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ÉCOLE
CENTRALE LYON

Photo- synthesis

Sustainability report and
corporate social responsibility
2022





Demanding, multi-disciplinary courses that take a systemic approach to the complex issues linked to major changes in business and society.

Graduates with the human and technical skills to transform scientific knowledge into technical and social innovations, taking into account their impact, uses and public policy priorities.



Research in engineering sciences, information sciences and exact sciences, carried out in partnership with industrial players, major public bodies and international partners, to provide answers to the challenges facing society: more sober technologies, energy and digital transition, preservation of the environment and decarbonisation.

In this report, the actions are listed by Sustainable Development Objectives



and by **DDRS*** label axis:



Stratégie et
gouvernance



Enseignement
et formation



Recherche
et innovation



Environnement



Politique
sociale

The training activities recorded concern the general engineering curriculum. These may cover several SDGs.

The actions mentioned are not exhaustive.

The masculine gender is used generically, for the sole purpose of keeping the text simple.

*www.label-ddrs.org



The year 2022 was marked by the co-construction, with our stakeholders, of École Centrale de Lyon's strategy for 2030, with the ambition :

"To become the Caltech of Europe, recognised for its expertise in major transitions, at the service of socio-economic players. Our two main missions, the production and transmission of knowledge, play a vital role in supporting these major transitions, whether they be environmental, energy, digital, economic or social.

To this end, we have set up a Major Transitions Development Department to ensure that every policy and every action takes account of these challenges.

Centrale Lyon is therefore clearly affirming its commitment through an SDRS approach. It is working with all its stakeholders to constantly improve its positive impact.

To reinforce our commitment, in December Centrale Lyon joined the Convention des Entreprises pour le Climat and the Agora Lyon 2030 supported by the city of Lyon, in order to contribute its resources and expertise to accelerating the transition of the players in its ecosystem.

The framework was set, and the first actions led to this first DDRS activity report.

A very good read.

Pascal Ray

Director of École Centrale de Lyon



This first annual report on sustainable development and corporate social responsibility is a *snapshot*.

It's a *photo that* brings together, in a non-exhaustive way, our training initiatives to ensure that our future graduates have the knowledge and skills they need to meet the challenges of major transitions. It's a photo that highlights some of our research projects on key subjects: energy, transport, construction, the environment, health, etc. It's a photo that shows our main projects to move towards exemplary campuses. A photo showing the projects carried out by our staff and students to establish an inclusive and responsible social policy.

This report is also a *summary of* the strategy we have developed throughout 2022, which places the major transitions at the heart of our mission.

Like *photosynthesis*, this report is above all the starting point for a lively and ambitious process of transforming our actions into a positive impact for all our stakeholders.

Many thanks to all those who, with their convictions and energy, are helping to make École Centrale de Lyon a major player in the transition.

Stéphanie Lanson

Director of Development for Major Transitions

Overview of the main actions



Adoption of the 2022-2030 strategy, which places the major transitions at the heart of all the institution's missions.

Creation of the Major Transitions Development Department, with a director and two lecturer-researchers responsible for CSR and digital issues.

Creation of the post of ecological transition officer within the BDE to support the ecological transition in community life on the Écully campus.

Commitment to the Convention des entreprises pour le Climat, Lyon area.

Involvement in Agora Lyon 2030, supported by the city of Lyon as part of the European "100 Climate Neutral Cities" programme.



Creation of a 16-hour introductory course on climate and planetary limits for all first-year generalist students.

Adapting the specialised engineering curriculum to the ecological transition

Organisation of the Centrale Lyon Innovation Camp (CLIC) for first-year generalist students in partnership with Carbone 4, focusing on 5 themes: mass retailing and sobriety, the countryside in a time of global warming, motorways in a low-carbon world, luxury in a low-carbon world and fire-fighting in a time of climate change.

WEEK (Week of Engineering Experience) weeks for first and second year general engineering students on hydrogen, wind power, waste and pollution, and mobility. Innovation project for ENISE speciality engineering students on sustainable development projects proposed by local authorities.

Launch of 4 international masters degrees on the environment (Biomimetics and Surface Engineering, Sustainable Manufacturing and Advanced Technologies, Water and Wind Engineering and Ocean, Atmosphere and Climate Sciences), as well as the Erasmus Mundus "META" masters degree.

4.0 - Manufacturing 4.0 by intelligent and sustainable technologies".

Launch of the REMED project (Réussir l'Efficiency des Mobilités d'Excellence Décarbonées).



 Recherche
et innovation

Xenair: research project on the association between the risk of developing breast cancer and chronic low-dose exposure to 8 atmospheric pollutants.

Reward: improved detection of breast tumours using elastography.

Touchy Finger: an augmented, connected human finger device for assessing skin health.

Mustimplant: intelligent multi-scale texturing of medical implants.

Condor Chair: reducing the carbon footprint of jet engines through a better understanding of aeroelastic phenomena.

