conditions as part of a dedicated initiative.

ELSA has proven to be an important investment for the JRC. Buildings constructed according to the Eurocodes have demonstrated better resistance to even severe seismic events, saving lives and limiting economic damage. In parallel, the JRC's activities in Ispra on the built environment have evolved, extending to new topics, including smart buildings and much more environmentally sustainable construction.

The Director of the Institute for Systems, Informatics and Security, David Wilkinson, leads the President of the Italian Republic, Carlo Azeglio Ciampi, in his visit to ELSA, 22 September 2000.

The European Chemicals Bureau (ECB)

Regulation (EC) No 1907/2006 concerning the registration, evaluation, authorisation and restriction of chemicals (the REACH Regulation) is the main piece of EU legislation aimed at protecting human health and the environment from the risks that may arise from potentially hazardous chemicals at certain levels of exposure or environmental concentration.
In this field, the EU has an independent regulatory agency based in Helsinki, the European Chemicals Agency (ECHA), which has been operational since 2008. Before ECHA was established, the ECB of the JRC in Ispra played a key role for around 15 years in developing and implementing the EU legislative framework on chemicals.
In 1979, the sixth amendment to the EU directive on dangerous substances provided for the creation of an inventory called the European Inventory of Existing Commercial Chemical Substances (EINECS).
The responsible Directorate-General (DG XI, later DG Environment) requested the support of the JRC to set up the EINECS database, which included around 100000 entries reported on the EU market before 18 September 1981.
The project, which began with a preliminary study at the end of 1978, was completed in 1990 with the publication of EINECS in the *Official Journal of the European Union*.
The success of this project prompted DG XI to seek further support from the JRC in implementing legislation on industrial chemicals.
Following a communication from the Commission to the Council and the European Parliament, the ECB was formally established on 1 January 1993.
Placed within the JRC's Environment Institute, the ECB's objective was to carry out and coordinate the scientific and technical work required to implement EU legislation in the field of chemical control.
The ECB's tasks were initially organised into the following main areas of work, based on the legislation to which they related:

- classification and labelling of dangerous substances (Directive 67/548/EEC),
- test methods (Directive 67/548/EEC),
- notification of new substances (Directive 67/548/EEC) and related risk assessment (Directive 93/67/EEC),

The cover of the first volume of EINECS.

The cover of an ECB EU risk assessment report.

Logo of the International Uniform Chemical Information Database, version 5.

Next page:
The ECB building.

- data collection and risk assessment of existing substances (Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94),
- control of exports and imports of dangerous chemicals (Council Regulation (EEC) No 2455/92 and subsequently Regulation (EC) No 304/2003).

In the years that followed, the ECB assumed an increasingly important role in the evaluation, management and control of risks posed by chemicals circulating in the EU. It coordinated the risk assessment of priority substances and the drafting of the corresponding EU Risk Assessment Reports (RARs). To this end, starting from drafts prepared by Member State authorities, the ECB organised and chaired meetings of experts from the Member States, seeking consensus on the conclusions of the risk assessments. Meanwhile, the ECB's portfolio of activities was expanded with additional tasks, particularly the authorisation process for biocides (Directive 98/8/EC) and the development of computational toxicology as scientific support for chemical legislation.

The subsequent discussions among stakeholders led to a Commission proposal for the REACH Regulation. This regulation would include, among other things, the establishment of ECHA.

The Commission's idea was to propose Ispra as the location for ECHA, as it was already the site of the ECB, and to propose Helsinki as the location for the European Food Safety Authority (EFSA).

However, this proposal was not positively received by the President-in-Office of the European Council, Silvio Berlusconi, who insisted on having EFSA in Parma.

The outcome of the discussion was therefore that ECHA was located in Helsinki and EFSA in Parma. With the entry into force of the REACH Regulation in 2007, the JRC progressively transferred the ECB's activities to ECHA, along with a series of guidance documents developed for the implementation of REACH and some of its staff.

On 1 June 2007, an initial group of 40 staff seconded from the Commission began setting up the Agency in Helsinki. The JRC in Ispra nevertheless retained an important knowledge and expertise base on

From 1993 onwards, in association with the OECD, the ECB developed the International Uniform Chemical Information Database (IUCLID) as the main tool for collecting and exchanging data required for risk assessment under the EU programme on existing chemicals. In 1998, as part of a reorganisation of the JRC, the ECB was transferred to the newly created Institute for Health and Consumer Protection (IHCP), together with other units working in life sciences and consumer products. In 2000, based on an ECB study on the availability of data on existing substances, the European Parliament initiated a debate on the need for a new chemicals policy.

chemicals and their interaction with living organisms, forming a solid foundation for new activities in the health field in the years to come.

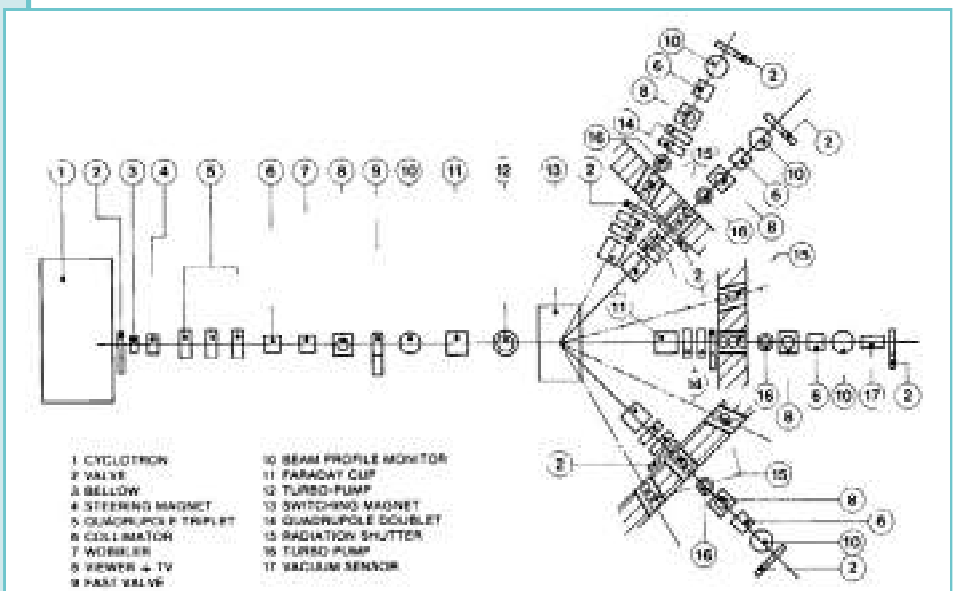
The EU legislation on chemicals is today among the most advanced in the world.

It not only ensures the timely identification of the intrinsic properties of chemicals and the adoption of appropriate measures for their management but also establishes an important reference framework for production and trade in a key industrial sector.

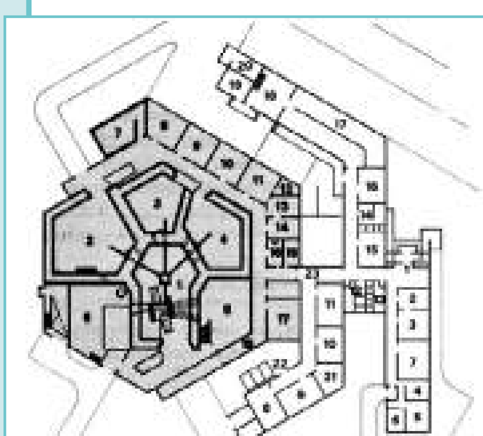
Part of the credit for this success is due to the JRC and the enduring legacy of the ECB's 15 years of activity.

The MC 40 Scanditronix cyclotron

One of the countless technical challenges to be addressed on the path towards the realisation of a thermonuclear fusion reactor is the damage to structural components caused by exposure to radiation generated by the high-energy neutrons produced in the fusion reaction.
To simulate this type of damage and test materials of interest for such reactors, a variable-energy cyclotron was installed at the physics division of the JRC in the early 1980s.
A cyclotron is a machine used to accelerate beams of electrically charged particles by means of a combined electric and magnetic field. These particle beams, particularly light ions, are much easier to produce in a laboratory than neutron fluxes.
Although different from neutrons, which are electrically neutral, they became established in the late 1970s as a simulation tool for studying radiation damage.
The MC 40 variable-energy cyclotron was manufactured by Instrument AB Scanditronix in Uppsala, Sweden.
It accelerated protons, deuterons, alpha particles and helium-3 ions, reaching a maximum energy of between 20 and 50 megaelectronvolts, depending on the type of particle, and generating currents with



The MC40 Scanditronix cyclotron.



Plan of the cyclotron laboratory.

intensities ranging from 30 to 60 microamperes. The particles could be channelled into three distinct beams, enabling multiple experiments to be conducted in parallel.

The cyclotron laboratory consisted of two separate buildings connected by a short corridor. The active building (building 50) had an irregular hexagonal shape and housed the cyclotron chamber, the three irradiation cells, the cooling and ventilation system room, the power supply room, the control room and the computer room with the experimental data acquisition system. It also contained three laboratories for the preparation and final control of irradiation experiments, chemical laboratories, a hot mechanical workshop and other rooms for activity monitoring. The other building (building 50A) accommodated the offices of operational and maintenance staff, a cold mechanical workshop and the electronics and vacuum laboratories used for the maintenance of the accelerator.

The first years of the cyclotron's operation were devoted almost exclusively to studies on materials for fusion reactors.

After some years, following developments in international agreements on fusion and a revision of the JRC's research programme, the decommissioning of the facility was scheduled for 1 January 1995. However, once again demonstrating its adaptability, the JRC repurposed the cyclotron to produce radioisotopes for medical diagnostics for hospitals in southern Europe.

This initiative, undertaken in collaboration with a commercial partner, was not only fully aligned with the JRC's new strategic focus on greater engagement with industry but also addressed a genuine social need while providing substantial economic returns to support the facility's maintenance.

In the subsequent period, the production of medical radioisotopes became increasingly consolidated and diversified. By the 2000s, the cyclotron was routinely used to produce fluorine-18, an isotope employed as a tracer in positron emission tomography (PET), a diagnostic technique for oncological, neurological, and cardiological conditions. It also produced substances such as copper-64 and astatine-211, used respectively in PET diagnostics and oncological therapy. During this period, the cyclotron also served as a Marie Curie training site, offering doctoral students the opportunity to spend up to a year at the JRC as part of their research work.

In parallel with the production of radioisotopes, the cyclotron continued to contribute to various research projects. Throughout the 1990s, the equipment was used for studies on the corrosion of metal alloys within the Institute for Advanced Materials.

After 2000, once integrated into the Institute for Health and Consumer Protection, the cyclotron team continued research on the corrosion of biocompatible materials for various prostheses and gradually came to specialise in the field of nanotoxicology.

The ion beams produced by the facility were used to radiolabel nanoparticles, enabling their tracking in biological matrices.

Radiolabelling and characterisation of nanomaterials thus became the cyclotron's predominant research applications until the facility's final shutdown on 22 December 2014.

On 20 December 2017, the JRC launched a call for tenders to select an entity interested in receiving a donation of the MC 40 cyclotron and its related equipment. Following this call, on 20 November 2019, the JRC signed an agreement with the Czech Technical University in Prague for the transfer of the cyclotron to Czechia.

Thus, with one final success and the beginning of a new chapter, the story of one of the most versatile and profitably applied installations in the history of the Ispra site came to an end.

Medical radioisotopes produced at the JRC in Ispra.

Inside the cyclotron chamber, 1990s.

Chapter V

The European Research Area and support for Community policies (2001-2015)

Satellite view of the site, 2001.

Chapter V

The European Research Area and support for Community policies (2001-2015)

The Treaty of Maastricht had included provisions on the creation of economic and monetary union, including the introduction of a common currency, the euro. The criteria for adopting the new currency, colloquially known as the Maastricht parameters, concerned the deficit to gross domestic product (GDP) ratio, the debt-to-GDP ratio, the inflation rate, interest rates and membership of the European Monetary System for at least two years.

The Treaty of Amsterdam, which came into force on 1 May 1999, sought to update the Treaty on European Union in light of the changes occurring in eastern Europe. It incorporated the Schengen agreement into the first pillar and, among other things, formalised constructive abstention as a procedure of the Council in matters of foreign and security policy, thereby limiting unanimity for the first time. The subsequent Treaty of Nice marked further progress in addressing the need to modernise the functioning of the EU, a need that the Treaty of Amsterdam had only partially addressed. Signed in 2001 in the city of Nice on the French Riviera, the treaty came into force on 1 February 2003; however, its effects on the EU institutions were felt immediately. On the one hand, the ratification process ran parallel to the introduction of the single currency. The euro was introduced as a virtual accounting unit in 1999 and appeared as physical cash in 2002 in 12 of the then 15 Member States of the EU.

Entry of the euro into circulation, 1 January 2002.

Étienne Davignon,
2003.

This was a significant change, comparable perhaps only to the attempted creation of a European Defence Community, which had failed. The two were similar in that currency, like the armed forces, represents the very essence of national sovereignty.

On the other hand, the entry into force of the Treaty of Nice coincided with the European Convention, which addressed unresolved issues arising from the treaty, particularly regarding the EU's fundamental charter and its institutional framework. The treaty had changed the weighting of votes in the Council, the composition of the Commission and the number of Members of the European Parliament, but it had not included the Charter of Fundamental Rights of the European Union among its provisions.

The euro project objectively strengthened the European space, making it more cohesive than ever before. The convention aimed to conclude that elusive phase of the European Union during which it was neither a federation nor merely an international organisation.

It is therefore clear why so much attention was focused on the creation of the European Research Area and why the role of the JRC within this space needed to be defined, with all the implications that yet another redefinition of its role entailed. In January 2000, the Commissioner for Research, Philippe Busquin, established a high-level group chaired by a key figure in European construction, former European Commissioner Étienne Davignon.

The group, tasked with formulating recommendations, outlined them in a report that analysed the JRC's areas of activity and suggested the personnel and financial resources that should be allocated to them. This led to an examination of the operational consequences of the JRC's mission to assist in the EU policymaking process, with particular attention paid to its relationship with the European Parliament.

The report also reflected on how the JRC could better collaborate with other centres of excellence in the Member States and what changes were desirable in its governance structure. All of this would determine the path towards integrating the JRC into the European Research Area.

The report stated that, without serious reform, the JRC could not provide the scientific contribution necessary for the development of research and scientific expertise in Europe. The need for change was certainly recognised within the JRC, which was working to promote an interdisciplinary approach to its work through project clusters involving more than one institute. It was also striving to improve relations with other Commission Directorates-General.

However, according to the expert group chaired by Davignon, these efforts had not been sufficiently successful.

The experts believed that if the JRC remained solely a tool of the Commission, its relationships with the Member States and the Parliament would remain ambiguous.

Their main recommendation, therefore, was to transform the JRC into a body serving the EU as a whole, answering to all three institutions, as they all required scientific advice, research and services to support their respective legislative and governance roles.

Increasingly, when proposing legislation, the Commission needed access to high-quality, up-to-date and relevant scientific knowledge to inform its decisions.

Similarly, the Council and the Parliament needed scientific verification to legislate and had to be assured that proposed legislation was scientifically sound. A primary function of the JRC would be facilitating the collection and fair assessment of information on scientific and technological issues, to inform the EU institutions about the current state of knowledge on a given scientific topic.

The Commission also bore responsibility, on behalf of the EU, for monitoring existing legislation and, for example, ensuring that countries or organisations complied with the obligations imposed by directives.

To support these functions, the Commission required an independent scientific resource capable of developing monitoring systems or new measurement tools, independently, in collaboration with others or through subcontracting. In times of crisis, all three institutions needed scientific support to underpin the EU's response.

Davignon argued that it was therefore important that all the institutions could turn to a single source of EU scientific advice, capable of providing all of them with an impartial and informed assessment of the available ideas on a given topic. If each institution acted independently, they might receive conflicting advice and opinions. Even when a plurality of opinions was legitimately required, the JRC could still coordinate the debate rather than leaving it to interinstitutional dynamics.

The key point was that the JRC needed to be given a mandate tied to delivering what the institutions said they required, rather than what the JRC thought was necessary, as had often been the case in the past, in the absence of clear guidance. To assume this role, the JRC needed to become an organisation integrated into the broader scientific community, capable of collecting, monitoring and analysing research findings to reference the latest thinking or know-how. It had to ensure that information on a given topic was available, validated and fairly assessed, particularly when there were conflicting opinions or research findings.

In responding to requests for research or services, the JRC had to operate openly and transparently, making the results of its work available to all the EU institutions.

In fulfilling this function, the JRC would play a key role in facilitating the creation of a network of European centres of excellence and a common European system of scientific and technological reference, as envisaged in the Commission's communication *'Towards a European Research Area'*. It also needed to develop reference and testing products.

The JRC had to be able to meet the institutions' demands both autonomously, through the work of its own high-quality research facilities at the forefront of their fields, and in collaboration with others, through the creation of networks or subcontracting. Consequently, the JRC should no longer establish new institutes or research groups every time a new scientific area of interest emerged, especially when alternative centres of expertise already existed.

If the JRC were reformed in this way, the institutions would develop a sense of ownership

and involvement, rather than being passive recipients of services. The JRC would become the first point of reference for any EU body requiring scientific advice, research or services.
The report recommended that the three EU institutions should assess and set out their needs for scientific advice and services. This assessment was to contribute to the drafting of the JRC's work programme after 2002 through an additional resolution on a five-year cycle.
Logically stemming from this was the recommendation to develop highly user-friendly internet-based services to make the collected information easily accessible to EU institutions, scientific institutes within the European Research Area and EU citizens.
Furthermore, in line with its new mission as a tool of the EU, the JRC was to establish closer links with external organisations and experts, becoming part of a network of European reference centres.
The report also argued that activities outside the nuclear sector should primarily address the concerns of EU citizens, including issues related to health, food, the environment, privacy and the security of economic activities, including addressing new crimes linked to the information society and intellectual and industrial property rights. Great importance was attributed to EU enlargement, as this process, a priority for the EU, required scientific expertise on significant issues for the implementation of technical assistance programmes (both in the nuclear and non-nuclear fields).
In relation to common foreign and security policy, one of the pillars of the EU established in the Treaty of Maastricht, the JRC already had expertise in the relevant areas, such as food safety and security, as well as the environment, earth observation and information systems.
The report proposed that the JRC should, for example, play a leading role in the Global Monitoring for Environment and Security (GMES) initiative, first discussed in 1998, which concerned monitoring global change, environmental issues, natural disasters and industrial pollution and providing useful information to support the EU's common foreign and security policy.
Conversely, projects deemed less relevant to the JRC's new mission were to be discontinued.
A reform of this kind inevitably affected personnel, with regard to whom the report recommended greater mobility and increased use of short-term contracts to encourage a constant influx of new talent. When new specific needs were identified, the JRC was to bring together the necessary experts from external sources for a limited period.

One of the many 'From enlargement to integration' seminars organised at the JRC with researchers from future Member States.

Collection of samples for nuclear forensic analysis.

Equally central to the reform was, unsurprisingly, the JRC's budget. The Centre needed to know what its funding would be and what it was intended for, rather than the current situation where it knew how much funding it received but lacked sufficient guidance on how to spend it.
In the field of nuclear research, looking eastwards with enlargement, the JRC was to play an increasingly important role in supporting central and eastern European countries to improve the performance and safety standards of their nuclear facilities, similar to the role it played within the EU.
JRC experts were to provide technical expertise in enlargement negotiations when nuclear issues were discussed. Later, they would be called upon to prepare future Member States to apply the provisions of the Euratom Treaty and to contribute to combating illicit trafficking.
The report concluded that the time needed to transform the JRC from its exclusively nuclear origins into the diversified and multidisciplinary scientific body by now had ended.
It rejected any suggestion that the boundaries between nuclear and non-nuclear activities were sometimes blurred and too indistinct to always be clearly identified. Instead, a clear organisational and managerial separation between nuclear and non-nuclear activities was needed to recognise the different challenges and opportunities the JRC faced in each area. To reflect the importance of the nuclear element of the JRC's work and to manage this autonomous operation, the report suggested creating a position for an additional Deputy Director-General responsible for nuclear matters. The post holder was to be appointed on a fixed-term contract under the authority of the Director-General.
Strengthening the management of nuclear activities was all the more important given the potential additional workload that could arise from the EU's enlargement. One of the JRC's first priorities was therefore to develop a strategy to maintain the expertise base for its nuclear activities. Since nuclear physics was no longer a fashionable scientific field, the document reported, the number of graduates in this area was declining. With many current experts nearing the end of their working lives, the pool of available experts was shrinking, and the age profile of staff working in the nuclear sector was concerning. Therefore, the JRC needed to devise a strategy to ensure the availability of adequately qualified personnel to meet its ongoing responsibilities in the nuclear sector, considering the recruitment of new staff, retaining existing human resources, bringing in new talent and providing continuous training.
Although not all the recommendations of the Davignon report, including the changes to the organisational structure, were subsequently implemented, and the JRC remained, and still remains, part of the Commission rather than a separate entity serving all the European

institutions, the report itself represented an important turning point.
It exerted significant influence both on the formulation of the aforementioned communication *'The JRC's mission in the European Research Area'* and on the evolution of the JRC in the years that followed.
The proposal to establish a European Research Area (ERA) had shaped the debate on the future of research in Europe; through that debate, the steps necessary for the realisation of the European research area were decided on. Foremost among these was the development of the new framework programme, which shaped the creation of the ERA while also taking into account two themes discussed by the Council: the relationship between science and society, and the role of women in science.
As part of a significant effort in the context of the expansion of the ERA, the EU also promoted support for the retraining of over 30 000 Russian and Ukrainian researchers who had previously been engaged in military research.
The JRC entered the first decade of the 21st century with a well-defined research profile in core activities: food and chemical safety, the environment, reliability of information systems and services, and nuclear safety.

JRC vehicle equipped to take environmental pollution measurements.

Logo of the European Network of GMO Laboratories (ENGL). The network was officially launched in Brussels on 4 December 2002 in the presence of Philippe Busquin, the Commissioner for Research.

The assistance the JRC provided in developing the EU's environmental policies remained highly significant, particularly concerning climate change; air, water and soil quality; sustainable energy; sustainable development; and environmental assessment.

Within this framework, the JRC conducted research on risk assessment related to hazardous substances and developed methods for evaluating mixtures of chemicals present in the environment, analysing how a polluted environment affects human health.

In the field of food quality and safety, the JRC developed methods for detecting specific elements in food and feed. In terms of policy implementation support, in the field of genetically modified organisms (GMOs) the JRC in Ispra worked particularly on building the European Network of GMO Laboratories (ENGL).

In the nuclear field, 2001 saw the organisation of an international summer school on nuclear sciences, attended by students from candidate countries for EU accession and from China, Japan, India, Russia and the United States.

The European Research Area became a reality at the Council meeting in Barcelona on 15 and 16 March 2002, where it was decided to increase the share of GDP allocated to research and development from 1.9% to 3% by 2010.

The EU sought to regain its competitiveness against major technological powers, simultaneously launching the sixth framework programme for 2002-2006.

The work carried out in Ispra, as the JRC's largest centre, reflected the effects of the recommendations contained in the Davignon report. Two themes in particular continued to hold an important place in the JRC's activities: sustainable development and exposure to health risks in various sectors (food, chemicals, pollution, water supply, noise).

In the same year, 2002, the activities of management of assessment data and monitoring of parameters were brought together in a functional procedure for studying the impact of pollutants on human health. Tools were introduced to assess the influence of factors related to land use, such as the impact of changes in land use on flooding, alongside simulations, forecasts and impact studies.

The multidisciplinary approach involved the use of digital modelling to interpret remote sensing images. Moreover, the JRC, not only in Ispra, had continued to develop its network of partners, which now connected it to over 1 000 universities and research institutions worldwide.