LIVE-I: lighter transmission systems to improve the environmental impact of vehicles.

Ocean: resolution of the energy cycle paradox in the oceans thanks to the first direct observation of a double cascade of kinetic energy.

Irontech: regulating nitrates in aquatic ecosystems.

Biopiles: Multi-criteria optimisation of plant-based biopile technology.

Biosourced concrete: optimisation of a biosourced concrete formulation for additive manufacturing.

Offshore wind turbines: study of damage to anchor wires for the development of offshore wind turbines.

Destini: design and evaluation methods for 3D electronics devices and then with integrated cooling.

The renovation of the Skylab building was awarded the High Environmental Quality "Sustainable Building" Excellence level certification.

Thermal insulation of facades from the outside of 5 buildings on the Écully campus as part of the France relance programme.

Tremplin project: finalisation of the property and development master plan for the Saint-Étienne campus, which includes the complete refurbishment of the main building with thermal insulation of the shell.

Adoption of the establishment's sobriety plan.

Adoption of new rules for business travel: ban on flying if the journey can be made in less than 4 hours by train; ban on car journeys of more than 300 km unless an exemption is granted.

Adoption of the 2022-2026 Student Life Master Plan, including support for the ecological transition, sustainable development and corporate social responsibility.

Organisation, as part of the quality of life at work initiative, of participative workshops to identify and propose actions to be taken.

The first year of the CapECL preparatory cycle, which contributes to the social inclusion of engineering students by including 10 secondary school students with grants among the 24 recruited.

Signing of the "Cpas1option" charter: improving pupils' living and health conditions and combating risky behaviour.

Involvement in two Cordées de la réussite ("CapIngé" and "Innov'ton Avenir!").

Participation in the Génius programme, to support high-school students from regions still under-represented in the Grandes Écoles.

The seventeen

Sustainable Development Objectives



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THE Impact Rank 401-500

special distinction for the use of renewable energies and the fight against climate change

Les Echos Start

2nd engineering school most committed to the ecological and social transition

Grenoble agreements

Signatory of the Convention for the Transition of Higher Education Institutions

24 of the 45 actions in the General Management's annual action plan are linked to the SDGs

155 training initiatives* incorporating the SD&RS dimension (40% of the generalist curriculum)

90% of teacher-researchers and researchers contribute to at least one of the SDGs

153 publications related to at least one of the SDGs 18.15 FTEs involving 40 people, in support functions directly linked to the SDGs (excluding research and teaching functions)

22% of alumni from the generalist course work directly on DRS and 25.6% have a part of their mission related to it**.

* A set of teaching modules on a particular theme

** CGE survey on the integration of 2022 graduates

Adoption in October of the 2022-2030 strategy: "to be recognised as a leader in the major transitions at the service of socio-economic players". The 4-pronged strategy places the major transitions at the heart of all the institution's missions.

The Major Transitions Development Department (DDGT) was created in March, with a director and two lecturers responsible for CSR and digital issues. The DDGT is supported by a DDRS committee made up of lecturers and teacher-researchers, staff and students. The Director is a member of the school's Executive Committee.

Creation of the post of ecological transition manager within the BDE on the Écully campus to support the associations and clubs in the ecological transition. Appointment of ecological transition referents in each club of the École Centrale de Lyon Students' Association and the École Centrale de Lyon Students' Sports Union. Obligation for clubs to carry out their carbon footprint, supervised by the BDE's ecological transition officer, and provision of tools to help them do so.

Adoption in December of the sobriety plan listing the actions underway and to be carried out in the areas of training and awareness-raising for students, community activities, staff involvement, reducing energy consumption, work on technical installations, optimising operations, management of digital and laboratory equipment, and staff and student mobility.

Recruitment of a flow economist in December, within the Heritage Department.

Adoption in December of the Student Life Master Plan 2022-2026, which **emphasises** inclusion for all, health and prevention, social policy and support for the ecological transition, sustainable development and social responsibility.

Corporate strategy
www.ec-lyon.fr/strategie-2022-2030

Video by Pascal Ray: The era of major transitions at Centrale Lyon
www.ec-lyon.fr/actualites/2022/rencontre-pascal-ray

Student life master plan
www.ec-lyon.fr/sites/default/files/rapport_final_schema_directeur_bde-web.pdf



Over 170 students supported
through social assistance and tax exemptions
749 student residence places on campus
267 beneficiaries of Common Goods



Politique
sociale

Allocation of aid to low-income students and exemption from tuition fees by the Social Aid and Exemption Committee.

Lending of computers to students in difficulty by the Eclair student association in Écully and ENISE in Saint-Étienne.

Communal goods: equipment (hoover, crepe maker, board games, etc.) made available to students on the Écully campus at very low cost. Funded 1/3 by the CVEC, 1/3 by the BDE and 1/3 by the school.

Provision of menstrual pants to combat menstrual insecurity.

Every Tuesday evening, Solidari'Terre* **organises food drives**, serving around thirty meals prepared from food donated by Centrale students, accompanied by coffee and tea.



298 AMAP basket sales

320 participants in Cooking Lab workshops



Web radio programme on the theme: Food, a necessary transition?

Student projects: an application that uses image recognition to determine the yield of a wheat field; the design of a drone for the targeted distribution of an agricultural product in a field.



Agri.Builders: start-up created by general engineering students and winner of the Start-up Challenge* on the design of a bio-control system to combat pests effectively using pheromone diffusers.



Organisation at Cooking Lab of 34 cookery training workshops led by chefs from the Institut LYFE (formerly Institut Paul Bocuse) for staff and students.

Basket sales every Tuesday to staff and students, organised by Planet&Co** in partnership with an AMAP.

Vegetarian **meals** and local fruit **are distributed** at association events such as the integration weekend for the generalist course, the Challenge (a sporting event bringing together 3,000 students from all over France) and the Centralien association training weekend.

Around fifteen quality meals at low prices offered by the Fou-quette ** at events on the Écully campus.

*Student entrepreneurship competition supported by American alumni via the *Centrales-US Education Fund*

**Central Student Association



CHARTER SIGNATORY
Cpas1option

51 theses in progress

26 training courses: engineering for health, bioproduction, transport noise, medical imaging, etc.

Master's degree in health engineering, medical imaging, signals and systems course

Master's degree in health engineering, health product design and optimisation specialism

Master's degree in public health, biostatistics, biomathematics, bioinformatics and health pathway



Dual engineering-medicine curriculum:

first year of full exchange of medical students for the engineering curriculum and engineering students for the medical curriculum (dual curriculum, launched in 2019 in partnership with Université Claude Bernard Lyon 1 and the Hospices Civils de Lyon).

Student projects: manufacture of an intervertebral disc prosthesis; sociology of obesity.

UEPro conference: HIV/AIDS, its origins and current research at the virus-cell interface.



Xenair: publication in October of results on the association between the risk of developing breast cancer and chronic exposure to low doses of 8 atmospheric pollutants. Research project carried out by researchers from the Fluid Mechanics Laboratory and the

Acoustics in partnership with the Centre Léon Bérard and funded by the ARC Foundation.

Reward: improved detection of breast tumours using elastography. The research project, which models wave/matter interactions in tissues, is being led by mathematicians at the Camille Jordan Institute.

Touchy Finger: a connected augmented human finger device, created by 2 researchers from the Tribology and Systems Dynamics Laboratory, to diagnose skin health. Touchy Finger was presented as part of the CNRS's Echappées inattendues programme.

Virtual reality at the service of pedagogy and behavioural and cognitive therapies. Researchers at the Computer Science in Image and Information Systems Laboratory are studying the influence of polysensoriality in understanding certain disorders or anxieties as part of cognitive therapies.

Mustimplant: research into intelligent multi-scale texturing of medial implants, carried out by the Tribology and Systems Dynamics Laboratory.



Charter signed in May

"Cpas1option": improving pupils' living and health conditions and combating risky behaviour at festive events and sexual violence.

Installation of open-air **sports equipment** with free access in Écully: cross-training station, plyometric plints and step, pull-up bars and parallel bars.

Workshops on sophrology, first aid and mental health for 37 members of staff and 45 students.

Supervised cardio-training, badminton, table tennis and volleyball **workshops run by the school's PE teachers** every Friday for Écully staff.

To coincide with Sidaction, Solidari'terre* is organising a conference in April on HIV/AIDS, as well as various awareness-raising and fund-raising activities.

Cheer Up! organises campaigns to raise awareness of cancer: Pink October, Movember, Cancer Week with the organisation of a race against cancer and fund-raising events for the Ligue contre le cancer.

Awareness campaign on the dangers of drug use, the risks of being unknowingly drugged and the steps to take to minimise these risks, by Relex*.

13 students from the BDE are **on duty at the evenings** to provide first aid for people who are injured, manage and protect people who are too drunk, and deal with any conflicts.

Cpas1option" Charter
www.cpas1option.com

* Central Student Association



LABEL

"Welcome to France

quality of reception for international students

16h introductory course on climate and planetary limits for all students in the generalist curriculum

2,536 m² dedicated to student life on the two campuses



Deployment at the start of the 2022 academic year of competency-based assessment

throughout the general engineering curriculum, which will be taken into account when awarding the diploma. Centrale Lyon is thus becoming one of the first schools to assess competencies to such a high degree of detail. It is also the only one to offer a tool developed in-house that allows each student to view his or her skills in real time on a dedicated website.

Creation of a 16-hour introductory course on climate and planetary limits

for all first-year generalist students: course on the dynamics of ecological systems, planetary limits, the position of the problem of pollution and climate, the global energy issue and resources,

1 climate fresco animated by former students and a TD to encourage reflection and debate on preconceived ideas.

Adaptation of the ENISE Specialised Engineering curriculum to the ecological transition.