In addition, during 2002 Ispra was particularly active in the field of chemicals, providing independent scientific and technical support for the establishment of the related EU regulatory framework. Since 1991, Ispra had been home to ECVAM, which dealt with the development and scientific and regulatory validation of non-animal

Automated plant for *in vitro* toxicity testing, an alternative to animal testing.

testing methods, such as *in vitro* studies using cell culture or, later, computer modelling. Established within the framework of Directive 86/609/EEC for the harmonisation of national regulations on the protection of laboratory animals, ECVAM had been mandated to coordinate the EU-level validation of alternative testing methods and to promote dialogue among stakeholders to encourage them to develop, validate and disseminate these methods internationally. Initially, ECVAM's scientific activities focused mainly on the requirements of the EU cosmetics legislation, which gradually introduced restrictions on the use of laboratory animals for testing the safety of ingredients. When, in 2001, the European Commission published its *"Strategy for a Future Chemicals Policy"* and initiated the drafting of new legislation in this area, the JRC in Ispra played a crucial role in providing scientific support, both through ECVAM and the ECB.
In 2011, ECVAM's mandate to carry out and promote activities aimed at replacing, reducing and refining the use of laboratory animals in many areas of biomedical sciences was reaffirmed, formalising its status as an EU Reference Laboratory (EURL).
The direct actions carried out by the JRC in Ispra for Euratom saw an increase in the activities of the European Safeguards Research and Development Association (ESARDA), thus continuing the transfer of expertise through training courses.
During the following year, 2003, Ispra refined its strategy for responding to crisis situations and providing timely assistance to the Commission

Areas damaged by fires in the Peloponnese region of Greece during a particularly hot summer.

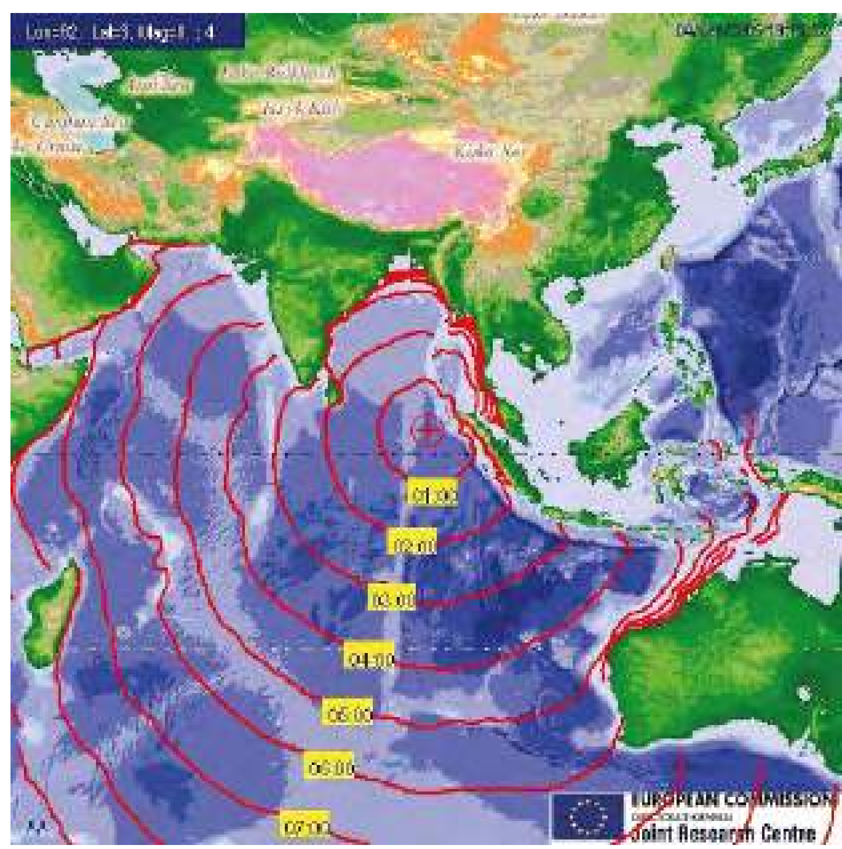
services and Member States. Within the framework of the European Forest Fire Information System (EFFIS), the JRC had provided daily fire forecast maps to services engaged in combating forest fires. The centre also used its expertise in remote sensing to assess the extent of the damage caused by forest fires.

In the area of hydrogeological instability, the development of a European Flood Awareness System (EFAS) was launched, aiming to exchange and harmonise information among the competent authorities across the EU.

Also in 2003, one of the recommendations of the Davignon report yielded its first visible results. The needs of candidate countries for EU accession had received particular attention through the JRC's enlargement activities, which included measures to increase the participation of these countries in all the Centre's relevant networks and projects, providing technical and scientific support for the transposition of EU legislation into their national legal systems and its subsequent implementation. Within the framework of the European Research Area, the

JRC continued to strengthen collaboration with scientific partners in Member States and candidate countries, expanding access to its facilities and sharing its expertise through networking with institutes, universities and industry in the countries concerned.
The JRC also sought to enhance its global reach, for example, in the environmental sector, with the automatic air pollution monitoring station installed in 2005 by the Ispra Centre on board a ship. This station collected some of the data that enabled the Commission and Member States to refine strategies related to climate change and air pollution.
The Commission also developed the first *Soil Atlas of Europe* to analyse the threats in this field, within the context of sustainable development, drawing on the Ispra Centre's extensive experience in the sector.
Similarly, an environmental information system was implemented to provide data on food needs and the distribution of aid following natural disasters and other emergencies.
After the tsunami that struck South-East Asia in 2004, the centre immediately responded by carrying out cartographic analyses at the regional, national and local levels.
In support of Euratom activities, the Centre cultivated numerous collaborations, particularly with the United Nations, Moldova, Russia and Ukraine, in the fight against the illicit trafficking of nuclear and radioactive materials.
The JRC also contributed to efforts to increase harmonisation and standardisation in the field of nuclear safety.

The challenge posed by the proliferation of weapons of mass destruction as a threat to citizens' security was addressed in October 2006, during the 25th anniversary of collaboration between the JRC and the International Atomic Energy Agency (IAEA). This event, with a strong communicative character, showcased the significant technical and scientific support provided by the JRC to the agency.
The JRC's research programme, the seventh framework programme, approved by the Council just a few weeks later, would guide the Centre's activities until 2013.
It had fully developed the Lisbon strategy, identifying the aspects that had seen the greatest convergence during the complex five-year period that had just ended.
In Ispra, the JRC would maintain its role as the EU reference laboratory (CRL, later EURL) in the



Tsunami wave propagation model developed by the JRC.

fields of genetically modified food and feed and of food contact materials, as well as providing Community reference in other areas related to its fields of expertise.

In a very different disciplinary field from those of previous decades, namely the socioeconomic domain, the JRC was to develop advanced techniques for econometric modelling and sensitivity analysis in a wide range of strategic areas, from macroeconomic modelling to short-term analysis of financial and trade cycles and the development and evaluation of composite indicators. In the related area of applying econometric and financial statistical tools to the financial services sector, the JRC was already participating in several initiatives, providing support for *ex ante* and *ex post* evaluations (including impact assessments), preparing specific indicators and conducting analyses.

Round table on financial stability organised by the JRC.
From left to right:
Professor Paul Demaret,
Rector of the College of Europe;
Dominique Ristori,
Director-General of the JRC;
Michel Barnier,
Member of the European Commission responsible for the internal market and services; and
Malcolm Harbour,
President of the Committee on the Internal Market and Consumer Protection, European Parliament.

Not long the JRC began this work, the global financial crisis that began in 2008, and the subsequent sovereign debt crisis in Europe, would highlight the weaknesses of global financial systems, having a significant negative impact on EU financial markets, particularly in the eurozone. With its scientific and modelling expertise, the JRC was able to contribute in the following period to the Commission's efforts to establish a strong and stable financial system for the EU.

In general, the European Research Area would see the JRC, and Ispra in particular, increasingly serving as a hub for networking, training and researcher mobility, providing access to research infrastructures and fostering collaborative research. This role was politically crucial for the involvement of new Member States and candidate countries.

In the field of energy, the JRC was to provide a reference framework for sustainable energy that met the needs of EU policy. In synergy with the Petten facility, Ispra would act as a reference centre for pre-normative performance control and certification of certain technologies (e.g. cleaner fossil fuels, biomass, photovoltaic energy, fuel cells and hydrogen). Furthermore, the Centre would provide information on the reliability of Europe's energy supply and the availability of renewable energy resources.

The political objective was to develop a data-driven debate that would facilitate informed decision-making regarding the appropriate energy mix to meet Europe's needs.

The transport sector also needed to become more sustainable, primarily for the sake of the environment, with research focusing on reducing emissions and their impact on ecosystems. Alongside the establishment in Ispra of the first laboratory for measuring vehicle emissions, the Vehicle Emissions Laboratory (VELA), research would be conducted on the potential for emissions reductions through emerging technologies, under different political scenarios. The sustainable transport research programme was complemented by various elements related to the technical, economic and social dimensions, such as the evaluation of new vehicle designs and of the impact of innovation on competitiveness and economic growth and the analysis of future transport policy options and of spatial and urban planning and its repercussions on health.

Execution of exhaust gas measurements in the VELA laboratory.

Energy and transport were, in fact, the main sectors responsible for air pollution. The JRC was to contribute during 2008-2013 to the EU's thematic strategy on air pollution, *'Clean Air for Europe'* (CAFE), paying particular attention to the characterisation of emissions and their attribution to different sources, in support of the development of emissions reduction strategies.

On another well-established research topic, information technology, the Centre would contribute to the development of policies in the field and the tools necessary for creating a dynamic and competitive European knowledge society, producing forward-looking analyses and strategies. Growth, solidarity, social inclusion and sustainability were the key themes considered. Life sciences and biotechnology were topics of interest for many strategic sectors, where they could make a significant contribution to achieving the EU's objectives. Here too, the JRC was soon to carry out studies on the socioeconomic impact of certain applications of biotechnology and life sciences, in support of future legislation.

Through an integrated effort in nanobiotechnology, physics, biology and applied chemistry, new regulatory strategies and technologies would be developed in Ispra for the benefit of the environment and health, including (eco)toxicological studies, food safety analysis and monitoring of the food chain.

European policies on rural development, agriculture and fisheries would also benefit from JRC research; the centre was to offer its support on the three dimensions of sustainability: production-related aspects, environmental aspects and aspects concerning consumers. Particularly in fisheries, new technologies, including the identification of fish origin based on DNA analysis, would be used to detect violations of regulations.

In line with the EU's maritime policy, then under development, the scope of services developed for the fishing industry, such as ship monitoring through remote sensing and electronic reporting, would be extended to the identification of merchant ships.

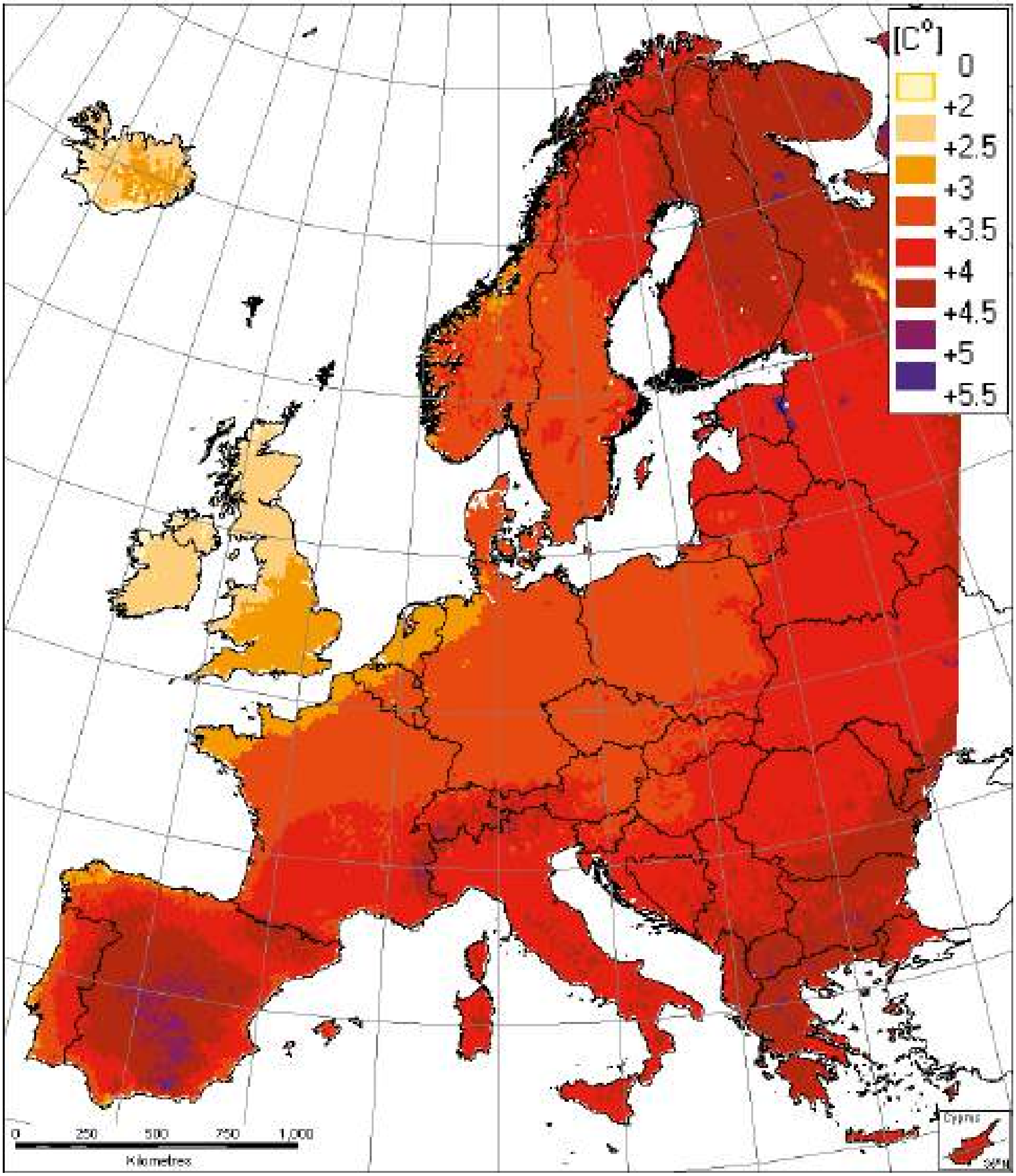
Furthermore, the impact of the ever-expanding aquaculture (i.e. fish-farming) sector was to be assessed, including environmental and socioeconomic aspects.

The reduction of greenhouse gas emissions would become a central objective under the Kyoto Protocol, an international agreement on limiting global warming, effective in 2005.

The JRC nanobiotechnology laboratory in Ispra in the mid 2010s.

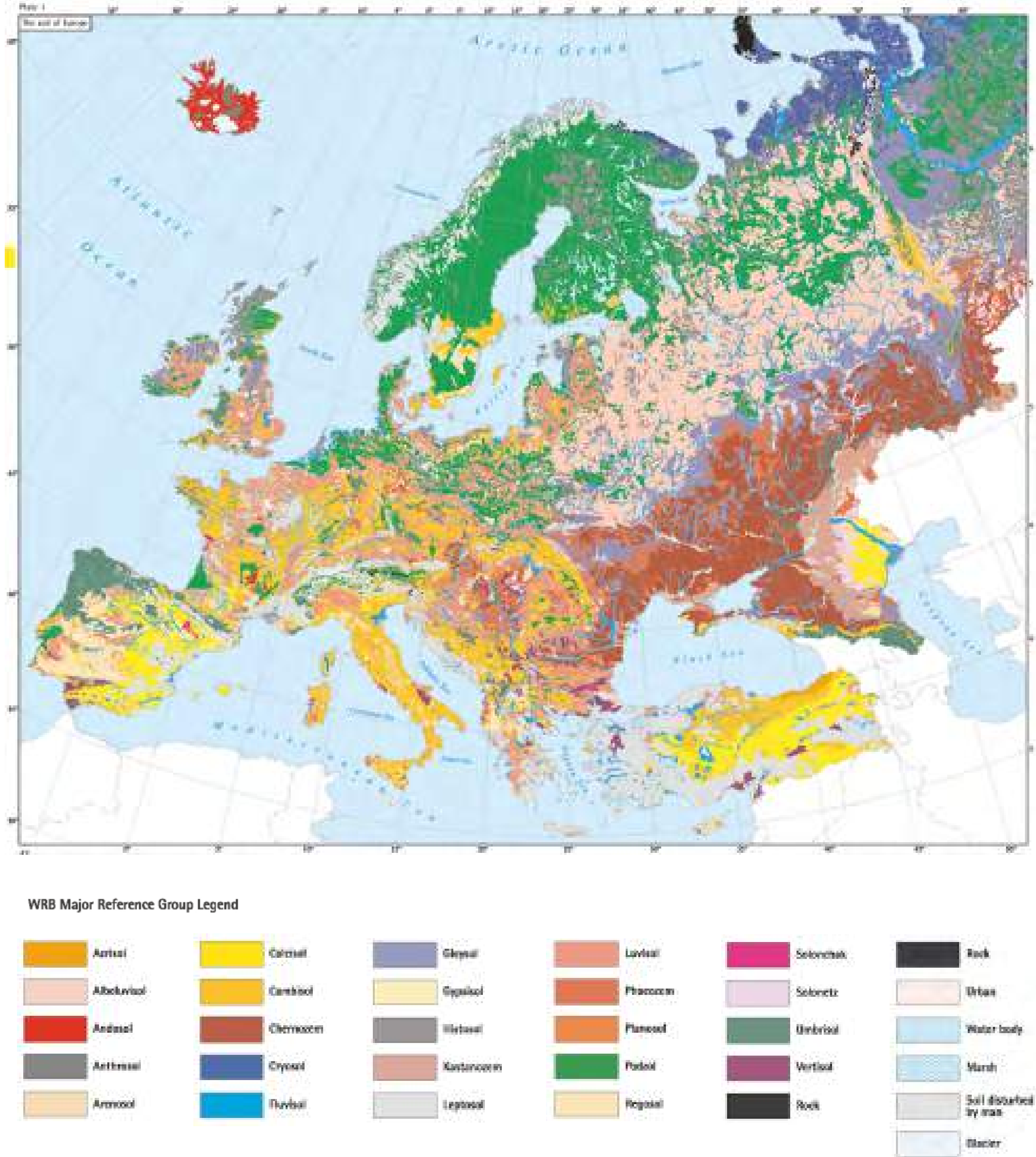
Adapting to climate change would become imperative, and the JRC would continue to collect and evaluate data on the climate's impact on various vulnerable sectors of the European economy. These would include agriculture, forestry, water resources and natural hazards.
In this field, the JRC would focus on developing model-based systems, earth observation technologies and measurement networks to address situations such as floods, droughts, oil spills, earthquakes, forest fires, avalanches, landslides and storms.
The JRC in Ispra would increase capacity to understand and address vulnerabilities, analyse risks, develop early warning and alert systems, monitor events, assess damage and devise prevention and mitigation measures.
In doing so, it would contribute to improving the EU's response capacity and crisis management in terms of rapid intervention, damage monitoring and evaluation, particularly within the framework of the EU Civil Protection Mechanism and the EU Solidarity Fund (EUSF).
Within this general framework of systemic risk management, the Major Accidents Hazards Bureau would contribute to safety in the technological field by monitoring accidents and incidents and drawing lessons from them, particularly concerning facilities covered by the Seveso II Directive (Directive 96/82/EC), the European regulation aimed at preventing and controlling the risks of major accidents involving hazardous substances in industrial establishments. Through its research, the JRC would strengthen its support for EU programmes on reconstruction and humanitarian aid by means of innovative technologies (including spatial and geospatial analysis, web intelligence and real-time information systems) for various levels of intervention, from preparatory activities to emergency response and field operations.
The aims were to address the identification of 'forgotten crises', early warning of potential crises, needs assessment in humanitarian aid, integrated crisis response and post-crisis damage assessment. Support for international humanitarian aid would also be provided by extending the capabilities of the global disaster alert and response system to intervene in a wide range of humanitarian disasters, in close cooperation with United Nations agencies, particularly the Office for the Coordination of Humanitarian Affairs.
Under the new programme, the JRC would establish a global geospatial database and contribute to rapid mapping services to support crisis management and security, promoting system interoperability and developing standards for data exchange.
This activity would be undertaken in the context of piloting future services for the GMES initiative of the European Space Agency (ESA).
The JRC in Ispra would also work on the non-proliferation of weapons of mass destruction, paying particular attention to dual-use technologies and the related strategic control of exports and international trade.
To this end, classification systems for export control, information and data archiving systems and multilingual internet search tools would be (further) developed.
This work was planned to integrate with relevant activities under the JRC's Euratom-specific programme of work.
An observatory for sustainable development and the environment would initially be established for the countries of Africa, the Caribbean and the Pacific. The long-term observation of parameters related to resources and the environment (e.g. land cover, forest cover, fires, biodiversity, coastal zones, climate vulnerability) would support trend analysis. Development would be carried out in close collaboration with the GMES initiative and the monitoring for environment and sustainable development in Africa programme.
The activities of the observatory related to global crop monitoring were to be developed within the context of food security and the EU initiative

Temperature: change in mean annual temperature [C°]



Change in mean annual temperature in Europe by the end of the 21st century.

aimed at eradicating poverty and promoting sustainable development. Research efforts were to focus on new methods for assessing food supply and demand, on information systems concerning food security and on vulnerability assessments. The final results were to be 'customer-oriented', in order to meet the needs of developing countries.
Ultimately, the seventh framework programme for research was a highly ambitious programme, aligned with the spirit and priorities of the time. The same level of ambition was evident in the plans for the evolution of research facilities and the development of the Ispra site.
The JRC in Ispra, as we know it today, has deep roots extending through the history of the 20th century and into the new century. Its current configuration stems from a transformation initiated in the first decade of the 21st century, with the conversion of the dense zone into a *'science zone'*, home to large multifunctional buildings with high energy efficiency.
A strategic development plan prepared by the site's management during 2004 concluded that many of the scientific units of the institutes were too dispersed across the site, with an average of 3.3 different buildings per scientific unit.
The lack of buffer spaces (vacant spaces for laboratories and offices needed to initiate a cycle of relocations) had created fragmentation, preventing optimal collaboration among research groups. Furthermore, the site's development over time had resulted in buildings being scattered over an unnecessarily large geographical area. Since 1995, approximately 18 200 square metres of usable space had been demolished or decommissioned due to the deactivation of nuclear facilities, while only 11 900 square metres had been added through new constructions. Additionally, around 5 100 square metres were temporarily out of use pending refurbishment. In total, this amounted to a net reduction of approximately 25% of the total space available to the institutes since 1995.
However, the number of JRC staff working in the institutes had remained relatively stable and had begun to increase from 2003.
At the same time, there had been a net reduction in the total staff at the JRC in Ispra, with a decrease in technical support staff within the site's management and the outsourcing of certain functions. However, this had resulted in only a very limited increase in the available usable space for the institutes.
Consequently, the scientific institutes' buildings were overcrowded, and the lack of available space made it impossible to quickly reorganise scientific resources to support new initiatives.
It was also believed that the best research personnel available in the future would be attracted to work in Ispra not only by the high quality of the scientific research facilities but also by the site's support structures, which were essential for the overall efficiency of the research environment.
For example, there was a growing need for childcare facilities near the workplace. In 2005, the demand for places in the Ispra nursery exceeded the number of available places by approximately 70%, making the construction of a new facility necessary, with work set to begin soon. The canteen, which was also in need of modernisation, remained essential to the centre's operation, in a local context that was certainly less rural than in the 1950s but still predominantly extra-urban.
Finally, the strategy for increasing the numbers of short-term visiting staff would be more effective if the site was able to provide temporary furnished accommodation.
In general, perhaps the most innovative and certainly the most ambitious objective of that plan was to make the site a 'calling card' for the institution: every time visitors saw the site, they would gain an understanding of the significance of the JRC.
In 2012, the President of the European Commission, José Manuel Barroso, visited Ispra



The first *Soil Atlas of Europe*, produced by the JRC in 2005.

Rendering of the
science zone,
2007

The science zone,
completed project,
2017.

to highlight the breadth of the JRC's scientific support for EU policy. JRC researchers presented their work in the fields of food security and natural resources, photovoltaics, nanotechnology and nuclear safety. The President visited ELSA and VELA, and, most notably, he inaugurated the new European Crisis Management Laboratory (ECML), which supports EU interventions in disaster-stricken areas worldwide. Around the same time, the Italian Prime Minister, Mario Monti, invited the EU to officially participate in the 2015 World Expo, on the theme 'Feeding the planet, energy for life' and addressing, among other topics, global food security.

Of particular significance during these years was the prominent role given in the JRC's programme to respecting fundamental ethical principles in the course of its research activities. These included, in particular, the principles enshrined in the Charter of Fundamental Rights of the European Union, such as the protection of human dignity and life, the protection of personal data and privacy and the protection of animals and the environment, in accordance with EU law and the latest versions of the applicable international conventions and codes of conduct.

This strong ethical dimension demonstrated how the EU was establishing itself as a civil power, according to the definition used in academic studies, one that derived its strength not from gunboats but from its values and society. In 2012, just before the 2007-2013 research programme was completed, the EU was awarded the Nobel Peace Prize.

It was the spirit animating the EU and Europe at that time that justified the award, but other dynamics were taking shape in European society and politics, of a very different nature.

Interior of the canteen.

The crèche at the Ispra site.

Commission President José Manuel Barroso (first on the right) opens the European Crisis Management Laboratory. In the photograph are, from left to right, the Director of the Institute for the Protection and Security of the Citizen, Stephan Lechner; the Director-General of the JRC, Dominique Ristori; and the Commissioner for Research, Máire Geoghegan-Quinn.

Director of the Institute for the Protection and Security of the Citizen, Stephan Lechner, briefing President Barroso on the European Crisis Management Laboratory's budget.

From left to right: Herman van Rompuy, José Manuel Barroso (holding the 2012 Nobel Peace Prize® certificate) and Martin Schulz (holding the 2012 Nobel Peace Prize® medal).

Paradoxically, it was the attraction to what the EU was becoming that drove different sectors of society, on the eastern border, to seek further enlargement of the EU.

In 2004, the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia had joined, in the largest enlargement seen to that point.

Bulgaria and Romania joined in 2007 and Croatia in 2013, marking what seemed to be another step towards reconciliation after the wars that had bloodied former Yugoslavia. However, in the same year, the long crisis between Russia and Ukraine began, as did a crisis within Ukraine itself, partly arising from the protests of those in society who sought to join the EU.

These crises profoundly affected the European integration process, presenting the EU with new and revived challenges regarding external relations and internal cohesion. The epitome of the phase that began in 2016 was the decision of the United Kingdom to leave the EU, marking the first, and to date only, case of withdrawal, with all the institutional procedures it entailed.

Map of the European Union at the end of 2013
(Administrative boundaries: © EuroGeographics
© OpenStreetMap).

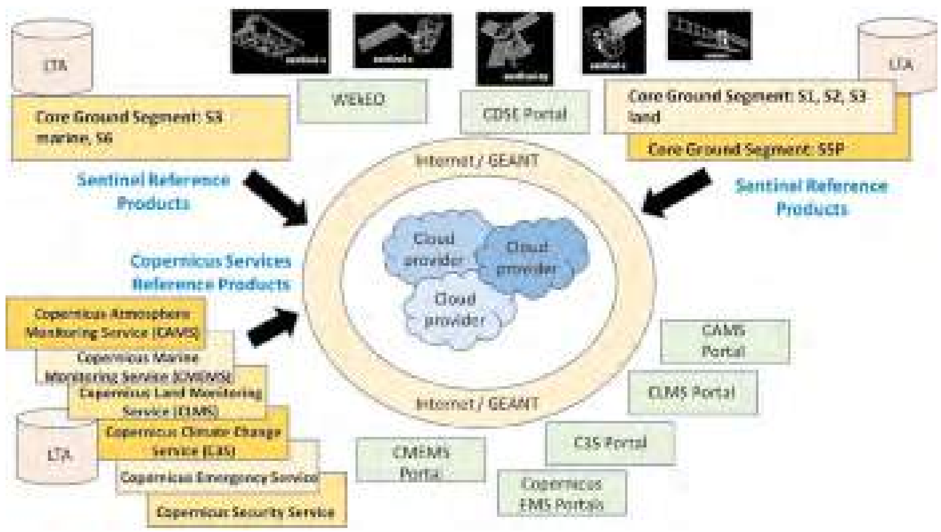
Global monitoring for environment and security: the Copernicus programme

The Copernicus programme, previously known as the "Global Monitoring for Environment and Security" (GMES) programme, is the Earth observation component of the EU's space programme, jointly managed by the European Commission and the European Space Agency (ESA).
The programme combines a constellation of observation satellites, the so-called Sentinels, with services that provide free access to data and information on environmental issues, climate change, natural or human-made disasters and security in general. The first satellite of the programme, the radar imaging satellite Sentinel-1A, reached orbit on 3 April 2014.
Presence in space is strategically important: satellites in orbit fly over the entire globe. Observation satellites capture images of almost every point on the earth's surface every few days.
This makes it possible to map, measure and monitor various aspects related to the environment and security, collect data and provide scientific evidence.
EU countries were not pioneers in space, but Europe nonetheless has a history of building, launching and operating satellites, combined with analysing the data they provide. Part of this history, specifically related to the analysis of satellite imagery, is reflected in the research activities of the JRC.
This work, which began in 1973, has been part of every JRC multiannual research programme in various forms ever since.

The take-off of Sentinel-1A from Europe's Spaceport in French Guiana on 3 April 2014 (Source: © ESA / Centre National d'Études Spatiales / Arianespace).

Map of the land use of Sicily, produced by the JRC Institute for Remote Sensing Applications, 1992.

Initially aimed at creating an inventory of agricultural crops and forests in Europe, the research quickly expanded to other areas, including the marine environment, atmospheric studies, disaster risk management, water resources, desertification and urban analysis.
When, in the 1990s, the debate began on how Europe could ensure a continuous presence in space and support its industries in the sector, the JRC started combining satellite image analysis with other space technologies such as positioning, focusing on potential applications to inform EU policies.
At that time, the JRC also began to organise an annual seminar bringing together the scientific community and policymakers. The ongoing debate reached a turning point at the third of these seminars, held in the town of Baveno, on the Piedmontese shore of Lake Maggiore, in May 1998.
On that occasion, representatives of the Commission, several national space agencies, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and ESA agreed upon and signed the "Baveno Manifesto".
This document stated that Europe could and should strengthen the provision of information for the definition, development and implementation of environmental policies and that earth observation systems could be the source of such information.
This decision led to the creation of the Global Monitoring for Environmental Security (GMES)



Copernicus conceptual elements in relation to data access.
(Source: [Copernicus Data Access](https://www.copernicus.eu/en/access-data) - https://www.copernicus.eu/en/access-data).

programme; within a year, security aspects had gained greater importance, and the programme was renamed "Global Monitoring for Environment and Security". Since then, the GMES programme has provided a framework for earth observation operations and thus long-term support for the European space industry.
Entering into force on 9 November 2010, it included the construction and operation of some of the most technologically advanced imaging satellites in the world, alongside the provision of services using these data. The programme, later renamed Copernicus in honour of the Polish astronomer Nicolaus Copernicus, became fully operational in 2012.

Map of burned areas in Europe in 2023, produced by EFFIS.

After Sentinel-1A, nine more satellites were launched into orbit: two additional Sentinel-1 radar satellites, which provide images in all weather conditions, day and night; three Sentinel-2 optical imagers, which provide high-resolution images mainly for land and emergency services; two Sentinel-3 satellites, which provide images for oceanographic studies and monitoring vegetation productivity; Sentinel-5P, which measures atmospheric composition; and Sentinel-6A, which provides altimetric measurements for monitoring sea level.
Today, the programme provides services covering six areas: atmosphere, marine environment, land, climate change, security and emergencies. The JRC manages the emergency management service and the global component of the land monitoring service.
An excellent example of the value of Copernicus is the European Forest Fire Information System (EFFIS).
The system provides information on forest fires and their ecological impacts in European, Middle Eastern and North African regions.
It covers the entire cycle of needs, from fire danger forecasting to monitoring active fires and burned areas and assessing post-fire damage.
Thanks to Copernicus, EU policies on environment and security are now based on directly acquired evidence.
As a collective, we are better informed and will continue to be so as work on the next generation of Copernicus satellites progresses, further strengthening the EU's strategic use of outer space and increasingly filling information gaps in all the fields covered by Copernicus's six service areas.

Decommissioning of nuclear facilities in Ispra

In 1999, the European Commission decided to initiate the long process of decommissioning and dismantling the nuclear facilities at Ispra, with the aim of returning the nuclear areas of the site to a greenfield state, meaning that they would be completely reusable without any restrictions arising from their previous use. This primary objective was combined with the opportunity to gain experience and expertise in the decommissioning process, which could prove useful for the potential decommissioning of production reactors and other nuclear facilities located elsewhere in the EU.

The first step in implementing this programme was the decommissioning of the radiochemistry laboratory, which had previously been used for experiments on radioactive substances but, after decommissioning, would be suitable for reuse as a conventional building.

Following a thorough analysis of the specific situation, authorisation was obtained to begin the meticulous work of clearing and thoroughly cleaning the building. The decommissioning process began in 2006 with the removal of all radioactive samples and potentially contaminated equipment, followed by a very thorough cleaning.

After a rigorous verification process involving 15 000 radioactivity measurements over a surface area of 1 800 square metres, experts from the JRC and the Italian labour inspectorate gave the green light in 2010 for the building to be declared suitable for conventional use. In 2012, the building was refurbished to host the first visitors' centre at the Ispra site, along with offices and meeting rooms.

In parallel, a general plan was developed for the complete dismantling and remediation of all other nuclear facilities at Ispra.

In 2009, an agreement was signed with the Italian government under which the dismantling of the Ispra-1 reactor would be undertaken by Italian national organisations, while the dismantling of the ESSOR reactor and other nuclear installations would be carried out by the JRC.

The JRC would also be responsible for activities related to the characterisation, treatment and temporary storage of low- and intermediate-level waste generated by the decommissioning until the Italian final repository became available.

The fissile nuclear materials present at the site, such as the fuels used to power the ESSOR reactor, would be returned to their respective countries of origin.

The Ispra-1 reactor interior before dismantling.

Characterisation of waste steel drums.

In 2018, the Italian government entrusted the decommissioning of Ispra-1 to Sogin, to which the management of the reactor was formally transferred the following year.
At the time of writing, the JRC has obtained some of the decommissioning licences and operational plan approvals for the dismantling and securing of the nuclear installations and is awaiting authorisation from the competent authorities for the decommissioning of ESSOR and other laboratories.
To implement the decommissioning programme, the JRC has initiated the construction of a series of facilities for:

- the characterisation, categorisation and inventorying of radioactive waste;
- the removal of bituminised drums from the site and their shipment abroad for treatment;
- the cementation of drums containing waste into special prismatic containers of approximately 5 cubic metres in volume;
- the removal of non-radioactive waste (uncontaminated and/or non-activated) to allow its treatment as conventional waste (e.g. scrap metal).

Pending the availability of the Italian final repository for nuclear waste, the JRC has constructed a temporary intermediate storage facility (ISF) at the Ispra site. Waste drums will be placed in special stackable, standardised and highly resistant containers, which will initially be stored in the ISF and later be transferred to the Italian final repository. Key elements of the process include the characterisation and measurement of radioactivity and the digital documentation of every single item involved. The management of the secure digital database ensures that any item can be identified, tracked and safely and unequivocally assigned to the correct waste category and subsequently transferred to the ISF.
The health and safety of all workers involved is always the top priority.
The working environment of each individual operator is constantly monitored, and all relevant work procedures are strictly applied.

The final phase of the decommissioning process will involve the dismantling of the waste treatment facilities themselves, including the temporary storage facility, with the aim of restoring the site to its original condition.
The timeline for achieving this objective will, of course, depend on when the Italian repository becomes available; however, the current working assumption is that the decommissioning and dismantling programme will be completed around 2050. In line with this plan, the JRC will ensure that all ongoing research involving direct access to nuclear and radioactive materials continues at JRC sites other than Ispra.

The intermediate storage facility.

Dismantling of reactor components.

The European Union's participation in Expo 2015 in Milan

In 2015, the JRC in Ispra was responsible for the EU's participation in the World Expo in Milan in 2015, representing not only the European Commission but also all the other EU institutions, in particular the European Parliament. The JRC in Ispra was chosen for this task not only because of its proximity to Milan but also due to its many scientific activities relevant to the theme of Expo 2015: 'Feeding the planet, energy for life'.

The World Expo took place in Milan from 1 May to 31 October 2015, taking as its theme 'Feeding the Planet, Energy for Life'. It was the second time Milan had hosted a universal exhibition, the first having taken place in 1906. A total of 145 countries, 3 international organisations and representatives of civil society, corporations and non-governmental organisations participated. The event was held in pavilions located on a 200-hectare site situated north-west of Milan's city centre.

In May 2013, the European Commission decided to take part in the event, responding to an invitation extended the previous year by the Italian Prime Minister, Mario Monti, to President José Manuel Barroso. David Wilkinson, Director for Scientific Policy and Stakeholder Relations at the JRC, was appointed as the EU's general coordinator.

The aim of the EU's presence, in a 1900-square-metre pavilion under the banner 'Growing Europe's future together for a better world' and located directly opposite the Italian pavilion, was to communicate to European and international audiences the EU's role in food security, nutrition and sustainability, to contribute to the global debate and to facilitate contacts between EU and non-EU businesses. The EU pavilion was inaugurated on 8 May 2015 in the presence of Martin Schulz, President of the European Parliament, and Federica Mogherini, High Representative of the Union for Foreign Affairs, in time to celebrate Europe Day the following day. During the six months of Expo 2015, the pavilion was visited by more than 650 000 people.

The social media campaign reached over 250 000 people through the dedicated Facebook and Twitter accounts, which were among the most popular at the exhibition (with more than 50 000 and 18 000 followers respectively, a significant achievement for the time). For the occasion, a different communications approach was chosen compared to those usually taken by the Commission. It was based on a simple and direct emotional narrative, centred on an animated film, which was accessible to all and used as a vehicle for the message. The story told in the film, entitled *The Golden Ear*, was complemented by an exhibition based on a solid scientific programme, contributing to Expo 2015's role in addressing food security issues.

Map of the Expo 2015 site.
(Source: Expo 2015, CC BY-SA 3.0, *Wikimedia Commons - Planimetria EXPO 2015* https://commons.wikimedia.org/wiki/File:130528_MSP_EXPO2015_wiki.jpeg).

Sylvia and Alex, protagonists of the short film *The Golden Ear*, presented at Expo 2015.

The pavilion was managed by a small core team from the JRC, supported by a total of 850 young student volunteers from 40 countries, many with an Erasmus background. With the support of the Milan Chamber of Commerce, a commercial cooperation programme was implemented between EU companies and sectors and those of non-EU countries.
A total of 1 700 small and medium-sized enterprises, clusters and sectoral organisations from the EU Member States and 57 non-EU countries in 7 strategic regions were involved, with a particular focus on the agricultural/food sector, sustainability and biotechnology.
Expo 2015 was also an excellent opportunity for institutional and political relations. A total of 13 European Commissioners, 85 Members of the European Parliament and 40 heads of state and ministers visited the EU pavilion. Several official events were also held there, including meetings of five European Parliament committees and the Joint Parliamentary Assembly of the African, Caribbean, and Pacific (ACP) countries and the EU. Various official delegations from Member States were also hosted in the pavilion.
The scientific programme for the EU's participation in Expo 2015 was developed by a dedicated committee composed of 11 scientists and 5 internationally renowned experts.
The committee was chaired by a former Commissioner for Agriculture, Rural Development and Fisheries, Franz Fischler, while the scientific secretariat was managed by the JRC.
The programme included 230 events, promoted not only by the EU institutions but also by international, national and local bodies, including universities. The concluding conference, held on 15 October 2015, put forward various policy recommendations for the EU in its report *New ways of providing knowledge for food and nutrition security*. On 26 January 2016, United Nations Secretary-General Ban Ki-moon personally thanked Fischler for the work of the scientific committee he chaired.

Volunteers outside the EU pavilion.

Inside the EU pavilion.

Managing the EU's participation in a universal exhibition was an unusual experience for the JRC and entailed a significant workload for the services involved. Nevertheless, it was also formative for the JRC's future development and beneficial at the time in terms of visibility, offering recognition both from the EU institutions and from the Italian government, as well as at the international level.

Chapter VI

Complexity and the flood of information: research and knowledge management (2016-2025)

Satellite view of the site, 2018.

Chapter VI

Complexity and the flood of information: research and knowledge management (2016-2025)

In 2013, a comprehensive analysis was released on the impact of the JRC's direct actions, investigating where and how JRC outputs had made a difference in science and governance within EU policy and regulation.

A statistical analysis of the immediate effects of JRC activities in 2012 revealed its overall impact for that year.

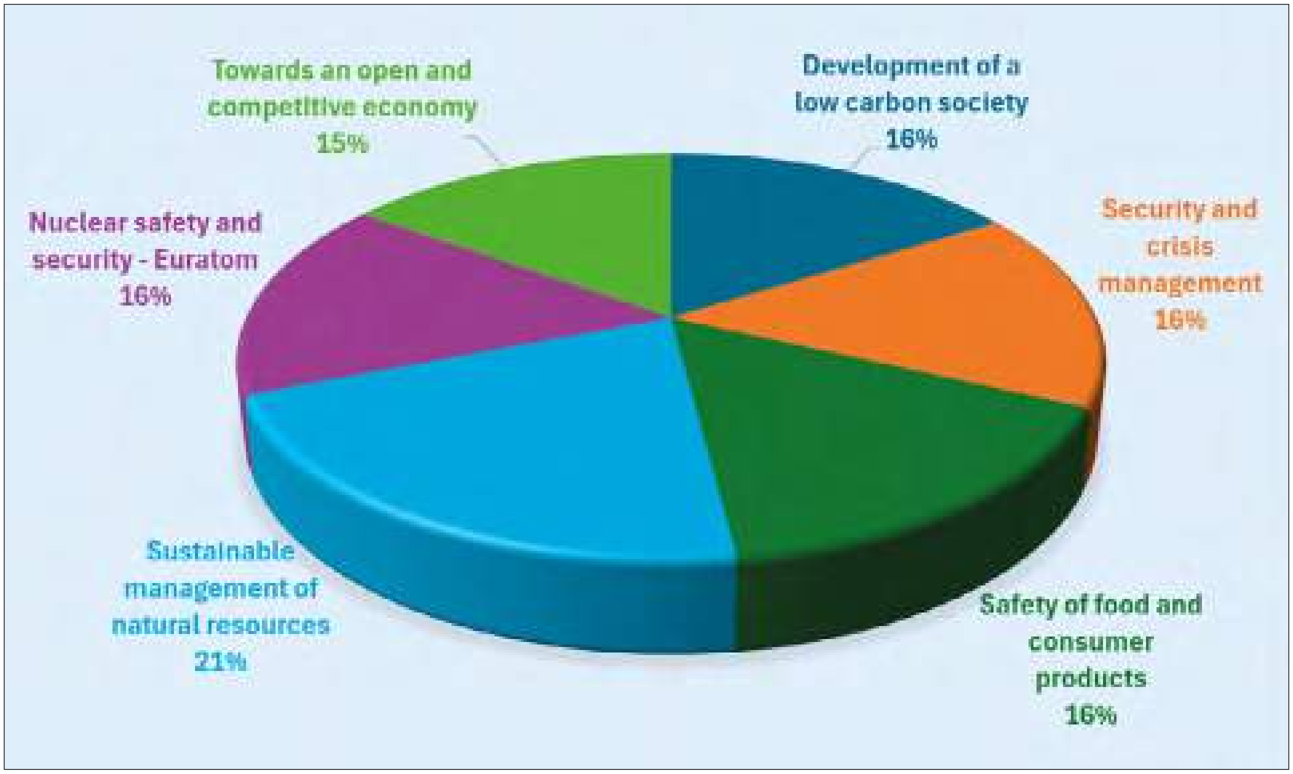
Screening a number of specific activities over a longer period allowed for a qualitative analysis of long-term impact, distinguishing between political impacts, technical impacts (including scientific results), economic impacts and intangible impacts. The report was prepared on the occasion of the JRC's 100th Board of Governors meeting.

The statistical analysis recorded 269 validated immediate political impacts in 2012 and confirmed that the JRC consistently produced such a number of annual impacts.

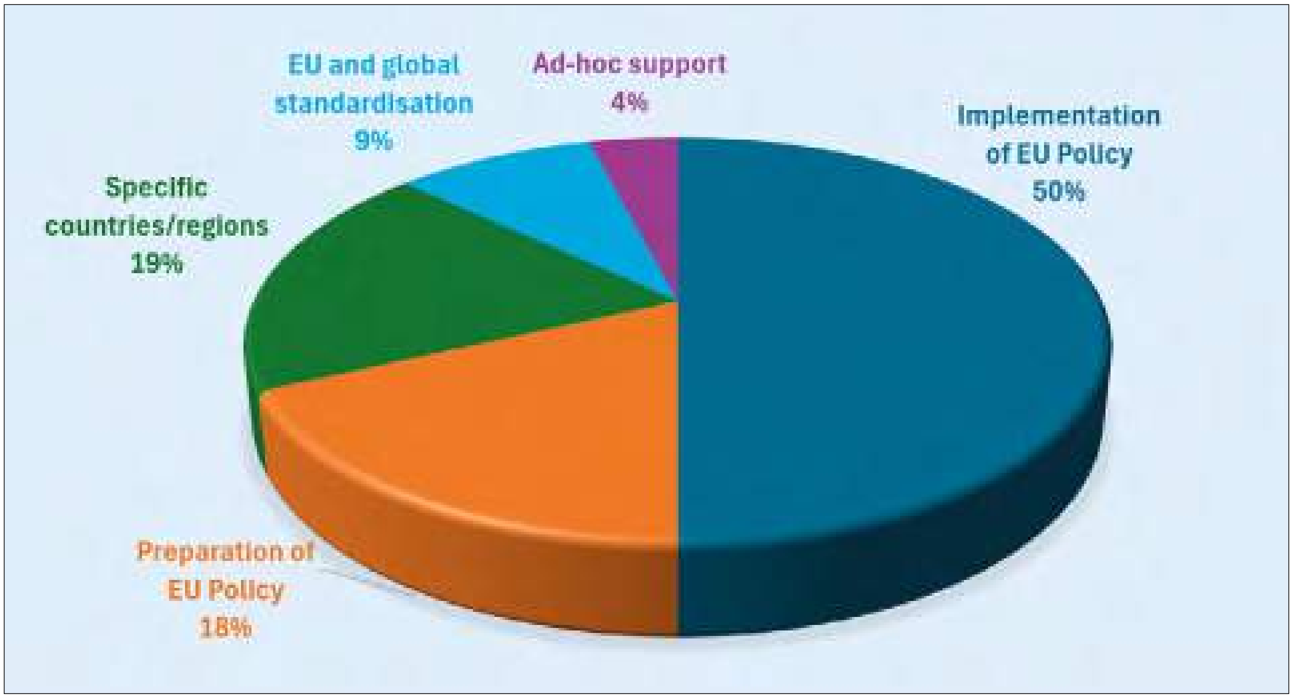
They were distributed across various categories of political impact: 50% were directly linked to the implementation of EU policies, such as directives, regulations and recommendations (e.g. results produced by an EU reference laboratory or a JRC office); 18% were directly connected to the preparation of EU policies during the drafting phase of policy proposals (e.g. JRC research incorporated into Commission proposals); 4% concerned ad hoc support (e.g. a situation assessment used for emergency response, aid or assistance); 9% related to standardisation at the European and global levels (e.g. a JRC testing method adopted by an international standardisation body); and 19% of impacts stemmed from support to specific countries or regions (e.g. training laboratory staff to enable a new Member State to apply regulations).

The outputs produced by the JRC at its various sites served a wide range of clients, beneficiaries and partners – Member State authorities, EU agencies, international organisations and standardisation bodies – but the majority were intended for the Commission itself.

The impacts of these products were spread across numerous policy areas, with a concentration of impacts in areas where science plays a key role in addressing issues related to health, safety, the environment and the competitiveness of the European economy: the results produced by the seven EU reference laboratories hosted by the JRC, measures for restoring financial stability, research on biofuels and Indirect Land-Use Change (ILUC), post-Fukushima stress tests on EU nuclear power plants, the work of the Euratom laboratories on



Impact analysis of the JRC's work: breakdown by thematic area, 2010.



Impact analysis of the JRC's work: distribution over the policy cycle, 2012.

nuclear safeguards, the work on the directive establishing an Infrastructure for Spatial Information in Europe (INSPIRE) and contributions to the Industrial Emissions Directive (IED).
These cases involved 13 actions, representing 5-10% of the JRC's work programme in terms of combined financial and human resources.
Some cases primarily concerned policy preparation; others related to the implementation phase, including the provision of technological support for verifying compliance with international treaties.
In relation to policy implementation, the JRC was generally also involved in the preparation phase (e.g. in its contributions to the INSPIRE Directive and the IED and through the work of the EU reference laboratories, particularly the one for GMOs) and provided the Commission with the scientific knowledge needed to develop sound and technically well-founded proposals. The expertise used was generally built up well in advance, which was characteristic of the JRC's proactive approach.
The report also proposed a taxonomy of the various types of impacts of the JRC's work, divided into four categories, as outlined below.