Definition of a skills repository with 4 areas of activity: energy, natural resources and biodiversity, climate science and social and societal issues. Review of syllabuses with integration of DDRS issues and deployment of new teaching for the 1st year of the preparatory cycle.

Centrale Lyon Innovation Camp Week (CLIC)

organised in October for the 365 first-year students on the Generalist programme, in partnership with Carbone 4. Five themes were proposed: mass retailing and sobriety, the mountains in a time of global warming, the motorway in a low-carbon world, the

luxury in a low-carbon world and firefighting in a time of climate change.

WEEX (Week of Engineering Experience) **weeks** for first and second year generalist students on 4 themes: hydrogen; wind power; waste and pollution; mobility.

Innovation project from May to June for ENISE speciality engineering students, with sustainable development projects proposed by local authorities.

Climate Fresco: 164 students trained in the Climate Fresco at the start of the 2022 academic year at ENISE.

Skylab: 1,200 m² of co-design, creativity and training rooms and cubicles to facilitate collaborative learning and creativity, opening in February 2022 on the Écully campus.

Awareness-raising workshops for CAP "Restaurant Production and Service" **students** to understand certain physico-chemical reactions at play in the kitchen:

These workshops were designed and led by two teacher-researchers from the Lyon Institute of Nanotechnology.

Fête de la science in October in Écully: around 20 events, 50 research players (teacher-researchers, researchers, doctoral students, engineers, technicians, etc.), 620 participants to discover the role of science and innovation in the era of major transitions and to open up a debate on the place of engineers in society.

European Researchers' Night in September at the Cité du design in Saint-Étienne: discover virtual reality by reconstructing physical or emotional environments for multi-sensory immersion combining sight, hearing and smell.

Student projects: Project Factory Club to introduce disadvantaged schoolchildren to culture, sport and student life.

Video Compétences

ec-lyon.fr/actualites/2022/discover-our-mini-series-valorisation-competences

Video CLIC

www.ec-lyon.fr/weex-weeks-engineering-experience

Video Skylab

www.ec-lyon.fr/actualites/2022/skylab-lieu-unique



LABEL

Cap Ingénieuses "Women and Science"

combating gender stereotypes in careers guidance

1 training course: Company and individuals

4 women out of 7 members of the Executive

Committee Recruitment of a director in September at

Head of ENISE, the in-house school on the Saint-Étienne campus

43% of management positions held by women



18 femmes et of science. Fun and

Web radio programme on the theme of the feminisation of science.

Student project: study of the behaviour of Grandes Ecoles in the face of sexist and sexual violence (SGBV).

UEPro conference: the place of women and inclusiveness in companies and in the engineering professions



Awarded the "Cap Ingénieuses" label by the Conférence des Directeurs des Écoles Françaises d'Ingénieurs (CDEFI) for the Movement's project* "Des

are deployed in elementary and junior high schools to raise awareness of engineering studies and careers and the principles of gender equality.

Organisation of Centr'L week in March 2022

by the school and the Movement, with exhibitions on the place of women in science and raising awareness of this issue at a themed evening event and during presentations to secondary school classes in neighbouring establishments.

Stéphanoises d'hier à aujourd'hui vers demain" **exhibition at ENISE**. Through ten portraits, the exhibition retraces the rich lives and destinies of Saint-Étienne's most outstanding women.

Signature in June of the "Jamais sans elles" charter by the Junior Entreprise Centrale Lyon Conseil. The Jamais Sans Elles charter promotes gender diversity and equality in the workplace.

Set up by Le Mouvement

"Back-to-school lectures on the Écully campus to talk about VSS: presentation of official statistics, definitions, resources and presentation of the listening facilities set up on campus.

A theatre group performs during the ENISE integration week to prevent harassment. A free speech tree has also been installed in the hall.

Anti-SSV sessions during the evenings, run by 40 student referents from several Centrale associations, for a total of 210 hours, supervised by the BDE and Le Mouvement*. The referents have to take a 7-hour training course explaining the legal framework of VSS.

Action plan for gender equality in the workplace

www.ec-lyon.fr/sites/default/files/2020.12.03_plan_daction_egalite_professionnelle_final_0.pdf



4 theses in progress

1 training course :
water quality and treatment



Student projects: desalination of seawater; photothermal disinfection of water; smart, connected siphon to save water.



Thesis on the development of electrochemical sensors for the detection of emerging pollutants in the aqueous phase at the Ampère laboratory, co-supervised with Hassan II University (Morocco).

Irontech: a project by the Ampère laboratory on the regulation of nitrates in aquatic ecosystems.

*Central Student Association



75 theses in progress

26 training courses: wind turbines, thermal generation, energy storage-conversion, Weex hydrogen and wind power...

1 specialised engineering course in energy

8 to 10% of the energy consumed on the Écully campus thanks to photovoltaic panels



Seminar on "hydrogen, the emergence of an ecosystem" organised by the Centraliens de Lyon association.