Long-term policy impacts

- Technical implementation of the relevant EU legislation and decisions. Where necessary this includes harmonisation amongst the Member States in networks with implementing national authorities and making available certified reference materials.
- Actual verification of compliance with legislation and international treaties.
- Scientific and technical clarification and specification, data and modelling results in a range of official EU policy documents (directives, regulations, recommendations, impact assessment, Commission reports).
- A large number of standard methods supporting the Commission's implementing regulations and EU regulations, many of which were subsequently adopted by the European Committee for Standardization (CEN) and the International Organization for Standardization.
- Awareness-raising during the policy preparation phase, enabling the Commission to draft appropriate proposals and EU decision-makers to make informed decisions based on up-to-date and comprehensive scientific knowledge.

Technical impacts

- Validated tests and a well-developed analytical and testing capacity in Member States and candidate countries (through inter-laboratory comparisons).
- Development of new analytical methods, models, modelling tools and international standards.
- Higher accuracy and precision with fewer false positive and false negative decisions thanks to regular benchmarking tests (external quality assurance).
- International uptake of technological expertise developed by the JRC.

Associated socioeconomic impacts

- Consistent implementation of regulations for efficient international trade.
- Proper functioning of the internal market with fewer disputes over divergent analytical results, benefiting Member State control authorities and industries.
- Net reduction in administrative burdens for Member States.
- Protection of EU consumers' interests.

Intangible impacts

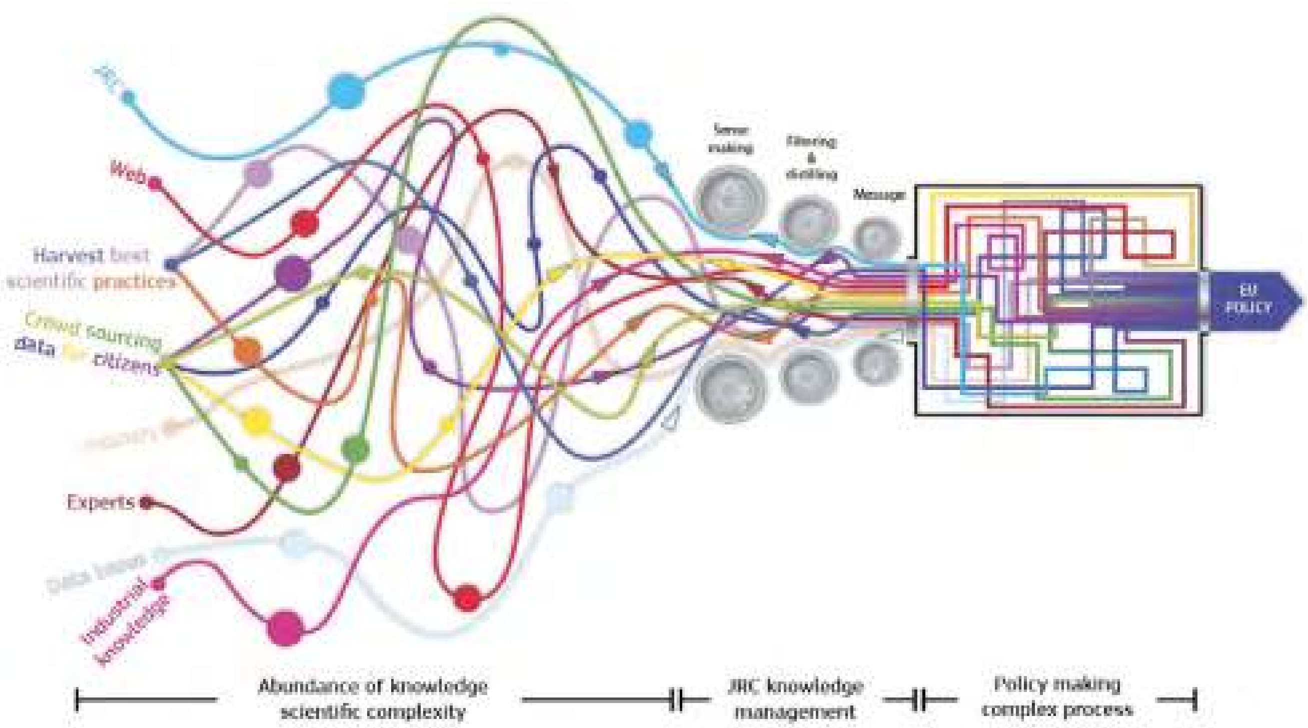
- International recognition and credibility amongst key players in the relevant fields.
- Strengthening the position of the European reference (metrology) centre.
- Confirmation of impartiality.
- Fostering internal debate within the Commission on the scientific aspects of policy proposals.

- Ensuring compliance with nuclear energy safety and security requirements.
- Serving as an example for non-EU countries that turn to the JRC for technical advice.

It was undoubtedly a positive assessment, which could not, of course, recount all the JRC's challenges and successes but provided a snapshot of a vast and diverse landscape.
A few years later, in 2015, the seven-year evaluation of the direct actions of the entire JRC under the seventh framework programme, conducted by a group of experts, highlighted some strategic development lines for the centre.
The group noted the commitment of the management and staff to the JRC's mission of supporting EU policies.

However, within the scope of this mission, it observed that many of the JRC's objectives and much of its programme of work appeared to be determined by a combination of historical legacy and responses to changing current demand.
According to the group, the JRC needed to establish a strategy that clarified its vision, activities, objectives, values and rules.
The challenge was to develop its role as a scientific service, facilitating knowledge management within the Commission and finding the right balance between science and services, between reactivity and proactivity.
To maintain its credibility, the JRC needed to preserve a significant degree of autonomy in its research, and, with a view to greater transparency, its relationship with Member States had to be managed in a way that ensured mutual awareness of what was being done by the JRC and by the Member States.
This could lead to multiple benefits through cooperative research initiatives, as well as facilitating feedback on societal developments and other emerging issues at the national level.

Representation of the role of the JRC in knowledge management in support of EU policies.



Some of these suggestions required the utmost attention from the Commission, which was tasked with facilitating some of the recommended improvements.

Developing a strategy with a long-term vision had long been a challenge for the JRC.

Some earlier versions of such a strategy had never materialised, resulting in the JRC being repositioned multiple times based on contingent priorities and needs, without a comprehensive review of its role.

A JRC strategy adopted and approved by stakeholders would help to create a shared understanding of what the organisation was and was not and of what it did and did not do.

The climate within the Commission was favourable to new initiatives aimed at transforming the JRC into an organisation even more relevant to policymakers, who until then had not fully utilised its services.

In response, the JRC had already repositioned some of its activities towards the priorities of the new Commission. However, without a clear strategy, it would be difficult to decide whether and how to meet the full demand for increased support from the various services of the new Juncker Commission.

Considering that the Commission was oriented towards greater efficiency, the group of experts believed that a proposal from the JRC for a long-term strategy would be well received, and it made a strong recommendation that such a strategy should be established before the mid-term evaluation of the Horizon 2020 framework programme in 2017.

According to the group, a successful strategy for the scientific service of the European Commission should be based on reliability, integrity, transparency, scientific quality and relevance. It would outline the key areas on which the JRC should focus, avoiding duplication of national and industrial research efforts. The JRC should engage in exploratory research in specific areas, taking a proactive approach so that it could offer new scientific services in support of policymaking (in terms of scale, the group of experts considered that allocating 10% of resources to such activities would be appropriate).

Given that many of the JRC's 'clients' were actually partners in the development of a final outcome, the strategy should include criteria for deciding whether the cost of support should be borne by the beneficiary or financed through institutional funds, so that choices in this regard were made based on strategic considerations rather than financial objectives.

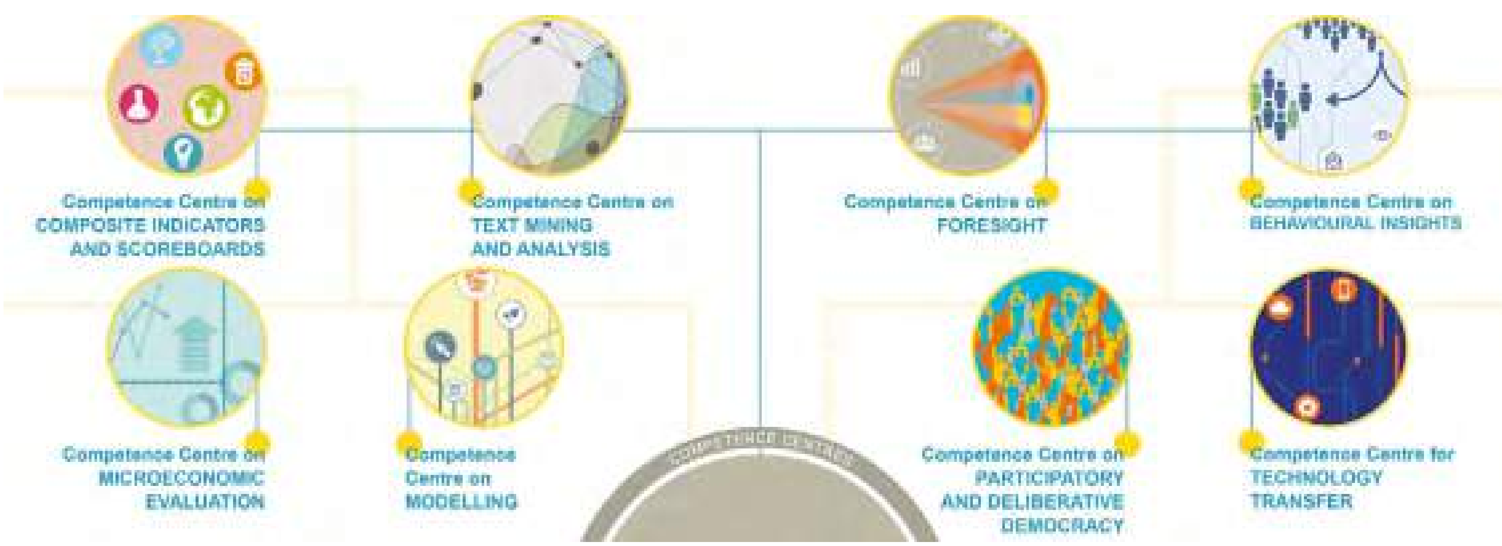
It should also include criteria for assessing when a service should be considered routine; the group proposed that a service found to be routine should be outsourced to the private sector, an EU or national agency or a research organisation.

The strategy would also influence the JRC's infrastructure policy and internal skills development policy.

Finally, it would help the JRC to focus, taking into account suggestions from researchers in the social sciences, on broad and transformative issues, rather than dealing with transient or marginally important matters.

The group of experts observed that several Commission departments had expressed a greater or new need for knowledge management support from the JRC to support their policy work. In response to this increased demand, the JRC had gradually adapted its working methods to improve its policy support services for the Commission. In particular, the JRC had decided to create Knowledge Centres, virtual communities built around priority policy issues to bring together policymakers and scientists, gather experiences and knowledge both within and outside the European Commission and collaborate on both the formulation of policy questions and the research-based answers provided. Their function was to inform policymakers about the state of the latest scientific evidence and the results of the latest research in a transparent, tailored, concise and

Overview of
Knowledge Centres



Overview of
Competence Centres.

independent manner. Complementing the Knowledge Centres, which were structured around policy challenges, the JRC also aimed to establish Competence Centres, focused on investigative methodologies and analytical tools that could be flexibly applied to any policy issue and mobilised as needed by the European Commission. By integrating all the relevant information in a given field, the JRC hoped to make new and existing knowledge more easily accessible to all stakeholders, both within the Commission and in the Member States.

The group of experts considered this innovative approach to scientific policy support to be advantageous, as it could facilitate the creation of links and synergies within a given field.

At an organisational level, this targeted approach allowed the JRC to create the necessary internal pressures to prioritise activities and discontinue less urgent ones. The group approved the JRC's proposal to establish the new Centres but expressed some concern that the programme's management responsibility might be distributed across these structures. A key condition for success was that the JRC should establish Knowledge Centres only for a limited number of key topics, without creating an additional layer within the organisation.

In particular, the Knowledge Centres should facilitate – and not complicate – management and organisational structures. Furthermore, they should enable the JRC to maintain the necessary autonomy in its research activities.

According to the group of experts, an additional advantage was that this new organisational form could help overcome constraints arising from the JRC's geographical distribution. Indeed, the location, organisation and names of the institutes were historically and culturally determined. They did not follow managerial principles of interaction between units, thereby failing to exploit synergies in terms of management and governance.

The group thus noted that large organisations such as the JRC could benefit from periodic reviews and, if necessary, restructuring. However, the latter could be difficult and disruptive and should not be undertaken without clear objectives and strategies.

The group had not been able to carry out sufficient analysis to justify specific proposals for radical change.

Nevertheless, it noted that a review of the structure and division of labour among the seven institutes might be warranted.

During the evaluation, the group of experts repeatedly heard that the JRC offered an independent perspective, which was considered an added value. In the JRC's mission, 'independent' meant free from national and private interests, but this did not imply independence from the Commission's leadership. Indeed, since 2013, the JRC's detailed work programme had been formally approved by the College of Commissioners.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The JRC's 2014-2015 work programme, formally approved by the Commission.

This procedural change underscored the importance of the JRC's programme and confirmed the Commission's leadership, although this should not influence the quality or truthfulness of the science produced by the JRC. In this regard, the group of experts believed that independence – that is, objectivity and impartiality in the context of providing scientific support and advice to the European Commission – had not been compromised.

In light of the recent establishment by the Commission of a new independent Scientific Advice Mechanism (SAM), with independent external experts, the group confirmed the relevance of the JRC in providing scientific advice to the EU, as part of the Commission services under the President and the College of Commissioners.

Finally, the group of experts considered the JRC's relations with the Member States to be a priority

JRC Board of Governors
meeting in Ispra,
November 2012.

Jean-Claude Juncker, 2015.

issue, and, in this context, they emphasised the essential role of the Board of Governors, whose evolution they discussed in detail.
Since its establishment, this body had quadrupled in size: created in 1984 with 10 high-level representatives, one for each Member State, *'to be convened twice a year'*, it had grown in 1996 to 15 representatives from as many Member States, *'to be convened at least four times a year'*, and by 2013 it included 39 representatives – 28 from the Member States and 11 from countries associated with the framework programme – who met three times a year. Since the inception of the Board of Governors, the JRC's mission had undergone substantial changes. In 1984, 80% of the JRC's programme was focused on nuclear research, whereas, by 2013, 75% of its work programme was centred on its (non-nuclear) mission of providing scientific support to EU policies.
These developments meant that the role of the Board of Governors had evolved from assisting the Director-General and providing advice to the Commission to offering broader guidance to the JRC on how best to fulfil its mission.
All of the expert group's observations were rapidly and extensively addressed by the JRC, leading to the release, in 2016, of the *'JRC 2030 Strategy'*. This new document looked ahead to the end of the following decade, taking into account some recent changes in the Commission's working methods in response to contemporary challenges and the need for greater flexibility and decision-making capacity at the European level.
In particular, the need to manage resources more efficiently and ensure maximum impact of policies adopted required an increasingly integrated and multidisciplinary approach.

The pressures on the Commission's human and financial resources not only persisted but were expected to intensify, necessitating even more prudent and targeted management.
Furthermore, the transformations initiated by the Commission under the leadership of President Jean-Claude Juncker had brought about a profound cultural shift within the institution, focusing on strong collaboration between Directorates-General to make the Commission more agile, responsive and capable of addressing increasingly complex challenges.
The long-term trends were therefore clear.
More and more policies required a solid foundation in data, offering the JRC immense opportunities to provide added value by delivering knowledge or services that no other source could offer. To this end, the JRC needed to become a strategic partner close to the political heart of the Commission, rather than acting as a kind of consultant responding on a case-by-case basis to specific requests from individual Directorates-General.

Its goal and ambition had to be to focus on political priorities, which would often mean working with many different parties simultaneously.
It was therefore necessary to work beyond political silos, which meant that the JRC's own structure had to become more integrated. There had to be *'one JRC'*, with an integrated management structure and all parts of the organisation working together seamlessly.
A leaner and more efficient organisation was required: like the rest of the institution, it had to do more with less and use its resources more intelligently. A people-centred structure was to be put in place, capable of attracting top professionals and offering them a stimulating working environment.
Finally, as the EU's agenda became increasingly dominated by crisis management (e.g. the 2008 financial crisis and the subsequent sovereign debt crisis, the Syrian refugee crisis and the terrorist attacks of 2015 and 2016), and, although complexity and uncertainty were on the rise and many developments could not be predicted, a stronger culture of anticipation would enhance the EU's preparedness and resilience. The JRC could make a significant contribution in this regard. It already possessed many of the necessary capabilities and tools but needed to further develop them.
Since the success of any strategy depends on solid foundations, the JRC required a new unifying vision statement that would succinctly set out the organisation's future direction, aspirations and primary objectives. Everything the JRC staff would do in the future would ultimately have to contribute to these objectives. The vision would engage everyone, enabling them to be more productive; it was the cornerstone of the strategy. This conceptual framework connected certain values deemed fundamental to the JRC, namely inclusion, integrity, openness, accountability and innovation. According to the new strategy, 80% of the JRC's projects would be co-designed, in a spirit of partnership, with the policy Directorates-General and/or, in the case of activities under Euratom, the Member States. These projects would need to be genuinely collaborative. The relationship between the JRC and the policy Directorates-General would not be purely formal and/or based on interpersonal relationships. Instead of simply delivering its research at the beginning of the policymaking process and no longer being involved, the JRC would need to establish an iterative relationship with the other Directorates-General, where questions and answers would be generated through a co-creation process involving JRC researchers and their counterparts in the policy Directorates-General.
In other words, the JRC would no longer receive instructions from the policy Directorates-General but would instead act as an equal partner, working closely with them while maintaining its scientific independence. These research projects, whether conducted in laboratories or elsewhere, would incorporate a new knowledge management dimension, exploring and taking into account all relevant knowledge, including that not generated by the JRC.
Although every co-designed activity would have a lead Directorate-General, other Directorates-General with an interest in the dossier could and should also be closely involved, ensuring that diverse policy perspectives were considered to better build consensus within the Commission.
Another 15% of the JRC's projects would aim to provide foundational knowledge, focusing on emerging areas deemed likely to be important in the future. For example, they might involve an emerging technology for which the JRC identified the need to develop new definitions or measures, to be used, for instance, in regulations related to that technology.
The remaining 5% of the JRC's projects would consist of exploratory research.
Although these projects were required to have some connection to EU policy, there were no

predefined themes. A bottom-up process was envisaged, in which JRC researchers would be invited to propose ideas for projects, with the best ones being selected, providing scientific staff with an opportunity to consider possible futures and engage in blue-sky thinking capable of challenging accepted paradigms.

Work in support of Member States, enlargement countries or international organisations could be justified in the presence of a relevant legal and political framework, as in the case of research in the nuclear field and training under Euratom, or following a request from the Directorate-General responsible for the policy.

Similarly, EU agencies wishing to request support activities from the JRC should do so through the competent Directorate-General, obtaining, where possible, its direct contribution to funding.

Partnerships with leading scientific organisations in their respective fields worldwide would also play a fundamental role in the success of the JRC's mission, with the unwavering goal of supporting EU policies.

The 2030 Strategy also specified what the JRC would *not* do. For instance, the JRC would support policy Directorates-General in designing and creating new systems and processes, but, once these became operational, they were to be handed over to one or more other bodies, such as an external contractor or a Member State agency, which would then be responsible for their long-term operation.

The JRC could continue to play a supporting role, such as monitoring work to ensure it was carried out uniformly and correctly, but it would no longer take on routine, long-term operational tasks. Pre-existing activities of this nature would be gradually phased out, with some exceptions, such as work involving databases containing confidential information or work on sensitive issues that would be unsuitable for outsourcing to an external contractor. The 2030 Strategy was accompanied by a radical transformation of the JRC's organisational structure.

From a purely terminological perspective, the institutes that had existed since 1988 disappeared and were replaced by directorates, organisational entities much better integrated into the European Commission. Furthermore, the JRC chose to leverage the possibilities offered by modern technology to connect working groups with similar activities and expertise, even if located on different sites, in order to fully exploit its potential and eliminate duplications.

The directorates thus lost the geographical character typical of the institutes, anticipating the remote interconnection process that the COVID-19 pandemic would make more widespread a few years later.

The relatively large size of the Ispra site meant that it tended to host large working groups made up of staff from as many as 10 different directorates. Always with the aim of maximising the mobilisation of existing resources to address EU policy challenges, a matrix-like structure was created, with two 'horizontal' directorates focusing respectively on knowledge management and competences management.

In this context of great intellectual and organisational ferment, shortly after the JRC's 2030 Strategy and as a direct emanation of it, a cutting-edge vision for the Ispra site was developed. This vision, outlined in a new development plan, aimed to transform the site into a European benchmark, a model of a modern and open research centre managed as sustainably and efficiently as possible, while also being a stimulating, pleasant, safe and protected environment for the thousands of people working there. Four words summarised this vision – "Smart", "Sustainable", "Open", and "Efficient" – the cardinal points determining the lines of action to achieve the aforementioned vision.

To make the centre *smart*, efforts were directed at promoting the site as a place for cutting-edge research, transforming it into a 'Living Lab' with advanced and interactive technological demonstrators, alongside new smart buildings

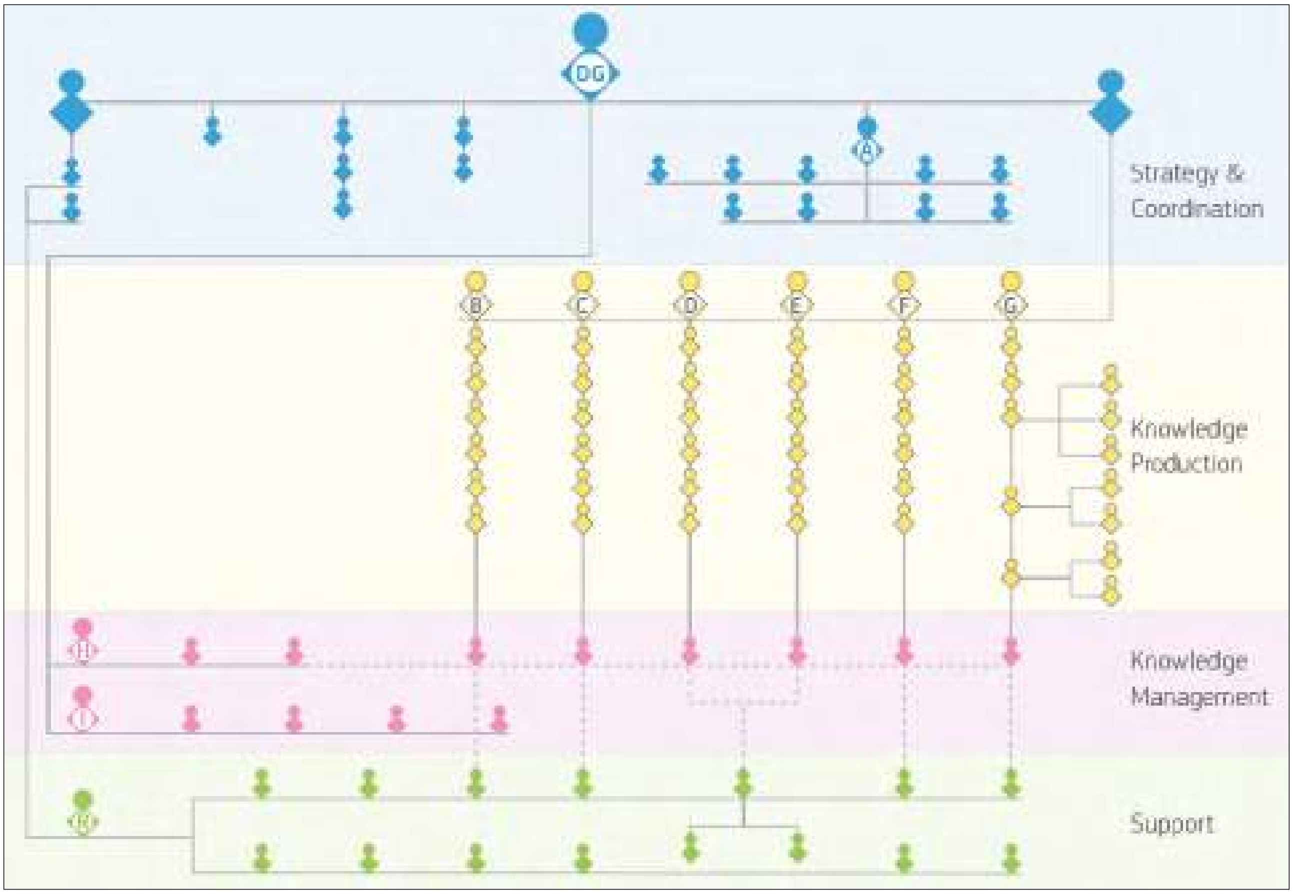
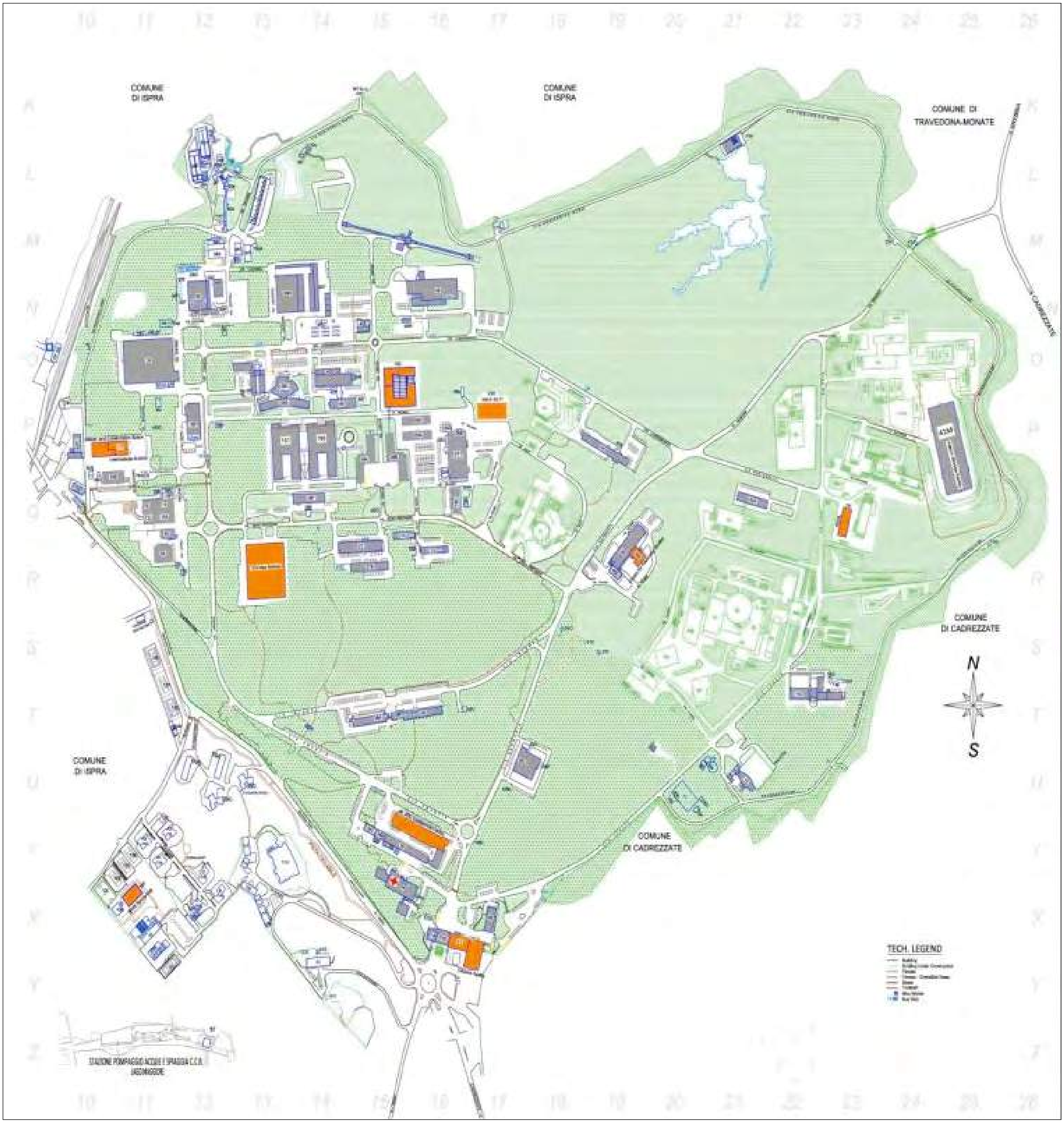


Diagram showing the JRC's organisational structure as of 1 July 2016.

and innovative working methods. In line with the pre-existing tradition (from the EcoCentre onwards) of a *sustainable* centre, the aim was to further reduce the carbon footprint by maximising the use of renewable energy, improving the energy efficiency of both new and existing infrastructure and promoting the use of low-emission transport.

The decision to make the centre *open* translated into the objective of transforming the site into a more welcoming and collaborative space for many, adapting infrastructure to foster inspiration and sharing, while maintaining a secure and protected site. Finally, to make it *efficient*, the centre would be streamlined and digitalised, and the aim was to automate support services on the site as much as possible.

On the one hand, this Site Development Plan aimed to continue the development logic followed in previous years, which had been based on replacing old, obsolete and geographically dispersed buildings with a few large and energy-efficient structures located within the science zone. On the other hand, it addressed the concept of site development in its broadest sense, not only covering physical structures (brick and mortar) but also striving to provide a holistic vision of all relevant aspects of site management. In this way, the plan sought to modernise not only the main infrastructure but



Future vision of the Ispra site, according to the 2030 development plan. The buildings to be built are in orange.

The cover of the Ispra site development plan for 2030, published December 2018.

also various other aspects, including intangible ones, concerning how staff could work, live and move within the site in the years to come.
The drafting of the plan was entrusted to the site management department, established during the 2016 reorganisation, and benefited from, among other things, the contributions of the scientific directorates in the form of data, analysis and modelling, particularly on topics related to energy, future mobility and digitalisation, drawing on initial lessons learned from modernisation efforts at other research campuses in Europe.
Presented to the Board of Governors in March 2019, the plan immediately moved into the implementation phase, producing very significant effects in relatively short timescales.
First and foremost, a new building was completed, further contributing to the progressive concentration of scientific staff and enabling the site management services to proceed with the demolition of obsolete and energy-inefficient buildings. In addition to creating a functional and attractive working environment for around 300 people, the design of this new building achieved a high level of energy efficiency thanks to innovative air-conditioning and thermal insulation technologies. Furthermore, 760 square metres of photovoltaic panels for electricity production and a highly sophisticated heat pump system for thermal energy supply contributed to the 2030 vision of an intelligent and sustainable Ispra site.
This was followed by the construction of the VELA 10-11 building, inaugurated in 2022 for activities related to testing vehicle compliance under real-use conditions in response to recent concerns about discrepancies between exhaust emissions measured in laboratory tests and those measured on the road.
Thanks to this and other facilities, the JRC is today recognised as the Commission service responsible for conducting these tests.
The Site Development Plan also included a new conference centre, to be created through the renovation of the building constructed in the early 1960s to host CETIS, whose north-west wing has now been completely refurbished to create a modern, flexible, multipurpose facility capable of hosting conferences for up to 400 participants, seminars and meetings.
The choice of this location for the conference centre was based on several considerations, including the pre-existing infrastructure (an auditorium for 100 people and three videoconference rooms), the building's location near the site's main entrance and the large canteen car park and the building's structure,

which offered the possibility of creating a large, 550-square-metre meeting room that could be divided into three smaller rooms, with unobstructed visibility and good internal height. Complementing the conference centre project was another new structure, the Europa Science Experience (ESE), a building located outside the protected perimeter of the Ispra site, capable of hosting exhibitions and information sessions for visitors, integrating flexible digital technologies for data visualisation.

Inaugurated on 20 April 2023 by Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth, the ESE today continues and expands the activities previously carried out in an existing visitors' centre located within the perimeter, including various initiatives related to education and youth.

The building consists of two main spaces: the Cube, a glass focal point near the main entrance, and the multifunctional exhibition area, spread over two floors, with permanent and temporary exhibitions on the ground floor and a configurable meeting room on the first floor for conferences of up to 80 people, round tables, workshops and seminars.

The building, highly energy-efficient (a nearly zero-energy building), aligns with the "New European Bauhaus" (NEB) initiative, launched by the Commission in 2020 to connect the European Green Deal to everyday living spaces, with the aim of creating beautiful, sustainable and inclusive environments.

Alongside the infrastructure to be built, the site development plan outlined a rather ambitious strategy in terms of energy efficiency and

Multipurpose building completed in 2020.

sustainability, in line with the general guidelines of the EU.
The plan specified that the site, in the years to come, would diversify its energy supply, relying on a combination of self-produced electricity and thermal energy from natural gas, as well as electricity from renewable sources purchased from the national grid and/or self-produced from photovoltaic systems installed on site.
Specific objectives were set, including replacing the existing co-generation plant with a state-of-the-art, more efficient and environmentally friendly one, deploying an increasing capacity for photovoltaic energy production and, above all, saving energy by improving the energy performance of buildings.

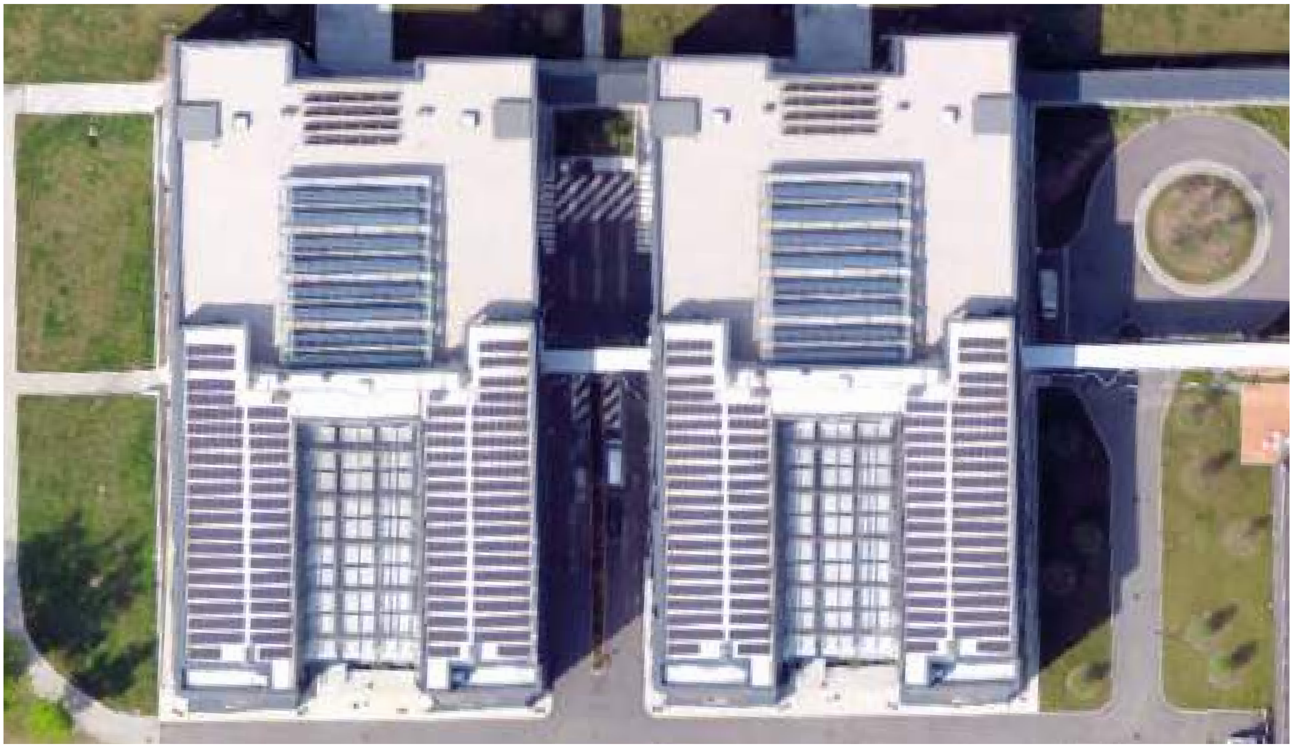
It was also decided to promote more sustainable mobility by gradually phasing out site service vehicles with internal combustion engines and replacing them with electric equivalents.
From an environmental perspective, the plan aimed to manage green areas sustainably to ensure their aesthetic and functional longevity in line with modern practices in the field, leveraging potential synergies, both old and new, with local authorities.
To achieve this, the site management department proposed adopting a compensation scheme to ensure no net losses to the site's ecosystem (e.g. due to tree felling for new building), implementing procedures to regulate the management of green areas (selection, planting,

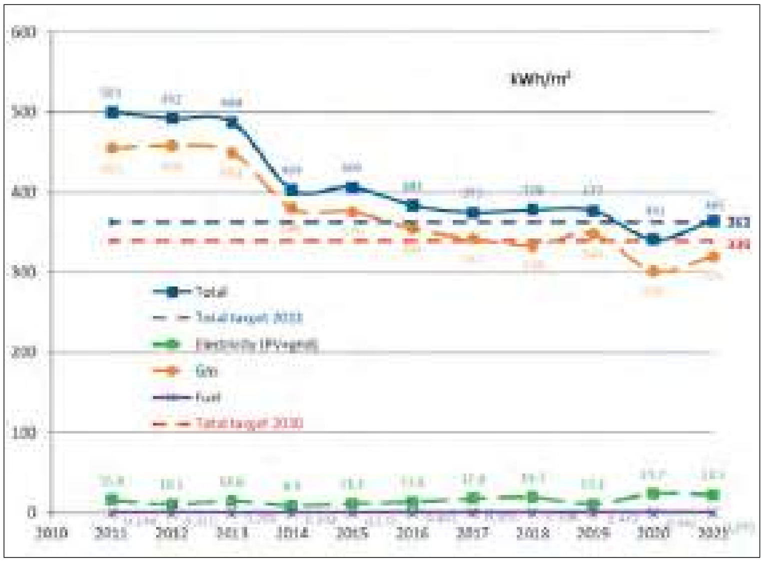
The Europa Science Experience and the main entrance to the JRC site, May 2025.

pruning, felling, replacement and conservation of trees, grass mowing, flowerbed maintenance) and, finally, implementing and monitoring guidelines for the effective management of the plant and animal species present.
The 2030 Strategy was revised in 2023, starting from the recognition that the European Union has set out on an ambitious path to address global challenges such as climate change and ecosystem degradation, digital acceleration, demographic changes, public health, security, shifts in human geography and the future of work. In a rapidly evolving geopolitical context, Europe must strengthen its resilience to face these challenges, drawing on the lessons learned from the COVID-19 pandemic.

While the strategy adopted in 2016 had strengthened the JRC's position within the Commission as a provider of scientific support for EU policies and political priorities, the renewed document should be seen as a complement to and evolution of that strategy, updating its key elements alongside a mid-term evaluation.
Recognising that the world has not stood still since 2016, efforts have been made to reset, reimagine and renew the JRC, thereby reinforcing its role in serving the European project.
Through strengthened partnerships within and beyond the European Commission, the JRC aims to enhance its capacity to anticipate new challenges and opportunities, helping policymakers to better understand issues and

Photovoltaic panels on the roofs of buildings in the *science zone*.





Evolution of energy consumption in buildings, 2011-2021.

Evolution of the types of service vehicles used, 2011-2021.

provide responses and solutions to the complex and interconnected challenges society faces. The revitalised strategy and new organisational structure aim to position the JRC as an organisation even more firmly focused on science at the service of policymaking.

As the nature of the challenges the EU faces becomes increasingly systemic, requiring broad social, technical and political responses, the scientific objective must also adapt. The JRC must remain flexible, embracing change and continuing to adjust the strategy to anticipate and respond to emerging challenges.

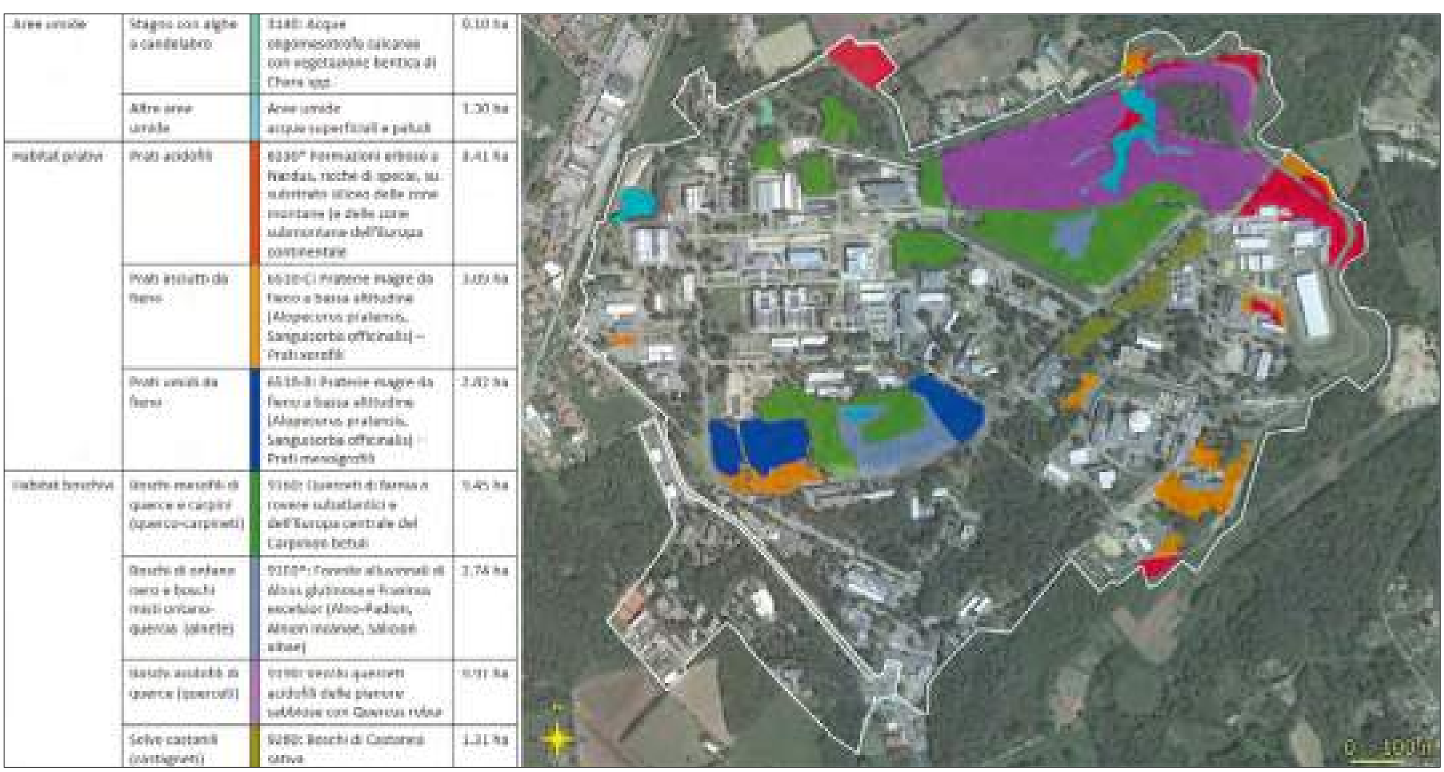
By supporting excellence in science for policymaking and related aspects with foresight, integrating scientific expertise across disciplines to contribute to shared decision-making, combining foresight and innovation, synthesising knowledge and promoting experimental research, the JRC will ensure its expertise in data and digital matters is made visible, communicating more effectively externally, setting an example within the European Commission and collaborating with partners to better leverage expertise and address the growing challenges of digital transformation, in terms of both policies and research outcomes.

Guided by these priorities and a commitment to breaking down silos, work has been reorganised into portfolios, which are now the main building blocks of the multiannual work programmes.

The portfolios bring together scientific disciplines from across the JRC to address a common theme or issue with various priority elements.

Signature of the collaboration agreement between the JRC in Ispra and ARPA Lombardia, the regional environmental protection agency, 2017. From left: the site Manager Marinus Stroosnijder, and the Director-General of ARPA Lombardia, Michele Camisasca.

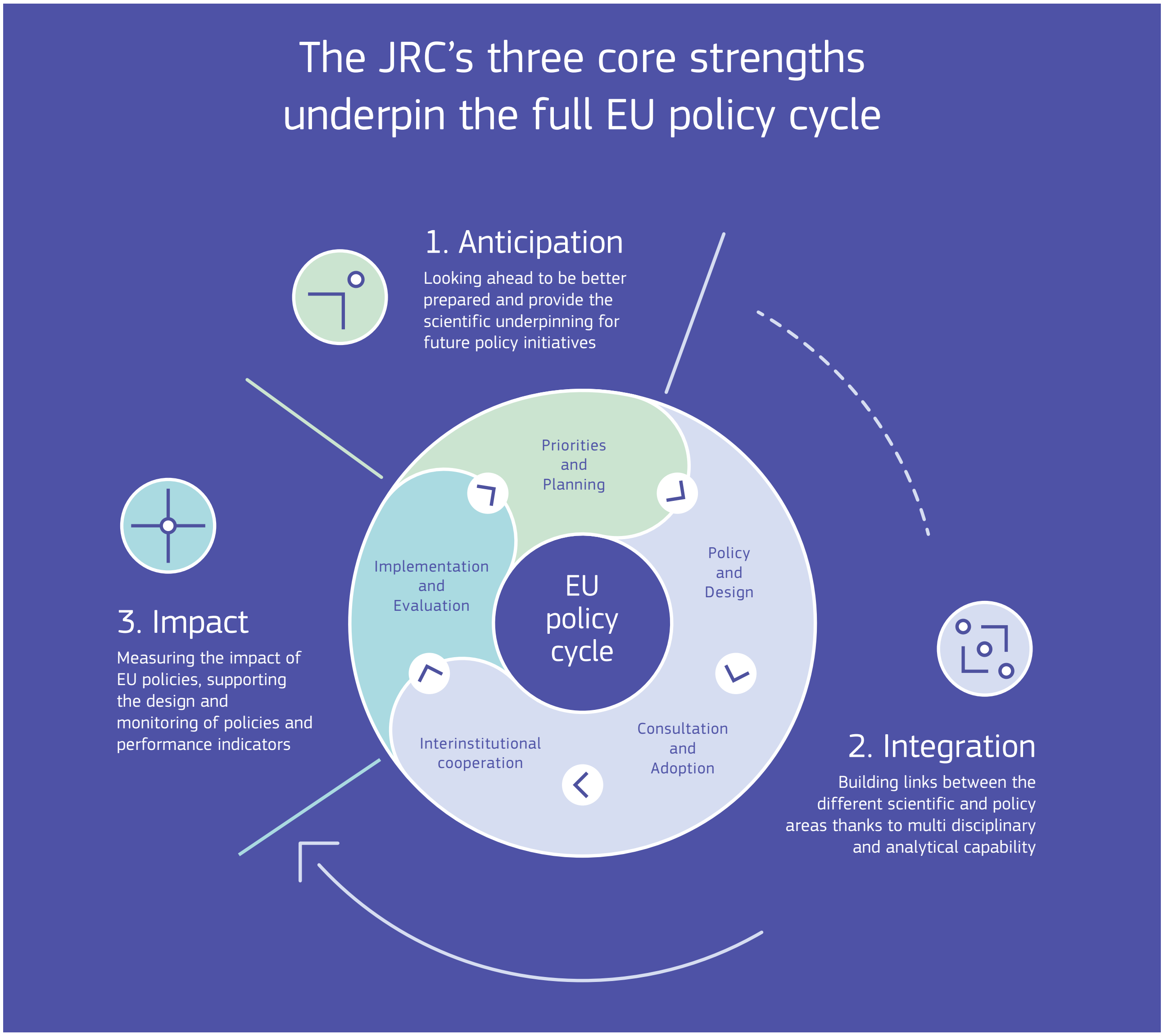
Biodiversity map of the Ispra site.



This interdisciplinary approach creates new insights, knowledge and methods, ensuring greater integration between scientific and policy sectors and maximising the JRC's ability to anticipate new challenges, support the development of resulting policies, and design and monitor their impacts.

Through this new integrated approach, the JRC now supports policymakers in a more coordinated way to address the complex and, at times, unprecedented challenges that Europe faces today and will face in the future.
This new way of working aims to lay the foundation for a more streamlined and agile

The role of the JRC in supporting the EU policy cycle.