Student projects: design and manufacture of a vertical wind turbine; energy self-sufficient car park; plant energy production.

UEPro conferences: new nuclear power, the role of gas in the ecological transition, hydraulic turbines.



Offshore wind turbines: collaboration between

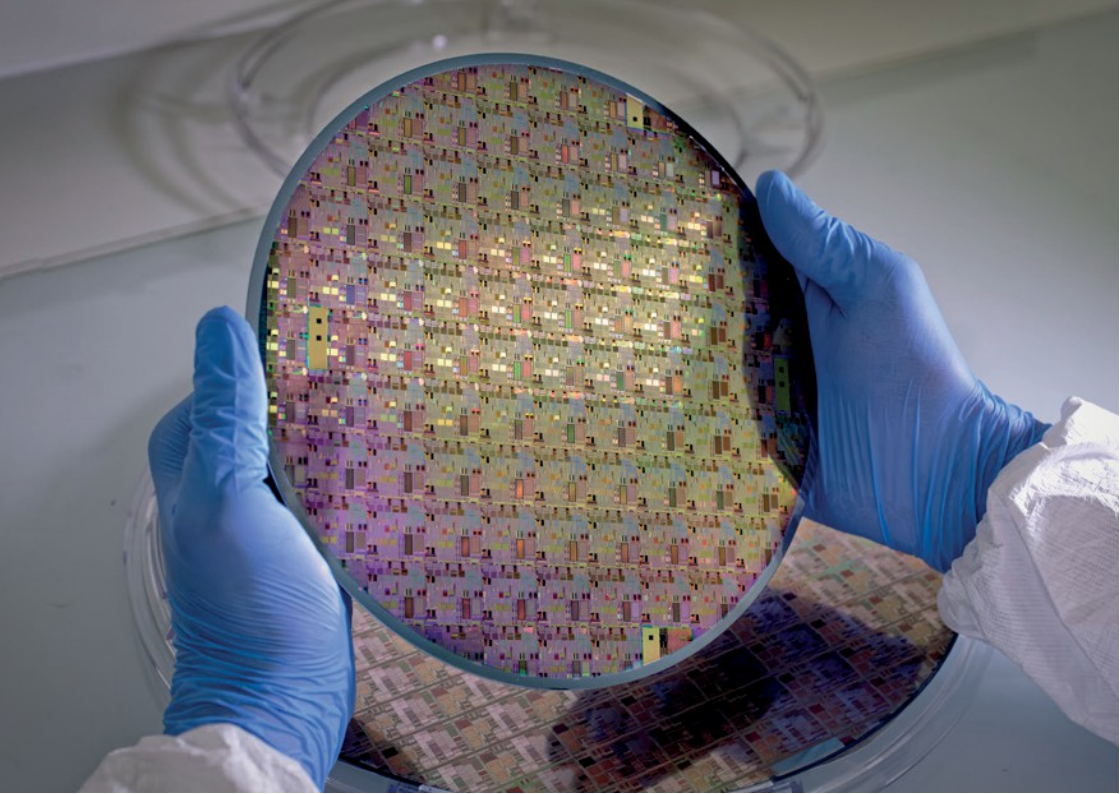
des Systèmes and IFP Énergies nouvelles on the study of damage to offshore anchor wires for the development of offshore wind turbines.

Destini: design and evaluation methods for 3D power electronics devices with integrated cooling (AMPERE lab)



Commissioning in January 2022 of 1,150 m² of self-consuming photovoltaic panels on the roofs of 3 buildings on the Écully campus.

Connection to the Ouest Lyonnais metropolitan district heating network: launch of roadworks on the



Écully campus. Objective: an En&R rate of at least 83%.

Work to optimise the containment of the Data Centre on the Écully campus, enabling the cooling set point to be lowered by 4°C.

Heating: heating programmed at 19°C in commercial premises and 17°C in workshops when occupied, and at 16°C and 15°C respectively when unoccupied and in frost-free mode during the winter.

of closing time; 2-hour reduction in heating time during the day; reduction in the heating period (from the end of October to the spring holidays).

Lighting: adapting timetables to reduce light periods in the morning and evening.

Introduction of individual assessment of the consumption of the most energy-intensive equipment to optimise usage.



LABEL

HRS4R "Human resources strategy for researchers".

quality of reception for international researchers

70 theses in progress

4 training courses: the challenges of the ecological transition, working today...

150 participants in strategy co-construction workshops

37% of staff teleworking

655 continuing training courses

3.6% absenteeism rate among staff



22 cohesion for TDF...

Inaugural talk by Émery Jacquillat, owner of CAMIF (a company with a mission) and Chairman of the Community of Companies with a Mission, on responsible consumption, Made in France and companies with a mission, or how to reconcile profit with a positive impact on social and environmental issues.

Organisation of a number of team-building sessions for Manitowoc, including an induction seminar for the 80-strong engineering department; organisation of a training seminar for the company's management team.

Student project: study of the French economic transformation plan.

UEPro conference: what the ecological and Ukraine crises show about the way the current economy works.

Organisation, as part of the quality of life at work initiative, of participative workshops (35 people) to identify and propose actions to be taken. Creation of a 7-person steering group.

Management training for 6 managers and new arrivals (2.5 days).





29 training initiatives: eco-design, innovative sustainable materials, etc.

More than 150 theses in progress

Master's degree in mechanics, sustainable manufacturing and advanced technology

Master's degree in chemistry and materials science, materials and sustainable development course

Master's degree in materials science and engineering, biomimetics and surface engineering



Opening of the international Biomimetics and Surface Engineering (BIO- SURF)

Master's degree in materials science and surface engineering, with a cross-disciplinary approach to biomimetics and the ecological transition.

Opening of the international Sustainable Manufacturing and Advanced Technologies (SMAT) Master's degree on the manufacture of sustainable materials in the energy and transport sectors.

Koncrete, a student entrepreneurship project to create a marketplace for the sale of materials by small-scale producers. Koncrete won 1st prize in the Startup Challenge 2022*.

Web radio programme on the theme of research to support the ecological transition.

UEPro conference: the place of the engineer in the face of current societal issues; design of an electric competition vehicle.



Reducing aircraft engine noise. A world first with this level of precision, the digital simulation carried out by the Fluid Mechanics and Acoustics Laboratory provides a better understanding of complex physical phenomena and a detailed description of turbulence and acoustic propagation to reduce the noise of future generations of aircraft engines.

LIVE-I: European programme on the improvement and innovation of transmission systems to improve their impact on the environment.

vehicles.

*Student entrepreneurship competition supported by American alumni via the *Centrales-US Education Fund*



9 training courses: general economics, globalisation and transculturalism, philosophy of science, etc.

23% of students receive grants

10 secondary school students with grants joining CapECL 150 students in the Cordée de la réussite "CapIngé" 20 tutors in the Génius programme



The CapECL preparatory cycle starts for the first time in September on the Saint-Étienne campus. CapECL contributes to the social inclusion of engineering students by admitting 10 secondary school grant-holders among the 24 secondary school students recruited.

Participation in 3 Campus des Métiers et des Qualifications (CMQ): Aeronautics, Auto'Mobilités and Industry and Design. The CMQs bring together educational establishments from college to doctorate level and enable the development of training courses in partnership with the

Student project: Handicap International's regional mobilisation strategy.

UEPro conferences: creation and operation of OOrion, a mobile application for the visually impaired.



Involvement in the Cordée de la réussite "CapIngé", which aims to introduce 150 pupils from 6 schools in the region, located in priority urban areas or rural areas, to engineering careers. Participation in **La Cordée** in Saint-Étienne
"Innov'ton Avenir!"

20 student tutors as part of the Génius programme. Aimed at high-school students from areas that are still under-represented in the Grandes Ecoles, Génius is a tutoring programme that helps demystify the courses of excellence and self-censorship. In addition to Centrale Lyon, Génius includes École polytechnique, HEC, ENSAE, ENSTA and Télécom Paris. Of the 250 students tutored nationally, 80% have gone on to enter a preparatory class for the grandes écoles.

Awareness-raising activities as part of the Centrale Lyon Telethon*.

20 students trained in disability management by Companieros with the Respl'handis* club.

Organisation of sign language courses by Respl'handis* for 40 pupils trained for 2 hours a week and awareness campaign for pupils.

An evening organised by the Centrale Rainbow* club to **raise awareness of LGBT+ issues** during Pride Month.

*Central Student Association





CERTIFICATION
HQE "sustainable building"
Excellence level
for Skylab on the Écully campus

32 theses in progress

4 training courses: sociology of political behaviour, WEEX mobility, etc.

Master's degree in civil engineering, course in materials and structures for sustainable construction



3D printing challenge: "Let's reinvent a creative, recreational, cultural and sustainable district of Saint-Étienne", co-organised by ENISE. The challenge brought together nearly 80 students from different schools in May.

Web radio programme on the theme: transforming a building, at what cost?

Student project: low-tech collective house.

UEPro conferences: thinking about the sustainability of ski resorts; carbon-free urban logistics.



Biosourced concrete: research project by the Tribology and Systems Dynamics Laboratory on the characterisation, analysis and optimisation of a biosourced concrete formulation for additive manufacturing.

Experimental study of the ventilation of an urban canyon with different densities of tree planting in collaboration between the Fluid Mechanics and Acoustics Laboratory and the Politecnico di Torino.



High Environmental Quality "Sustainable Building" Excellence **certification obtained** for the renovation of the Skylab building on campus

in Écully.



TMM2 building handed over in October: natural ventilation (freecooling), optimised energy use via a building management system, rainwater recovery, water retention on the roof, brise soleil, etc.

Work as part of France relance: ongoing renovation of 5 buildings on the Écully campus: thermal insulation of facades from the outside, replacement of external joinery (double glazing, solar factors, shading by adjustable sunbreakers, installation of double-flow ventilation).