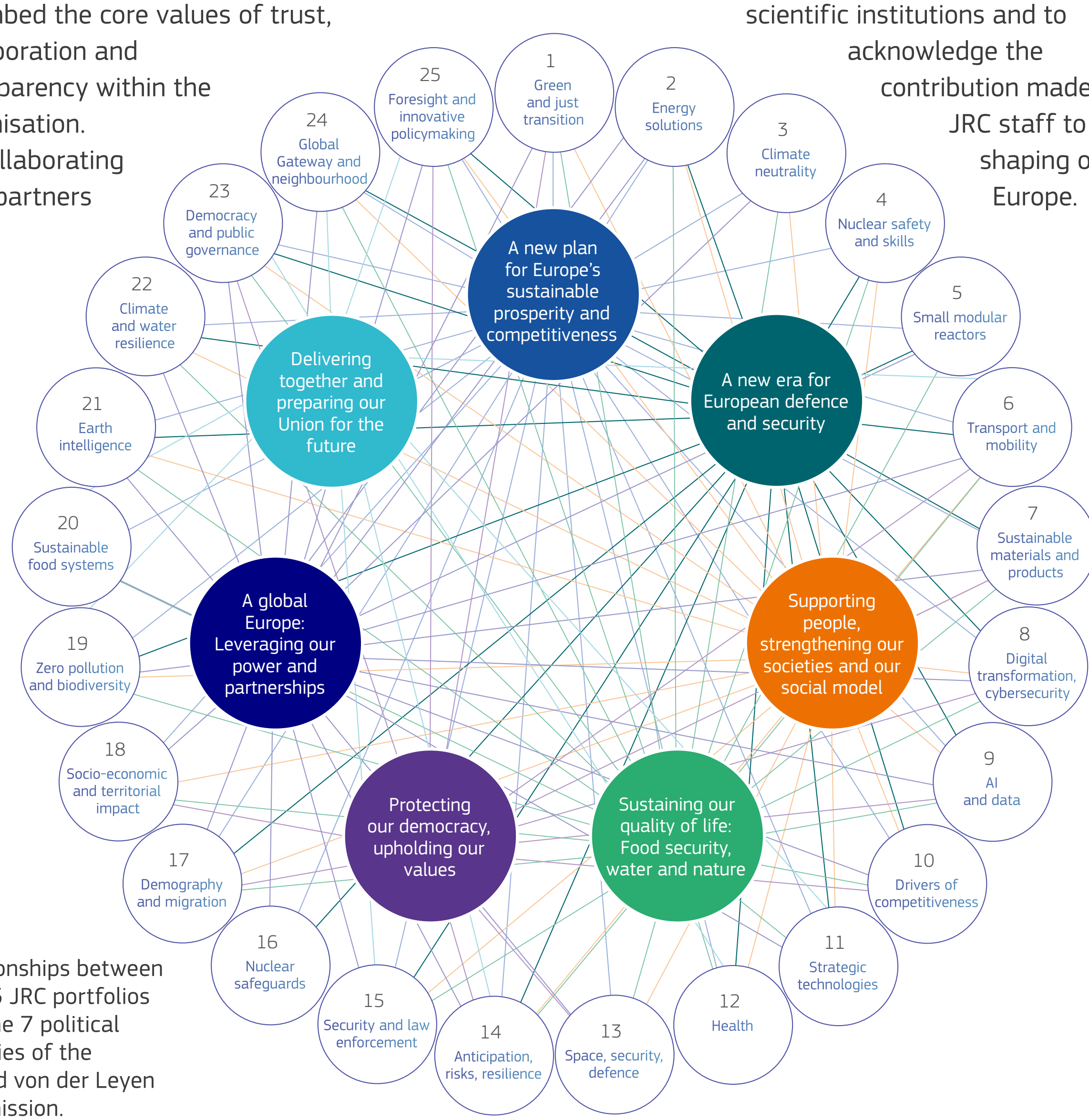
approach to work programming, responding to priorities, increasing efficiency and fostering collaboration. The portfolios allow for a better balance between areas of specialisation and the integration needed to best meet policy requirements. Operating on the basis of joint leadership and organised, highly competent teams, they include planning aspects such as data strategy, knowledge synthesis, stakeholder engagement, scientific development and the dissemination of results. The portfolios will adapt and evolve over time in response to new priorities, challenges and opportunities, helping to embed the core values of trust, collaboration and transparency within the organisation.

By collaborating with partners outside the Commission on the design and implementation of the portfolios, the JRC will make them excellent calling cards, demonstrating its activities and indeed its very *raison d'être*.

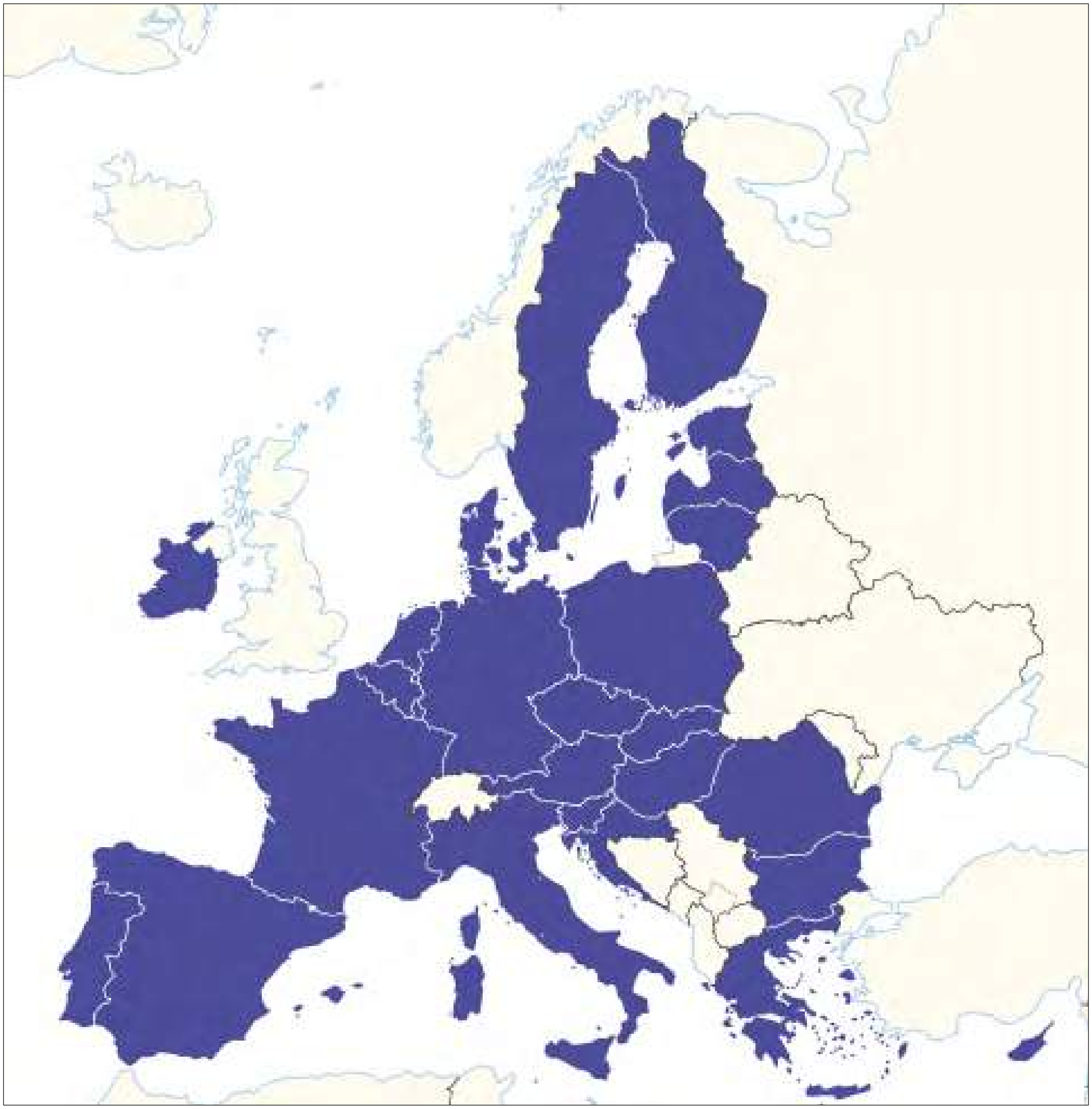
It is inevitable to conclude in the future tense a story that began in a not-too-distant past.

The JRC in Ispra has contributed to the response to all the major crises the EU has faced in recent decades, from the financial crisis to the COVID-19 pandemic, and has provided expertise on numerous major international issues.

These few pages have attempted to present to the public a unique story in the history of scientific institutions and to acknowledge the contribution made by JRC staff to the shaping of Europe.



Relationships between the 25 JRC portfolios and the 7 political priorities of the second von der Leyen Commission.

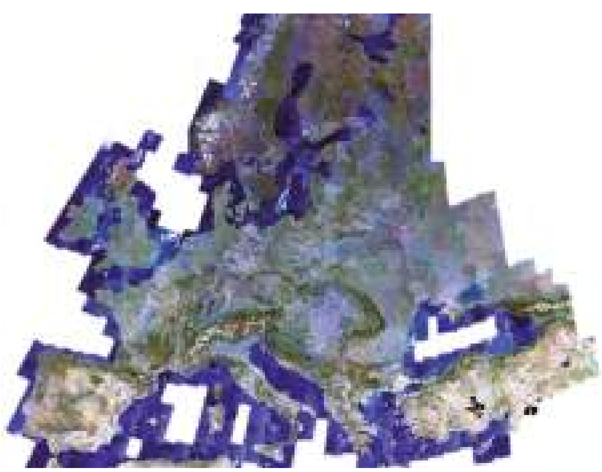


Map of the European Union in 2025
(Administrative boundaries: © EuroGeographics
© OpenStreetMap).

The European Commission, 2024-2029.
From left to right: first row, Raffaele Fitto, Henna Virkkunen, Teresa Ribera Rodriguez, Ursula von der Leyen, Kaja Kallas, Stéphane Séjourné and Roxana Mînzatu; *second row:* Dubravka Šuica, Valdis Dombrovskis, Hadja Lahbib and Apostolos Tzitzikostas; *third row:* Jessika Roswall, Olivér Várhelyi, Marta Kos, Michael McGrath and Ekaterina Zaharieva; *fourth row:* Wopke Hoekstra, Andrius Kubilius, Maria Luís Albuquerque, Magnus Brunner and Costas Kadis; *fifth row:* Piotr Serafin, Maroš Šefčovič, Jozef Síkela, Christophe Hansen, Glenn Micallef and Dan Jørgensen.

INSPIRE: an infrastructure for spatial information in the European Community

Policy-relevant assessments and analyses often rely on a combination of different types of environmental and geographical data, for example on land use, administrative boundaries, elevation, hydrology, transport networks, production facilities, protected sites and more. Since all this information relates to specific locations, its quality depends on the availability of spatial data that is associated with the location (or georeferenced) and subsequently processed to extract the information.
The INSPIRE Directive (Directive 2007/2/EC), adopted on 14 March 2007, established general rules for the creation of an infrastructure for spatial information in Europe, to support environmental policies and, more broadly, all activities with an impact on the environment.
The first digital maps prepared in Europe, derived from the digitisation of old paper maps, showed many anomalies along national borders because they used different geographical reference systems.
For example, roads crossing borders did not align correctly. When satellite images of the earth became more readily available to cartographers, it became essential to rationalise the system across the EU. Today, 20 years later, digital geographical mapping has become essential for countless businesses, public services and even individual citizens using smartphone apps for their daily navigation needs.
Moreover, the latest European data strategy aims to create a single market for publicly available data in the interest of Europe's global competitiveness and data sovereignty.
The JRC, which had been exploring the practical use of satellite remote sensing data for environmental monitoring since the 1980s, was among the first to notice the anomalies caused by the different national standards.
On 11 April 2002, Commissioners Wallström (environment), Solbes (economic and monetary affairs) and Busquin (research) signed a memorandum of understanding to establish a basis for ongoing cooperation between the Directorate-General for Environment, Eurostat and the JRC on the development of the INSPIRE initiative.
In particular, the JRC took on the task of designing harmonised standards to support the future directive. This directive, still in force today and currently being amended, did not require Member States to collect new data but specified the reference standards to be used to facilitate the interoperable sharing of existing data at the national level. In this way, it directly supported the concept of the EU single market by ensuring the free movement of publicly available geographical data.
Today, the role of the JRC, in collaboration with Member States, is to support research and



In 2006, the JRC developed the IMAGE2000 satellite image mosaic of Europe, a key element of the Inspire system.

First version of the European geoportal (2006), developed by the JRC as the main point of access to geospatial information in Europe.

experimentation on standards and, more generally, technical approaches to facilitate the sharing of spatial data, as well as to keep information on the INSPIRE system easily accessible and available to data providers and users in the EU.
In this regard, it is desirable that spatial data infrastructures evolve from complex and highly specialised environments to more sustainable, flexible and agile data ecosystems, lowering the entry barrier for non-specialists and broadening participation to less traditional stakeholders (e.g. open-source software communities, standardisation bodies and early adopters) in addition to data providers and users. A good example of a practical application of INSPIRE is the European Flood Awareness System (EFAS), developed to produce European overviews of flooding (both forecast and ongoing).
It was developed by the JRC in collaboration with national hydrological and meteorological services, European civil-protection organisations and other research institutes.
Flood forecasting begins with precipitation forecasts provided by the European Medium-Range Weather Forecasts service.
The process then uses digital elevation data, which show the exact shape of the terrain by specifying the height above sea level on a fine grid of geographical positions. This allows computer models to calculate the flow of rainwater and predict the risk of its accumulating in a river basin and causing flooding. Such floods can easily occur far from where the rain fell and, consequently, the computer models and associated mapping data must seamlessly cover national and administrative borders.
A reliable forecasting service allows authorities to alert individuals and businesses in areas affected by these extreme phenomena.
More than 20 years after the JRC's initial studies in this field and following various applications such as EFAS, the integration of the INSPIRE system into the common European data space envisaged in the recent European data strategy represents a new frontier in the journey towards seamless and user-centred data exploitation, capable of meeting an ever-growing range of societal needs.

The cover of a report on INSPIRE and the European Green Deal.

EFAS display showing flooded areas between 31 January and 5 February 2024 near the town of Redon, France. Different shades of blue correspond to different days (less intense = most recent date).

The VE(e)LA laboratories: 20 years of research and experimental measurements on vehicle emissions – and beyond

Road vehicle emissions have a significant impact both on the quality of the air we breathe, and hence on our health, and on the climate, as transport is responsible for around a quarter of total carbon dioxide emissions. In the early 1970s, following serious air pollution problems that began to emerge in many large European cities, norms were introduced at the Community level to harmonise the legislation of Member States on the control of pollutant emissions from motor vehicles (Council Directive 70/220/EEC of 20 March 1970).

In the following years, these regulations were progressively tightened and extended to other road vehicles through a series of legislative acts that set out new emissions limits, known as the Euro standards, the first stages of which (Euro 1 and 2) came into force in the last two decades of the 20th century. At the end of the 1990s, given the increasing complexity of the issues and the enormous economic implications, the European Commission strongly felt the need, for the development of future legislation in the field, for high-level technical and scientific support that was also independent of national and partisan interests.

Since then, the evolution of the Euro emissions standards, which is still ongoing, has been closely linked to the activities of the JRC in Ispra and, in particular, to the history of the Vehicle Emission Laboratories (VELA).

In 1999, the first emissions laboratory (VELA 1) was inaugurated, dedicated to measuring emissions from light-duty vehicles, followed in subsequent years by other laboratories that extended emissions measurement capabilities to heavy-duty vehicles and other types of engines. In the early 2000s, these laboratories supported – through hundreds of tests on cars, motorcycles and heavy-duty engines – the development of various regulations, for example the establishment of the World Harmonised Motorcycle Test Cycle (WMTC), the global technical regulation on non-road engines and the revision of the EU directive on fuel quality.

The growing recognition of the JRC's role in developing vehicle emissions legislation culminated in those years in an invitation from the United Nations particle measurement programme to act as scientific coordinator for the validation exercise to be conducted on the new methodology for measuring the number of particles emitted in exhaust gases, deemed necessary to set the new Euro 5 limits and for the large-scale adoption of diesel particulate filters. Furthermore, in 2003, the JRC organised the International Conference on Future Worldwide Emission Requirements for Passenger Cars and Light-duty Vehicles, supported by the Directorates-General for Environment, Energy, and Transport.

Today, the VELAs, which have naturally evolved to keep pace with technical and scientific progress, include various test cells that allow emissions from modern vehicles to be measured with a high degree of accuracy, despite increasingly lower values, under a wide range of test conditions. It is possible to assess the impact on emissions of different types of fuels (including biofuels, hydrogen and e-fuels), environmental conditions (varying test temperatures from – 30°C to + 50°C) and driving profiles (from those typical of urban areas to those that might be expected in more demanding conditions).

Another laboratory allows the evaluation of emissions of volatile organic compounds resulting from the evaporation of petrol in car tanks and fuel systems during parking, a problem exacerbated during periods of high external temperatures.

The range is completed by two facilities inaugurated in October 2015, dedicated to pre-regulatory testing and research on the electrification of road vehicles. These new laboratories, whose names are spelled 'VeLA' to emphasise the nature of the vehicles tested

VELA 1: the first of the JRC's vehicle emissions laboratories.

VeLA 9: an e-mobility electromagnetic testing facility.

there, enable experimental evaluation of the functionality of electric or hybrid vehicles, their energy efficiency, range, electromagnetic compatibility and, for hybrid vehicles, exhaust emissions. These laboratories are playing a decisive role in the development of the new Euro 7 standards, as well as other globally harmonised regulations on new-concept vehicles, including autonomous vehicles, whose innovative technologies pose new challenges that often require a complete revision of testing and type-approval procedures.

A significant turning point in EU regulations on the certification of pollutant emissions from motor vehicles was the introduction of real-driving emissions tests to complement laboratory tests. These tests are carried out using Portable Emission

A portable emissions measurement system (PEMS).

Measurement Systems (PEMS) on vehicles driven on the road, enabling a more realistic assessment of environmental impact.

The JRC in Ispra has been working on PEMS since the mid 2000s and was among the first to highlight the sometimes significant discrepancies between emissions values measured in laboratories and actual emissions on the road.

Since 2010, the JRC has effectively coordinated the development of the PEMS testing procedure at the European level and its validation for legislative purposes; this methodology, also adopted by many non-EU countries, became an integral part of the Euro 6 standards in 2016.

In 2018, Regulation (EU) 2018/858 introduced the obligation for Member States and the European Commission to establish a market surveillance system for motor vehicles, aimed at making controls more systematic and effective and ensuring that vehicles on the European market comply with the applicable regulations. Following the adoption of this regulation, in September 2020 the JRC formally took responsibility for physical testing of vehicles within the context of the market surveillance activities carried out by the European Commission.

Under this framework, the JRC in Ispra no longer only verifies emissions but also evaluates all other aspects assessed in the vehicle type-approval process, such as safety.

To meet this commitment, a new laboratory for vehicle market surveillance was inaugurated in 2022, with the aim of performing the required checks more efficiently. Assessing emissions under typical usage conditions in addition to compliance with other requirements such as the prohibition of systems

The Vehicle Market Surveillance Facility: external view.

capable of recognising when the vehicle is being tested requires multiple tests under different conditions. Moreover, the Ispra site has also become an open-air laboratory, enabling specific tests on the operation of certain active safety systems, such as pedestrian recognition or emergency braking.

More than 25 years after the opening of VELA 1, the activities of the JRC in Ispra in the field of sustainable mobility technologies have grown steadily, making vehicle testing a success story and a cornerstone of the JRC's future work.

Fully integrated into the new portfolio structure, these activities will help anticipate solutions and support the development of policies for the transition to smarter, safer, cleaner, fairer and more energy-efficient mobility systems and technologies.

This will include elements of digitalisation, automation and modal integration, which will play a key role in future transport and mobility systems.

The new approach to knowledge management: Knowledge and Competence Centres

With the 2030 Strategy, the JRC embarked on a profound transformation, evolving from a traditional research institute into an organisation capable of managing scientific knowledge generated by other sources, such as universities, industry, other research bodies and non-governmental organisations, in direct collaboration with the policy Directorates-General of the Commission. This gave rise to new functions specifically dedicated to managing knowledge and expertise, both as a new cross-cutting internal development and to support and inform EU policymaking.
The most emblematic examples of this new approach were the Knowledge Centres (KC) and the Competence Centres (CC), virtual entities bringing together experts and knowledge available both within and outside the European Commission.
The KCs focused on policy issues or specific topics, while the CCs concentrated on analytical tools applicable across various fields. Together, they provided contextualised information, data analysis and visualisation, informing policymakers and stakeholders about the latest scientific findings relevant to their respective mandates and objectives.
First described in a policy document presented by the Director-General to the JRC directors in September 2015, the KCs and CCs immediately emerged as key elements of the 2030 Strategy, formally recognised by the Commission in 2016 in a specific working document, the communication 'Data, information and knowledge management at the European Commission' (C(2016)6626 final).
The first KC, on disaster risk management, was inaugurated on 30 September 2015, even before the official release of the 2030 Strategy. Its mission was to improve understanding of and resilience to disaster risks, fostering an informed approach to policymaking in this area. Co-chaired by the JRC and the Directorate-General for European Civil Protection and Humanitarian Aid Operations, it brought together representatives from 11 directorates-general and collaborated with 34 countries participating in the EU Civil Protection Mechanism.
The first CC, on composite indicators and scoreboards, was launched only a few months later, on 3 February 2016. Its objective was to contribute to monitoring the impact of EU strategies and policies at the national, regional and local levels.
To achieve this, the centre developed, constructed and validated composite indicators (performance indices) and scoreboards capable of summarising multidimensional processes using simplified concepts. The CC drew on expertise from 5 different JRC directorates, supporting 20 Commission Directorates-General and services, 3 Member States and 17 international organisations, including the OECD and the UN. In the years that followed, from 2016 to 2022, numerous other KCs and CCs were established. Among these, those listed below operated partially or entirely in Ispra.

Graphic depicting the Knowledge Centre for Disaster Risk Management.

Graphic depicting the Competence Centre on Composite Indicators and Scoreboards.

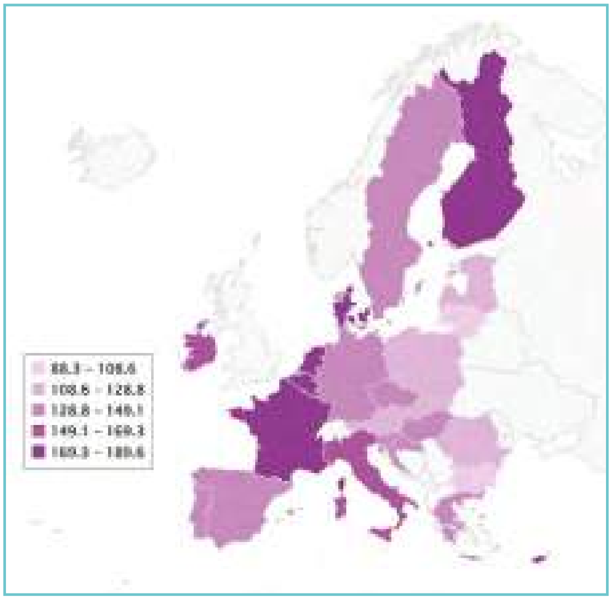
Knowledge *Centres*

- The KC for Territorial Policies, founded in 2016, aimed to strengthen competitiveness, preserve diversity and improve the quality of life in European cities and regions, supporting the EU's territorial development efforts.
- The KC on Migration and Demography (2016) was dedicated to the systematic analysis of the multiple aspects of these two phenomena on a global scale and their social impact on the EU in the medium and long term.
- The KC for the Bioeconomy (2017) was designed to make data and information from various sources accessible, bringing together the knowledge needed to assess the state, progress and impact of the bioeconomy.
- The KC for Global Food Security and Nutrition (2018) was established to improve understanding of the social, economic, political and environmental dynamics related to food system security.
- The KC for Biodiversity (2020) was created to support the EU biodiversity strategy by promoting cross-sectoral dialogue on biodiversity and related sectors.
- The KC on Earth Observation (2021) was launched to maximise the use of knowledge generated from earth observation, particularly from the Copernicus programme, in EU policymaking.
- The KC on Cancer (2022) focused on collecting, managing and harmonising data and information to promote scientific alignment, coordination and support for EU policies and activities on cancer prevention and care.

Competence Centres

- The CC on Microeconomic Evaluations, inaugurated in 2016, aimed to contribute to better regulation and better spending in the EU through microeconomic analyses.
- The CC on Text Mining and Analysis (2016) was tasked with developing text mining techniques and tools needed across EU institutions, particularly monitoring the web for signals, innovations and trends useful for informing policy action.
- The CC on Modelling (2017) was created to promote the responsible, coherent and transparent use of modelling to support the evidence base for EU policies, including establishing standards in the field through a dedicated community of practice.
- The CC on Participatory and Deliberative Democracy (2021) was created in response to the growing demand for a less technocratic and more citizen-oriented EU and was intended to support participatory projects at the request of the Commission, other institutions and individual EU countries.

The results achieved by the KCs and CCs over the years, and especially the online resources created and made available to other Directorates- General, stakeholders and citizens, have been remarkable. Among the most notable examples are the European Cancer Information System (ECIS), the Biodiversity Information System for Europe (BISE), the Migration and Demography Atlases, the Risk Data Hub (which includes various modules on different aspects of disaster management), the European Media Monitor (EMM) and the Citizen Engagement Navigator. These and many others are made available and managed by the JRC through a dedicated online platform.
Overall, the KCs and CCs represent a success story for the JRC. Not only are most of them still active and continuing to support European policies, but their creation marked a turning point.
They contributed to overcoming the internal compartmentalisation that was an issue that needed to be addressed in the JRC at the end of the first decade of the 21st century, thus paving the way for the subsequent reorganisation of the work programme based on portfolios in 2023.



Estimated incidence of female breast cancer by Member State, in absolute numbers per 100 000 people of all ages, in 2022 (ECIS data).

Appendix 1

JRC Directors-General and Ispra site Managers, 1957-2025

Appendix 2

JRC organisational structure and Ispra site management, 1957-2025

Appendix 1

JRC Directors-General and Ispra site Managers, 1957-2025

JRC Directors-General (or equivalent)

Jules Guéron	1957-1968
Giulio Guazzugli-Marini	1968-1970
Pietro Caprioglio	1970-1974
Stelio Villani	1974-1982
Jean-Albert Dinkespiler	1982-1986
Jean-Pierre Contzen	1986-1998
Herbert Allgeier	1998-2001
Barry McSweeney	2001-2004
Roland Schenkel	2004-2010
Dominique Ristori	2010-2014
Vladimír Šucha	2014-2019
Stephen Quest	2020-2024
Bernard Magenhann	2025-

Ispra site Directors and Managers, 1960-2025

Gerhard Ritter	1960-1967
Hendrik Kramers	1967-1969
Pietro Caprioglio	1970-1974
Jean-Albert Dinkespiler	1974-1978
Roland Mas	1979-1982
George Bishop	1982-1988
Helmut Holtbecker	1988-1998
Jean-Pierre Vandersteen	1999-2004
David Wilkinson	2004-2009
Dan Chirondojan	2011-2016
Marinus Stroosnijder	2016-

Appendix 2

JRC organisational structure and Ispra site management, 1957-2025

Over the course of 65 years of history, the organisational structure of the JRC as a whole, and with it that of the Ispra site, has gradually evolved, going through numerous changes.
Most of these changes consisted of relatively limited adjustments to the organisation chart, implemented to keep the organisation in line with its objectives and to focus attention and resources on topics considered priorities from time to time.
This type of organisational transformation occurs relatively frequently in a research body such as the JRC, and in public administration in general. It usually involves a few tens to a few hundred people, to whom new tasks are assigned, in organisational entities that are renamed or restructured in line with the new strategic orientations. At the same time, some research activities are reduced or completely stopped in order to free up resources for new objectives. However, none of these changes alters the organisation's overall management architecture, the core elements of which remain essentially the same, as do their functions.
To give one example, the establishment of the Institute for Health and Consumer Protection (in Ispra) and the Institute for Energy (in Petten), resulting from the break-up of the Institute for Advanced Materials between 1998 and 2001, while having a considerable impact on staff and research activities, did not in any way call into question the organisational structure of the JRC. At that time, the JRC was structured around a number of scientific institutes, each with its own director, divided into thematic units and under the authority of a Director-General, who in turn was accountable to the relevant Commissioner.
As already mentioned, such adjustments have often taken place in the history of the JRC, and describing them in detail is beyond the scope of this appendix and this volume.
Rather, it is interesting to reconstruct whether there have been transformations at a higher level over the decades, leading to a fundamental overhaul of the organisational model and chain of command. From this point of view, the organisational history of the JRC as a whole, and thus that of its Ispra branch can be considered to be divided into three stages.

1957-1988
The four JRC establishments

Article 8 of the Euratom Treaty, establishing a Joint Nuclear Research Centre, stated from the outset that *'the activities of the Centre may, for geographical or functional reasons, be carried out in separate establishments'*.
In the years immediately following the signature of the Treaty, through country-specific discussions and negotiations on the transfer of the selected sites to the Community, this provision resulted in the creation of four establishments, located respectively in Ispra (Italy), Petten (the Netherlands), Karlsruhe (Germany) and Geel (Belgium).
In 1962, the fifth general report on the Community's activities described the progress of each of them, listing the activities already under way and those soon to be started.
Thus, for the JRC as a whole, a decentralised organisational structure was established, in which each of the four establishments reported primarily to its own director, who in turn was answerable to the Commission, so that *'despite the geographical dispersion, the establishments were intended to form a cohesive Common Centre'*. It is clear from the same report that the internal organisation of each of the four establishments was linked to projects and installations, many of which were under way or pending, and organised by discipline (physics, chemistry, materials, technology, general services, etc.).
In the case of Ispra, a partial organisation chart – reported by Friedrich Geiss, dated 1964 and allegedly drawn up by the first director of the Ispra site, Gerhard Ritter – shows the existence of two organisational entities subordinate to the site director, one concerned with scientific affairs and the other with logistical and administrative matters. Each had its own director and was further subdivided into smaller entities.
In this scheme, the ORGEL experiment, the main *raison d'être* of the centre at Ispra at that time, did not belong to either directorate department but was placed under the direct responsibility of the site director. The relationship between the latter and the Director for Research and Training at the Euratom Commission (a role more or less equivalent to that of the current Director-General of the JRC) appears to have been more nuanced. It is indicated in the diagram by a dotted line, implying a coordination function rather than a hierarchical relationship.
The organisational structure, based on the four establishments and the split of the Ispra establishment into two directorates, survived the decision not to adopt the third five-year research programme at the end of 1967 and the subsequent period of uncertainty until the reorganisation in 1971, which transformed the JRC into a Directorate-General.
Following this decision, the organisation chart, included in the 1972 Ispra annual report and reproduced in **Figure 1**, outlined a JRC under the authority of a Director-General appointed by the Commission, based in Ispra.
The Commission issued guidelines for the development of research programmes, which were implemented by the Director-General, whose decisions guided the activity of the four establishments in Ispra, Petten, Karlsruhe and Geel. The Director-General was supported by a general advisory board made up of representatives appointed by the governments of the Member States and a scientific committee made up of heads of departments and projects and elected representatives of the scientific and technical staff.
Albeit with some changes at the highest level (merging the JRC with the Directorate-General for Research, moving the JRC Director-General's headquarters from Ispra to Brussels, replacing the advisory committee with an administrative board), this structure remained largely unchanged until the end of the 1980s, when the

APPENDIX

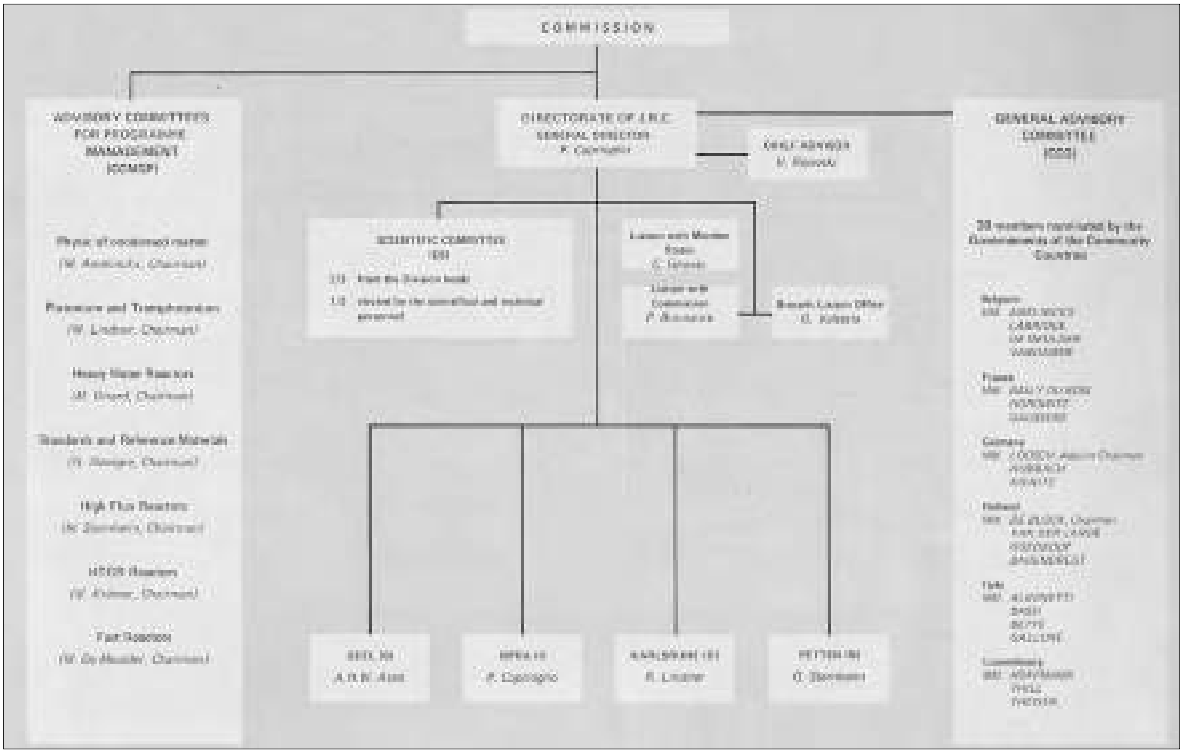


Figure 1 Organisational structure of the JRC, 1972.

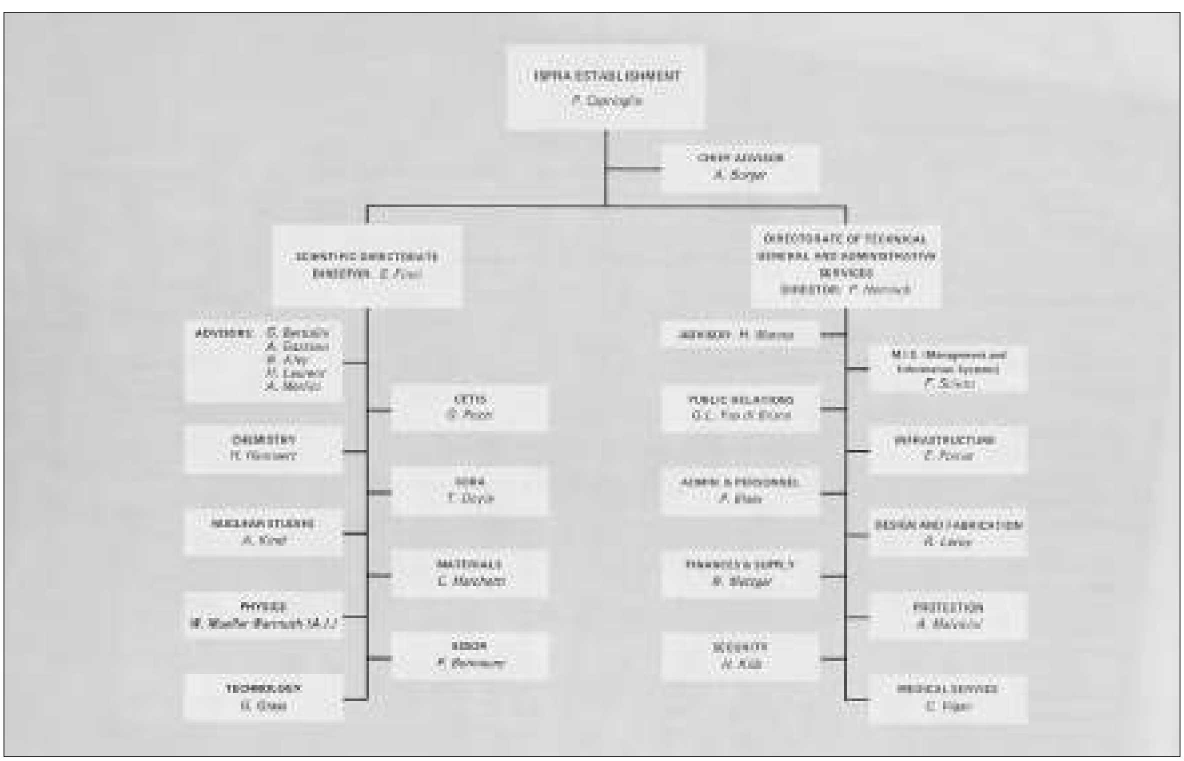


Figure 2 Organisation chart of the JRC establishment in Ispra, 1972.

JRC was completely reorganised and the scientific institutes were established.
Within this framework, the Ispra establishment was divided into two directorates, one scientific and the other for general and administrative technical services. These in turn consisted of divisions, focused on projects, disciplines or research infrastructure (**Figure 2**).
Unlike the general structure, the local organisational set-up changed rapidly, evolving as early as 1974-1975 into a matrix structure. The entities placed under the responsibility of the site director were diversified and divided into directorates linked to projects or functions and departments, providing technical and scientific expertise in service of the various projects.
One such directorate was responsible for site management, in particular for infrastructure, safety and radiation protection.
This organisational entity, which was later further separated from the management of human and financial resources, and whose names and substructures changed over the years, formed the operational backbone of the management of the site for many years to come.

1988-2016
The era of scientific institutes

The second half of the 1980s was a period of intense activity for the European Commission, led by Jacques Delors, culminating in the entry into force of the Single European Act in July 1987. Research in general, with the formulation of the 1987-1991 second framework programme for research, and the JRC in particular, were not immune to this development.
As early as 1986, a new role for the JRC was proposed, *'to produce such knowledge as is necessary for the development of norms and standards, in particular in the fields of safety and the environment as well as in selected industrial areas, thus entrusting it with a central role in Community research strategy based on activities arising from matters of public responsibility extending across the borders of the Community's Member States'*.
A year and a half later, in December 1987, the document *New Perspectives for the Joint Research Centre* paved the way for the years and decades to come, completely redefining in detail the JRC's vocation, activities, structure and management processes, including staff policy.
From an organisational point of view, the effect of this transformation was to replace the four establishments with an entirely new structure based on nine scientific institutes, one of which was located across two sites and another to be sited in a location yet to be decided. A first version of this new organisational structure was included in the document (**Figure 3**).
The planned reorganisation took place in 1988, following the Commission's proposal exactly as far as the institutes were concerned but only partly as regards the horizontal directorates, as a Brussels-based programme directorate replaced the planned Ispra site directorate. Ispra's technical, financial and administrative services were brought together in a single directorate for

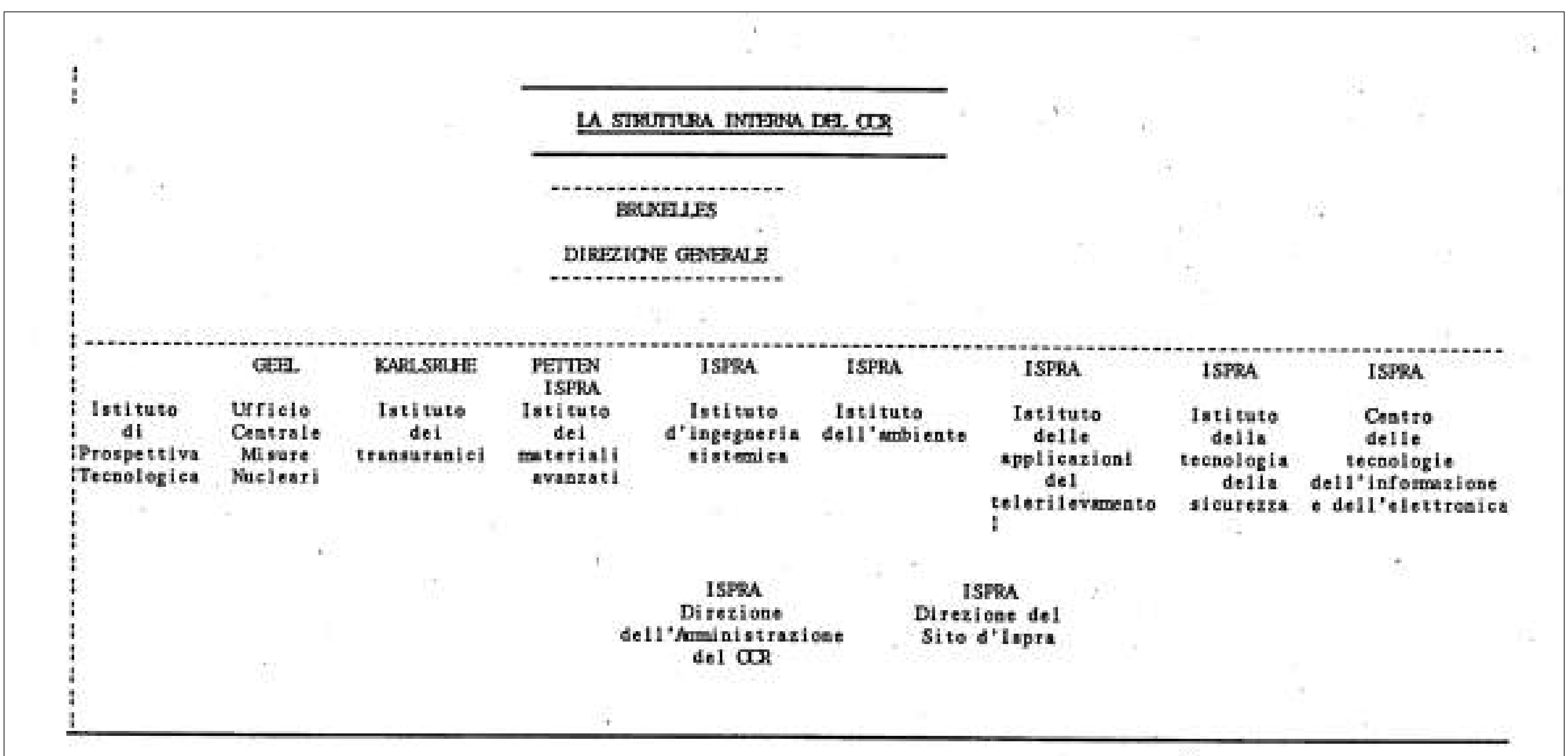
the administration of the JRC. The newly created Institute for Prospective Technological Studies was temporarily relocated to Ispra, before being transferred to Seville in 1994. In the following years, several adjustments of varying importance were made, including a new separation between the Directorate for Resources and the Directorate for Infrastructure Services (1998); the aforementioned split of the Institute for Advanced Materials gave rise to the Institute for Health and Consumer Protection in Ispra (1998) and the Institute for Energy in Petten (2001). The architecture based on scientific institutes stood the test of time, remaining largely unchanged well after the JRC's priorities shifted from pre-/co-regulatory research to supporting Community policies.

At the beginning of 2016, shortly before the last major reorganisation, there were seven institutes and three horizontal directorates.

Of the former, three were entirely based in Ispra, and one was split between Ispra and Petten, while the remaining three were located in Geel, Karlsruhe and Seville, respectively.

One of the horizontal directorates, responsible for the management of the Ispra site, had been recreated a few years earlier with functions similar to its pre-1988 predecessor (infrastructure, logistics, security), plus the dismantling of nuclear installations (**Figure 4**).

Figure 3 New organisational structure of the JRC (Commission proposal, 1987).



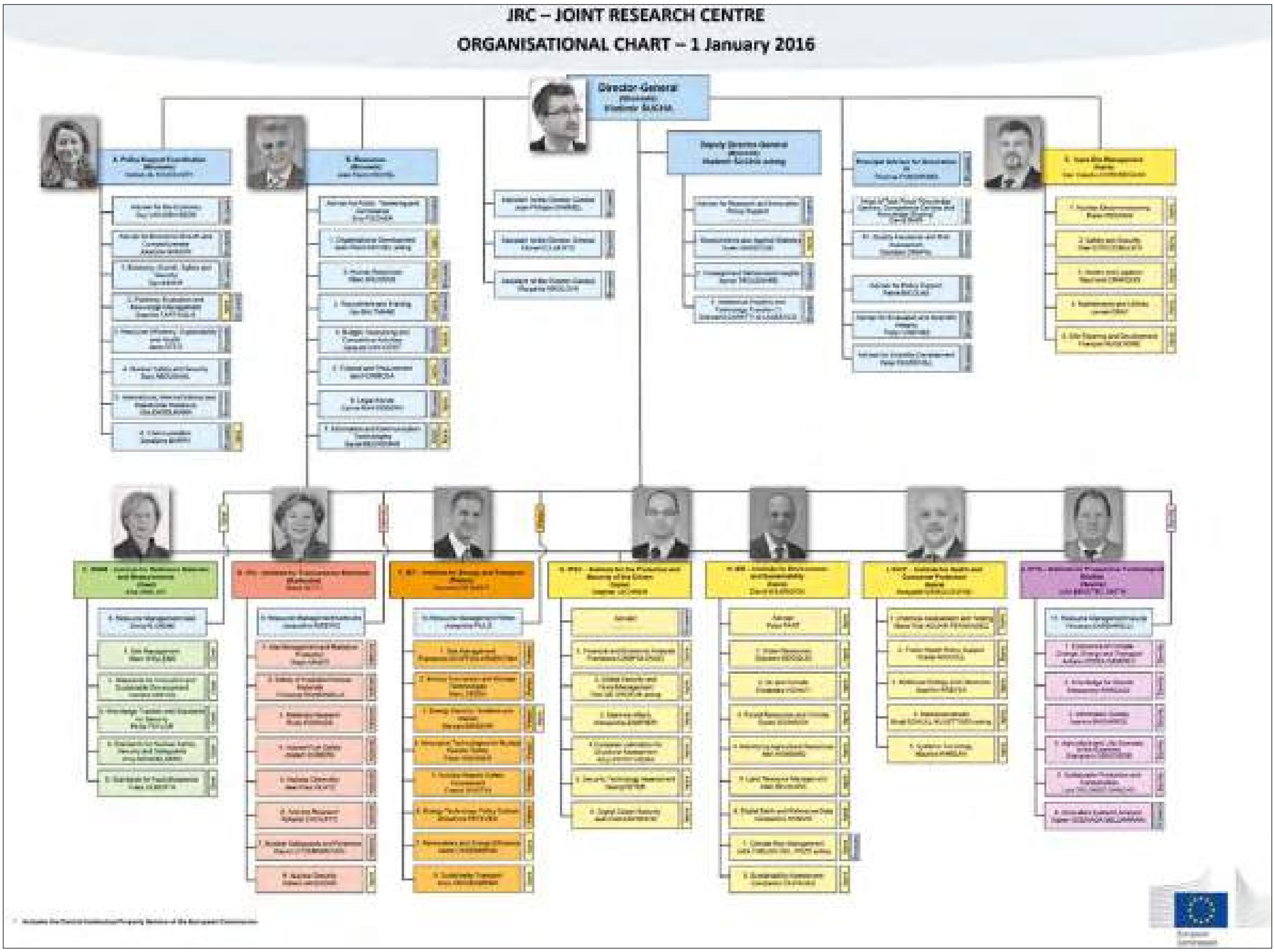
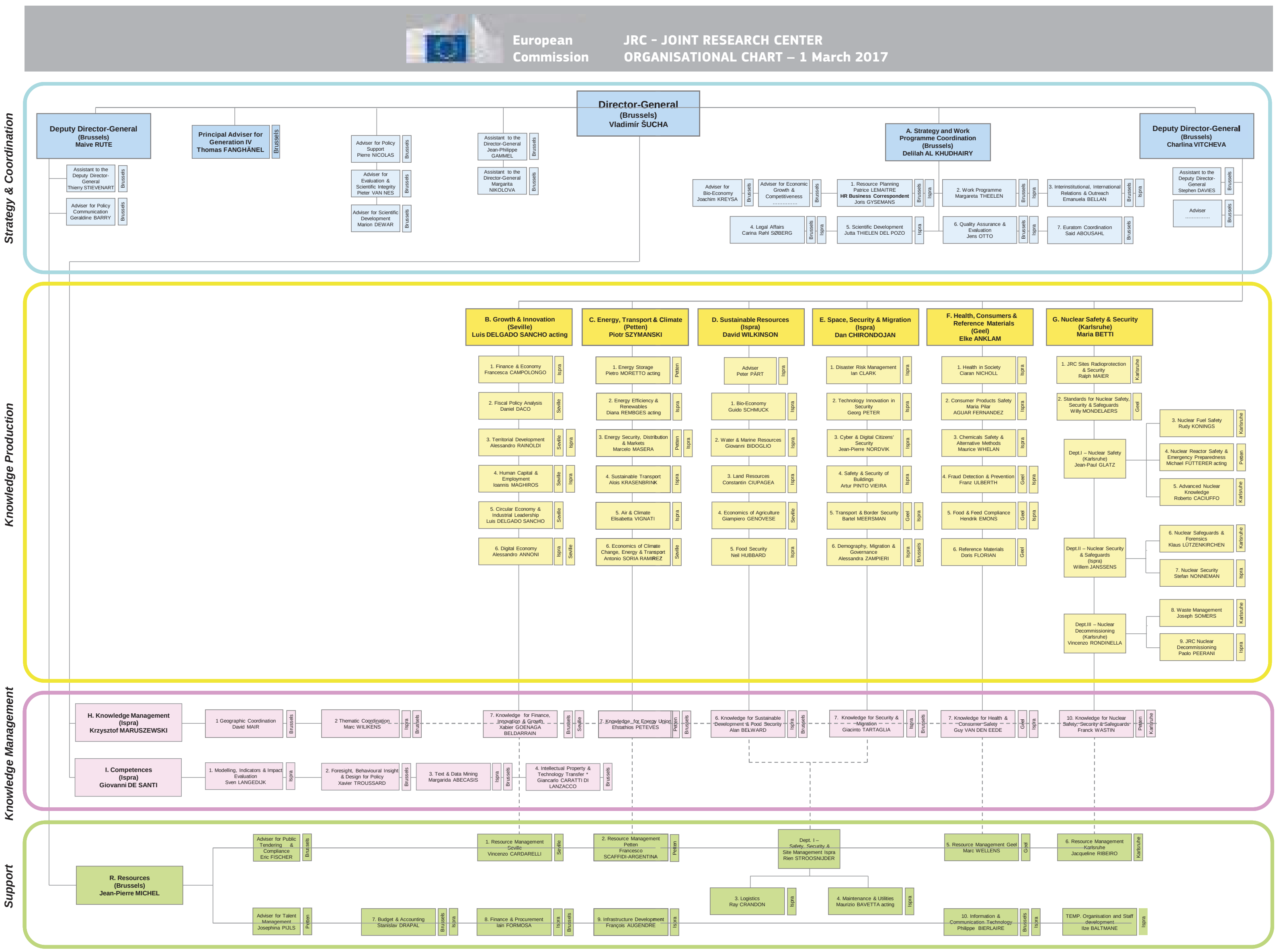


Figure 4 Organisational structure of the JRC at the beginning of the last year of existence of the institutes (2016).