Tremplin project: completion in 2022 of the property and development master plan for the Saint-Étienne campus, which includes the complete refurbishment of the building.

main building (10,000 m²) with thermal insulation of the shell and foyer (200m²).

Student soft mobility: €100 aid (in addition to Erasmus programme aid) for students travelling by train.

Adoption of new rules for business travel: ban on flying if the journey can be made in less than 4 hours by train; ban on journeys by car of more than 300 km unless an exemption is granted (transport of equipment, problems with access to the destination, tours).



50 theses in progress

21 training initiatives: responsible packaging design, waste and people, durability of materials and structures, Weex déchets, etc. and pollution...



Erasmus Mundus Master "META 4.0 - Manufacturing 4.0 by intelligent and susTAinable technologies": European Master's degree in partnership between ENISE, Politecnico di Torino, the Norwegian University of Science and Technology, the University of Ljubljana, the Chemnitz University of Technology and Mines Saint-Étienne to train experts in Industry 4.0.

Organisation of the 2nd edition of the FITE "Forum Ingénieur et Transition Écologique", with a plenary conference on the theme of "Coping with the shortage of raw materials" and three round tables on industrial ecology; the ecological transition in companies; and laws, standards and funding, as brakes or accelerators of the ecological transition.

Seminar on the theme of "Circular economy and energy transition" organised in November by a group of 5 students with the participation of Alstom, CGI, Citwell, Mews Partners, Saint Gobain, Savencia and Storengy.

The Ecuil Fablab moves into the new TMM2 building. The Fablab has a 3D area, an electronics area, a sewing and embroidery area and a MakerLab for working with wood and metal. It welcomes around 400 students and staff every month.

Student projects: production of bio-plastic; organisation of a repair café in Écully.

UEPro conferences: Fast fashion; how to think about and use semi-conductors in the context of the ecological crisis; thinking about an eco-responsible factory.

Organisation of the World Tribology Congress in July by the Tribology and Systems Dynamics Laboratory at the Lyon Convention Centre. This 7th edition of the World Tribology Congress welcomed more than 1,000 researchers on topics such as wear and tear of materials, surface engineering in tribology and bio-tribology, with a conference given by Ma- dame Masson Delmotte, member of the IPCC.

Labcom OUTIVOLYON on increasing the service life of mechanical safety parts by improving cutting tools: reducing energy consumption and increasing tool service life. The joint laboratory has been set up by the Tribology and Systems Dynamics Laboratory and TIVOLY.

Prize for a master's student in Innovative Materials for Health, Transport and Energy from the Société Française de Métallurgie et de Matériaux. This prize was awarded for work on the development of superhydrophobic metallic surfaces, inspired by the leaves of certain plants. The structure studied enables water repellency to be reproduced on metals using a hybrid laser process combining 3D metal printing and laser engraving, to replace the use of harmful chemical compounds.

Organisation in December of the 2tonnes Workshop for management and teacher-researchers involved in the DDRS committee, led by 2 École Centrale Paris students.

Planet&Co* **manages the donation centre** to avoid throwing away and needlessly buying new everyday items.

Workshops to take back and recycle old clothes, and DIY sewing workshops run by Centramoda*.



31 training initiatives: climate change and geo-engineering, transport and society, ecology, etc. and the environment...

Master's degree in risk and the environment, environmental risk governance course

Master's degree in risks and the environment, water and wind engineering course

Master's degree in ocean, atmospheric and climate sciences, with 3 pathways: atmospheric sciences, ocean sciences and climate sciences



Opening of the Water and Wind Engineering Master's degree in environmental fluid mechanics.

Opening of an international Master's degree in Ocean, Atmosphere and Climate Sciences (SOAC) focusing on physics, observation and modelling to understand the strong interactions between the three fields.

November saw the launch of the REMED project, Réussir l'EfficiencE des Mobilités d'Excellence Décarbonées, as part of the Campus des Métiers et des Qualifications Auto'Mobilités. Spearheaded by the University of Lyon 1, in collaboration with the École Centrale de Lyon, INSA Lyon, STRATE, three local high schools and more than 25 companies, REMED aims to meet the skills needs arising from the challenges of decarbonising mobility, in particular by installing an electric-hydrogen recharger on the Écully campus (an electrolyzer powered by photovoltaic panels to produce green

hydrogen).



Web radio programme on the role of research and engineers in the ecological transition.

Student projects: responsible, low-carbon mobility; design of a bicycle cargo; study of the behaviour of the grandes écoles with regard to the ecological transition.

UEPro conferences: transforming the customer through technology; the aircraft of tomorrow and its engine; the engineer and the ecological crisis.

 Recherche et innovation

CONDOR Chair: reducing the carbon footprint of turbojet engines through a better understanding of aeroelastic phenomena. Chair held by the Fluid Mechanics and Acoustics Laboratory.

 Environnement

Creation of a fresco for the climate at the start of the new academic year for staff on the Saint-Étienne campus.