2016-2024
From matrix structure to thematic directorates

In late spring 2016, Director-General Vladimír Šucha presented to staff at the Ispra auditorium and those from the other sites connected by videoconference the new JRC organisation chart, effective from 1 July that year.
The new structure reflected the new 2030 Strategy, the central point of which was to transform the JRC from a research body, as it had always been, to an organisation capable of mapping, collecting, analysing, monitoring and, above all, making sense of the best available knowledge worldwide, wherever it was produced, combining it with its own experience in support of EU policies.
To achieve this objective, the seven institutes that were still existing at the beginning of 2016 were replaced by six thematic directorates, each with a unit specifically dedicated to knowledge management in their respective fields.
In order to ensure efficient interdisciplinary coordination, the horizontal Directorate for Knowledge Management was established, to which the six units functionally belonged, thus effectively creating a matrix structure (**Figure 5**).
The framework was completed by the Directorate for Strategy and Programmes under the direct supervision of the Director-General and two other horizontal directorates, responsible respectively for the management of competences (in particular in the field of analytical models) and resources, understood very broadly to cover virtually all support services (finance, IT, infrastructure, logistics) on all sites.
Overall, the directorates lost the geographical specificity typical of the institutes.
The relatively large size of the Ispra site meant that it tended to host large working groups made up of staff from as many as 10 different directorates, while once again a site management directorate as such disappeared. In order to ensure the presence on site of a responsible manager to whom the Director-General could delegate the function of employer, a site management Department which still exists today was created within the Directorate for Resources. Departments were used as an intermediate level between management and units also in the Directorate for Nuclear Safety and Security, which included many different services, including decommissioning.
This structure – in its revolutionary but also rather complex and somewhat unbalanced way, with two very large directorates (resources and nuclear safety) alongside other much smaller ones (knowledge and competences) – evolved rapidly. First, activities related to decommissioning of nuclear installations at Ispra were separated from the Directorate for Nuclear Safety and Security and established as a separate Directorate in January 2021.
Second, the horizontal directorates for knowledge and competences, and with them the matrix structure, ceased to exist as of 1 January 2023.
As of 16 July 2025, the end of the period covered by this volume, the JRC's organisational structure consisted of 11 vertical directorates, including 9 thematic directorates and 2 management directorates, responsible, respectively, for programming and support services.
Of the 9 directorates, 6 report directly to the Director-General, while the other 5 are supervised by a Deputy Director-General (**Figure 6**).
The responsibility for the Ispra site remains with the Head of the site management Department.
After 65 years of evolution, the JRC's structure is now probably closer than at any other time in its history to the usual structure of a European Commission Directorate-General.
Looking at the organisation in the past, there has been an obvious change in terminology, from the four original establishments to the institutes of 1988-2016 and the current directorates, which are themselves much more typical organisational



* includes the Central Intellectual Property Service of the European Commission

Figure 5 Organisational structure of the JRC after the establishment of the Directorate for Knowledge Management and the Directorate for Competence (2017).

entities of the Commission. Over the years, the Director-General's strategic direction has gradually strengthened, while the operational services' geographical roots have weakened; most operational services now consist of entities spread over different sites, grouped not on the basis of geographical proximity but on their expertise and role in supporting EU policies.

This evolution, which began last century with the progressive improvement of travel options and the decrease in mission costs, accelerated in the first decade of the third millennium with the shift towards remote working, and the rapid development of teleworking tools and methods, definitively consolidating as a consequence of the COVID-19 pandemic.

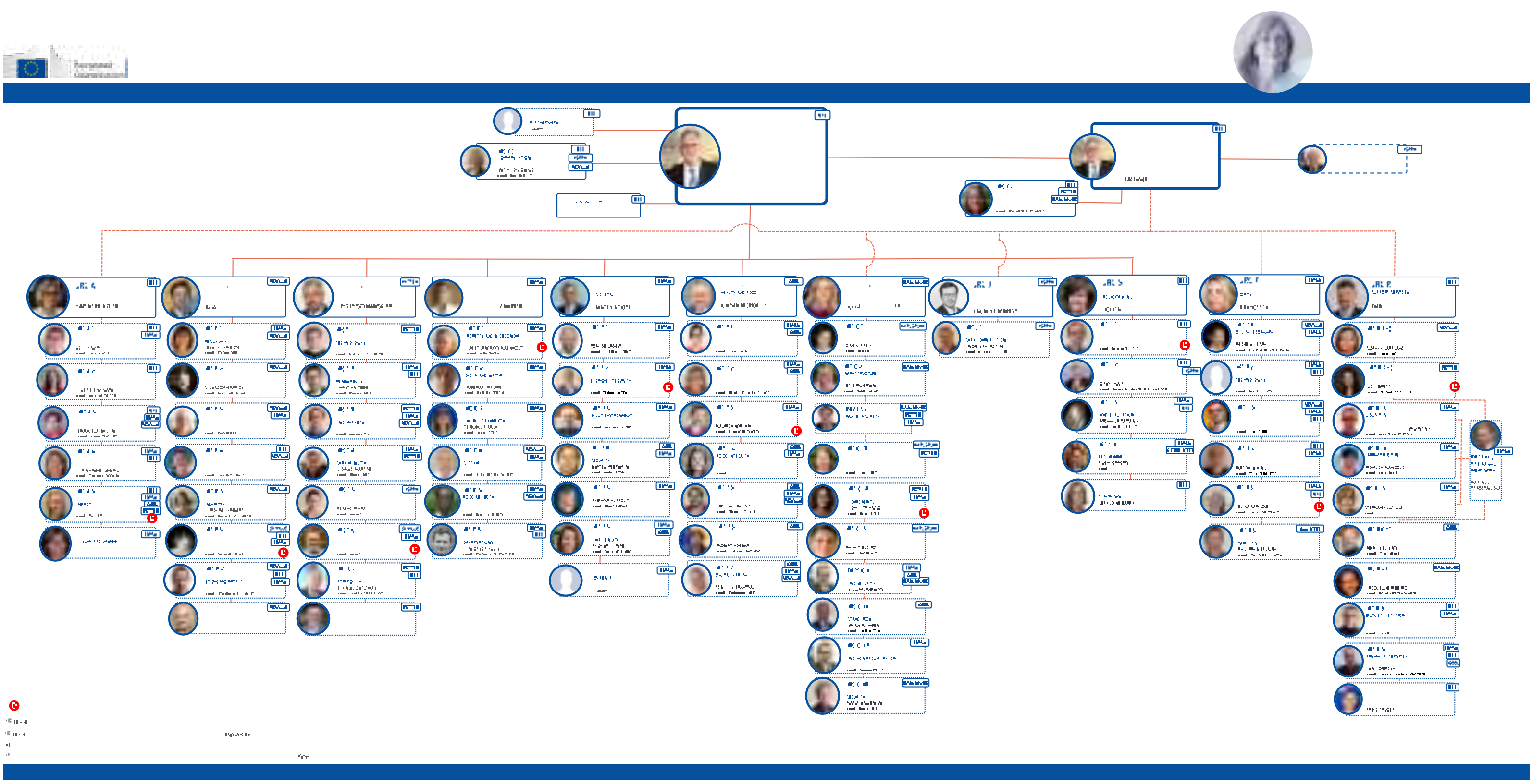


Figure 6 Organisational structure of the JRC at 16 July 2025.

Acknowledgements

Many people, in various ways, have contributed to making the drafting of this volume possible; the authors wish to express their gratitude to all of them. Starting with the sources – the primary, precious and irreplaceable resource of historical research – heartfelt thanks go to Sven Carnel and Maria-Francisca Ciudad Rodriguez of the Historical Archives Service of the European Commission in Brussels, to Dieter Schlenker and Agnès Brouet of the Historical Archives of the European Union in Florence, to Krista Kokořová of the European Commission Library in Brussels, to Jesus Pozuelo Moreno and Andrea Maffei of the technical archives at the Ispra site and to Dario Pardi, Document Management Officer of the JRC.

Micaela Ballario, José Joaquin Blasco Munoz (now retired), Natalia Serra, Pedro Rodriguez Huertas and Barbara Mortara of the JRC Communication Unit were of great help in the search for photographic material and in the design of the volume, including the cover.

Erica Nogueira Soares D'Almeida of the Legal Affairs Unit was a solid point of reference for matters related to intellectual property rights, and Manuela Carcano and Silvia Bombardone of the Data Governance and Services Unit provided patient and reliable guidance on the internal publication authorisation process.

Given the need to account for the decades-long history of a complex and multifaceted research entity like the JRC, the volume touches on a wide variety of scientific and technical topics.

The revision of the text could only be a collective effort, to which a large group of current and former JRC staff contributed, each person reviewing the parts most closely related to their field of expertise.

The authors are therefore grateful to (in alphabetical order) François Augendre, Alan Belward, Silvia Bombardone, Annette Borowiack, Matteo Fornara, Uwe Holzwart, Giorgio Martini, Marco Minghini, Fabio Monforti-Ferrario, Andrea Ravazzani, Pere Soler Lagresa, Clemens Wittwehr and Andrew Worth.

Finally, two of the authors, as JRC affiliates, look with pride and gratitude on the work of the many who preceded them and who, with their dedication to science and the European project, have given substance to the long history of the Ispra site.

Bibliographic and archival note

The narrative presented in these pages is based on a wealth of archival documents, grey literature and published scientific and journalistic sources. This heuristic approach to archival research is the result of collaboration with the Historical Archives Service of the European Commission in Brussels and the Historical Archives of the European Union at the European University Institute in Florence.

The JRC provided access to digitised sources resulting from the completed JRC institutional history project, which are stored in the European Commission's current online archive, the Advanced Record System (ARES), and in the Ispra site's technical archives. All the necessary institutional and legal documentation was retrieved from the EUR-Lex portal. The JRC's annual reports and other publications, available online through the Publications Office of the European Union portal, were indispensable sources for the necessary in-depth analysis of specific research activities.

The text is a critical "biography" of the Ispra centre, based on empirical research from archival sources and a review of the literature, avoiding anecdotal accounts in favour of the written records, the bedrock of all historical reflections. The co-authorship of these pages consolidated the nature of the history recounted, and the peer-review process carried out by the JRC, along with the participation of an external researcher, has ensured that the work is verifiable and based on carefully examined evidence.

The two main sources related to the characteristics of the Ispra site and its construction were the following.

- **BAC 118/1986, No 2766**, Année(s): 1958-1967, p. 17-25. EUR/C/1524/58 f/rm, 23 September 1958, available online through the Historical Archives of the European Union website, digitised along with the other files used for this narrative, as an active contribution by the archives to this work and to promote studies on the history of the JRC.
- **BAC 184/1980, Dossier 1 – vol. 1/1 UP:1512**, Année: 1959-1959, A. Lissoni, C. Rusconi Clerici, G. Rusconi Clerici – Relation sur l'organisation des bâtiments et des installations du Centre National pour les Recherches Nucléaires de Ispra (Varese – Italie): Comitato Nazionale per le Ricerche Nucleari – Servizio Progettazioni e Lavori Civili – January 1959. This account was retrieved thanks to the Historical Archives Services of the European Commission, which made a significant amount of documentation available.

Memories of the Ispra site and the biography of Jules Guéron are recounted by Friedrich Geiss, Guéron's close colleague, in *Where Science Meets Politics: The Eventful History of the EU's Joint Research Centre*, Lulu.com, 2015. *https://www.lulu.com/shop/friedrich-geiss/where-science-meets-politics-the-eventful-history-of-the-eus-joint-research-centre/ebook/product-1z4wrmdk.html?page=1&pageSize=4*

As for references to Ritter's biography, the source is Bernd-A. Rusinek, *Der Fall Greifeld, Karlsruhe – Wissenschaftsmanagement und NS-Vergangenheit, Karlsruher Instituts für Technologie* (KIT) Scientific Publishing, Karlsruhe 2019, pp. 262-266, https://ksp.kit.edu/reader/books/pdf/10.5445/KSP/1000085638.

Documents related to research programmes following the Merger Treaty and the long process of restructuring the Centre were retrieved from EUR-Lex. The following were particularly significant.

- **Council Decision 77/488/EEC, Euratom** of 18 July 1977 adopting a research programme to be implemented by the Joint Research Centre for the European Atomic Energy Community and the European Economic Community (1977 to 1980) (OJ L 200, 8.8.1977, p. 4, ELI: http://data.europa.eu/eli/dec/1977/488/oj).

- **Council Decision 80/317/EEC, Euratom** of 13 March 1980 adopting a research programme to be implemented by the Joint Research Centre for the European Atomic Energy Community and the European Economic Community (1980 to 1983) (OJ L 72, 18.3.1980, p. 11, ELI: http://data.europa.eu/eli/dec/1980/317/oj).

- **Council Decision 84/1/Euratom, EEC** of 22 December 1983 adopting a research programme to be implemented by the Joint Research Centre for the European Atomic Energy Community and the European Economic Community (1984 to 1987) (OJ L 3, 5.1.1984, p. 21, ELI: http://data.europa.eu/eli/dec/1984/1(1)/oj).

- **Council Decision 89/340/EEC** of 3 May 1989 concerning work for third parties performed by the Joint Research Centre relevant to the European Economic Community (OJ L 142, 25.5.1989, p. 10, ELI: http://data.europa.eu/eli/dec/1989/340/oj).

- **Council Decision 1999/174/EC** of 25 January 1999 adopting a specific programme for research and technological development, including demonstration, to be carried out by means of direct actions for the European Community (1998 to 2002) by the Joint Research Centre (OJ L 117, 8.5.1999, p. 28, ELI: http://data.europa.eu/eli/dec/1999/174(1)/oj).

- **Council Decision 2006/975/EC** of 19 December 2006 concerning the specific programme cooperation implementing the seventh framework programme of the European Community for research, technological development and demonstration activities (2007 to 2013) (OJ L 400, 30.12.2006, p. 86, ELI: http://data.europa.eu/eli/dec/2006/971/oj).

The key moments of strategic reflection were reconstructed by analysing evaluation documents produced by independent experts, particularly the following.

- A new outlook for the Joint Research Centre, **COM(87) 491 final** of 20 April 1988; document available online in the Historical Archives Service of the European Commission in Brussels, Official Documents series.

- Communication from the Commission to the Council and the European Parliament – Fulfilling the JRC's mission in the European research area, **COM(2001) 215 final** of 20 April 2001, https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:52001DC0215.

- P. Cunningham, E. Banda, H. Bernard, R. Eichler, R. Haug et al., *Ex post evaluation of the direct actions of the Joint Research Centre under the* *seventh framework programmes 2007-2013*, EUR 27343 EN, EU Publications Office of the European Union, Luxembourg, 2015, JRC96870, https://publications.jrc.ec.europa.eu/repository/handle/JRC96870.

A record of the JRC's difficult transformation at the end of the 1960s can be found in G. Beghi, *Il Fastidio della Ricerca: La crisi del Centro comune di ricerca Euratom dal 1968 al 1973*, FAST, 2003.

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On the creation of the Ispra site, see Gerlini, M., 'Nuclear settlers in a European land? The making of the Centre commune de recherche in Ispra', *Historical and Social Research*, Vol. 49, No 1, 2024, pp. 77-91, https://doi.org/10.12759/hsr.49.2024.04.

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- European Commission, *The European Commission 1986-2000 (hardcover edition) – History and memories of an institution*, Bussière, É. (editor), Dujardin, V. (editor), Ludlow, P. (editor), Romero, F. (editor), Schlenker, D. (editor) and Varsori, A. (editor), Publications Office of the European Union, 2019, https://data.europa.eu/doi/10.2792/814525.

List of Names

List of Acronyms

ACP Africa, Caribbeans and Pacific
AEC Atomic Energy Commission
AGRESTE Agricultural Resources Investigations in Northern Italy and Southern France
AIDS Acquired Immunodeficiency Syndrome
AMF American Machine and Foundry
AMN Ansaldo Meccanica Nucleare
ARPA Agenzia Regionale per la Protezione dell'Ambiente
BEMA Biogenic Emission in the Mediterranean Area
BIOSAFE Community Documentation Centre on Biotechnology Safety and Regulations
BISE Biodiversity Information System for Europe
CAFE Clean Air for Europe
CC Competence Centre
CDCIR Community Documentation Centre on Industrial Risk
CEA Commissariat à l'Énergie Atomique
CEN Comité Européen de Normalisation
CEO Centre for Earth Observation
CERN European Organization for Nuclear Research
CETIS Centre Européen de Traitement de l'Information Scientifique
CFSP Common Foreign and Security Policy
CIRENE CIse REattore a NEbbia
CISE Centro Informazioni Studi Esperienze
CNBM Central Bureau for Nuclear Measurements
CNEN Comitato Nazionale per l'Energia Nucleare
CNR Consiglio Nazionale delle Ricerche
CNRN Comitato Nazionale Ricerche Nucleari
COST European Cooperation in Science and Technology
COVID-19 CoronaVIrus Disease 19
CP Chicago Pile
CPSU Communist Party of the Soviet Union
CREST Comité de la Recherche Scientifique et Technique
CRL Community Reference Laboratory
ECB European Chemical Bureau
ECDIN Environmental Chemical Data Information Network
ECHA European Chemicals Agency
ECIS European Cancer Information System
ECML European Crisis Management Laboratory
ECO Essai Critique Orgel
ECSC European Coal and Steel Community
ECU European Currency Unit
ECVAM European Centre for Validation of Alternative Methods
EDC European Defence Community
EEA European Environment Agency
EEC European Economic Community
EFAS European Flood Awareness System
EFFIS European Forest Fire Information System
EFSA European Food Safety Authority
EFTA European Free Trade Association
EINECS European Inventory of Existing Commercial Chemical Substances
ELSA European Laboratory for Structural Assessment
EMA European Monetary Agreement
EMSL European Microwave Signature Laboratory
ENEA Ente Nazionale Energia Atomica
ENGL European Network for GMO Laboratories
ERA European Research Area
ERLAP European Reference Laboratory for Air Pollution
ESA European Space Agency
ESARDA European Safeguards Research and Development Association
ESE Europa Science Experience
ESSOR Essai ORGEL
ESTI European Solar Testing Installation
ETHEL European Tritium Handling Experimental Laboratory
EUI European University Institute
EURASEP European Association of Scientists in Environmental Pollution
Euratom European Atomic Energy Community
EURL EU Reference Laboratory
EUSF EU Solidarity Fund
FARO Furnace And Release Oven

FIAT Fabbrica Italiana Automobili Torino
FIRES Facility for Investigating Runaway Events Safety
GAAA Groupement Atomique Alsacienne Atlantique
GDP Gross Domestic Product
GMES Global Monitoring for Environment and Security
GMO Genetically modified organisms
IAEA International Atomic Energy Agency
IAM Institute for Advanced Materials
ICMESA Industrie Chimiche Meda Società Azionaria
IE Institute for the Environment
IEA International Energy Agency
IED Industrial Emissions Directive
IHCP Institute for Health and Consumer Protection
ILUC Indirect Land Use Change
INF Intermediate-range Nuclear Force
INFCE International Nuclear Fuel Cycle Evaluation
INSPIRE Infrastructure for Spatial Information in Europe
Interatom Internationale Atomreaktorbau G.m.b.H.
IPSC Institute for the Protection and Security of the Citizen
IPTS Institute for Prospective Technological Studies
IRIMS Ispra RIsk Management Support system
IRSA Institute for Remote Sensing Applications
ISE Institute for Systems Engineering
ISF Intermediate Storage Facility
ISIS Institute for Systems Information and Security
ISO International Standards Organisation
IST Institute for Safety Technology
ITER International Thermonuclear Experimental Reactor
ITU Institute for Transuranium Elements
IUCLID International Uniform ChemicaL Information Database
JET Joint European Torus
JHA Justice and Home Affairs
JRC Joint Research Centre
KC Knowledge Centre
LMFBR Liquid Metal cooled Fast Breeder Reactor
LOBI Light water reactor Off-normal Behaviour Investigations
LWR Light Water Reactor
MAFALDA Multi-Analysis Floating Apparatus for Limnological Data Assessment
MAHB Major Accidents Hazards Bureau
MARS Monitoring of Agriculture with Remote Sensing
NASA National Aeronautics and Space Administration
NATO North Atlantic Treaty Organisation
NEA Nuclear Energy Agency
NEB New European Bauhaus
NET Next European Torus
OECD Organisation for Economic Cooperation and Development
OEEC European Organisation for Economic Cooperation
ORGEL Organique-Eau-Lourde
PEMS Portable Emission Measurement Systems
PERLA Performance and training Laboratory
PET Positron Emission Tomography
PETRA Process Evaluation and Testing for Radwaste Management
PHONID PHoto Neutron Interrogation Device
PRO Progetto Reattore Organico
PTBT Partial Test Ban Treaty
PWR Pressurised Water Reactor
RACE Research and Development in Advanced Communications Technologies in Europe
RAR Risk Assessment Report
REACH Registration, Evaluation, Authorisation and Restriction of Chemicals
SADE Società Adriatica di Elettricità
SAM Scientific Advice Mechanism
SARA Sperimentazione Avanzata Reattori ad Acqua
SORA Sorgente Rapida
UNO United Nations Organisation
US United States
VELA Vehicle Emissions Laboratory
WTMC World Motorcycle Test Cycle

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