31 bikes loaned to students by Planet&Co*.



5 theses in progress

6 training courses: river hydraulics, ocean and coastal engineering, ocean and atmospheric dynamics...



Student project: bank protection using groups of piles.



Resolution of the paradox of the energy cycle in the oceans thanks to the first direct observation of a double cascade of kinetic energy by teams from the Fluid Mechanics and Acoustics Laboratory. This discovery, published in the journal Science Advances, offers a possible explanation for the paradox of the coexistence in the ocean of large-scale energy structures (such as currents and large cyclonic structures visible from satellites) and small-scale energy dissipation.



11 theses in progress

10 training initiatives: impacts on people, the environment and health, air pollution, natural resource management, etc.

Master's degree in philosophy under agreement with Université Lyon 3, ethics, ecology and environment course



Student projects: modelling and monitoring forest fires, designing and building a green wall; robot to assess the health of market garden plants.

UEPro conferences: developing an area to restore biodiversity; re-bandaging the planet.



Research on biopiles in the Ampère laboratory. By studying the biopile mechanism (the release of electrons through photosynthesis and interaction with soil micro-organisms), researchers are studying the stress on a plant.

which will release fewer sugars and therefore produce a weaker electrical signal.



Implementation of the green space management plan. Training staff in the rational pruning of hedges and shrubs and the differentiated management of green spaces.

Preservation of biodiversity: presence of protected chiropterans (installation of nesting boxes) in Écully and 30 Soay sheep in Saint-Étienne.

Installation of waste sorting bins on campuses to manage waste at all times sporting events.



2 training courses: ethics, sociology of political behaviour, philosophy of science

4 Ukrainian women researchers hosted on our campuses



Simulation of a UN negotiation on energy and climate, in the form of a role-play between representatives of different countries. Focusing on human impacts and geopolitical negotiations, the simulation aims to get the fifty or so students taking part to go beyond a purely 'technical' reading of the problem and take account of the geopolitical dimension of energy/climate issues.



Support for Ukrainian researchers: a researcher from the Polytechnic Institute of Kiev is being hosted by the Ampère laboratory to work in the field of signal processing for the analysis of

Taras-Chevtchenko National University in Kiev in the field of biochemistry. Another researcher from the Taras-Chevtchenko National University is hosted by the Institute of Nanotechnologies in Lyon. The Humanities, Languages and Sport department has opened its doors to a lecturer from the University of Dnipro as a teacher of French as a foreign language.

Welcoming and supporting a Ukrainian student on the Saint-Étienne campus.

Organisation by the students' associations, the staff association and the school of activities on both campuses for Ukrainian refugee families: cultural and daily life activities, organisation of an Easter egg hunt for children, cafés to exchange ideas and get to know each other, purchase of books in Ukrainian, etc.

34 DNA sequences and a researcher from

17 PARTENARIATS POUR
LA RÉALISATION
DES OBJECTIFS



2 training courses: sociology of political behaviour, globalisation and transculturality

More than 100 students from the school attend courses at the Collège des Hautes Etudes Lyon Sciences



Stratégie et
gouvernance

In December, Centrale Lyon joined the Convention des Entreprises pour le Climat (CEC) in the Lyon area. The aim of the CEC is to raise awareness among business decision-makers of the planet's limits and the impact of economic activities on the climate, biodiversity, land use, pollution and the water cycle. Through a series of six sessions, the CEC is helping business leaders to transform their business models.

Centrale Lyon's commitment to the Lyon 2030 Agora. Supported by the city of Lyon, the Agora is a group of 80 organisations whose aim is to propose solutions to help the city of Lyon achieve carbon neutrality by 2030, as part of the European "100 Climate Neutral Cities" programme.

The Lyon Saint-Étienne College of Engineering was created in November to meet the challenges of major transitions in three areas: low-carbon society and industry, circular economy and responsible digital technology.

The College of Engineering is an alliance of four engineering schools: Centrale Lyon, INSA, ENTPE and Mines Saint-Étienne.

Preparations for the expansion of the Collège des Hautes Études Lyon Sciences to include two new partners, Université Lyon 3 (law and IAE) and emLyon. Created by six member schools of the University of Lyon (École Centrale de Lyon, École Normale Supérieure de Lyon, Mines Saint-Étienne, Sciences Po Lyon, VetAgro Sup and the Conservatoire National Supérieur de Musique et de Danse de Lyon), the Collège des Hautes Études Lyon Sciences offers students cross-disciplinary training that goes beyond traditional fields to train professionals capable of tackling the major transitions in climate, environment, digital, culture, society and democracy.

Participation in the DDRS commission of the École Centrale Group.

Participation in working groups on ecological and energy transitions set up by the University of Lyon to draw up a roadmap and a charter. community.



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École Centrale de Lyon
36 avenue Guy de Collongue
69 130 Écully
+33 (0)4 72 18 60 00
www.ec-lyon.fr

