

---

## Postface

---

The authors of this book, two engineers, a sociologist and a philosopher, take us on a great journey through the energy transition and its societal consequences. Upon reading it, one can feel optimistic when witnessing the sum of technological, economic and social ingenuity of which mankind is capable, while also wondering whether local and global solidarity, which appears as essential to succeed in this transition, will actually come to pass. To succeed in the energy transition, it is necessary to collectively recognize the problems, climatic in nature, for example, which have not yet been resolved in our society, since climatosceptics remain relatively numerous (20% of French people are skeptical according to a recent survey). There is therefore a lot of work to be done to raise awareness, which this book allows for, particularly as it does not appeal to catastrophism, but rather is oriented towards a search for concrete actions.

The authors show in a relevant fashion that in order to experience the energy transition, it is important to work at several levels. Thus, climate change which is caused by greenhouse gases is linked not only to the energy choices made by each nation, to access to raw materials, to the development of cutting-edge technologies that combat CO<sub>2</sub> emissions, but also to the type of economy, ways of life and consumption patterns, as well as many other factors such as the standard of living within populations and corresponding town planning. Here, we can speak of “transitions” in a complex world where interactions are multiple and of different orders.

In this regard, let us highlight the European initiative of the Green Pact which proposes a new growth strategy for the European Union with a view to creating a more “sustainable” and fairer society, integrating environmental, energy, health and

food issues, while taking into account social, economic, financial, ethical and political issues. The fundamental systemic dimension of interdependencies is necessary, but often difficult to integrate into the operational management of complex processes that involve multifactorial issues. This jeopardizes their coherent and effective implementation. Yet, it is this challenge that the Green Pact wants to tackle. Within this vision, nature, matter, living species and territories are no longer primarily resources to be exploited by a human “master and possessor of nature”. This becomes a real lever to be able to change our modes of production, consumption and therefore of living.

The great advantage of this work is to be able to disentangle many aspects of the complexity inherent in the situation, to never use a single key parameter to solve all problems, such as the “all technological” parameter, which is nonetheless still often advocated for. The authors underline the links between energy issues and lifestyles, particularly with regard to the energy consumed for travel, heating or food, without forgetting the question of the buildings in which we live. “So would there be no smart buildings and smart cities without smart users?” This requires us to adjust policies in terms of training and education, so that they are firmly rooted in sociological analyses that are linked to acceptance and appropriation by users.

One of the merits of this work is also to propose possible solutions within the framework of the territories and the university, in an intelligent alliance between different organizations, each holding a share of power to move things forward. Different examples of actions within universities in their territory are offered: they explain the particular interest of these alliances. Thus, in their diversity of training for engineers, managers, economists, specialists in health and the human and social sciences, when higher education establishments like the Université Catholique de Lille combine their knowledge and know-how, in close collaboration with the city, like the metropolis of Lille and the Hauts-de-France region, concrete paths for a “sustainable future” in the corresponding territory may emerge. In this sense, the *living labs* of this same university, such as Live TREE which seeks to promote the UN’s sustainable development objectives to implement actions for the energy transition, represent real third-party collaborative spaces, sources of collective intelligence that our society is in need of. The demonstrators that these third parties produce make the search for sustainable solutions to experience the energy transition relevant.

To meet the challenges analyzed in this book and to act according to the avenues proposed, the questions of training and education are major. With regard to the university, which is presented here as a hub for working on the technical and societal changes necessary for the energy transition, training in ethics from within

the programs undertaken by engineers, economists, lawyers, political scientists or managers seems essential. The chapter about the ethics of energy and societal transition emphasizes the need to take future generations into account in today's projects, as the philosopher Hans Jonas already said 40 years ago through his *responsibility principle* and the categorical imperative that followed: act in such a way that the effects of your actions are compatible with the permanence of an authentically human life on earth. How do ecological considerations for "taking care of our common home" come to transform our ethical reasoning, at the individual level, at the level of a company and a community, and at the level of national and international politics? How and to what extent can the living world inspire mankind in their modes of organization? What are the consequences of technical, economic and social choices?

We can no longer speak of "sectoral" ethics like we used to, since "everything is linked". Training in ethics, "from within the apprenticeship of professions", must take concrete behavior and the necessary changes in lifestyles in society into account. Professions themselves should be modified, at least the way of exercising them and therefore of training for them, with a broader sense of responsibility in the service of the common good, and not only within the ethical framework of a profession. In the ethics of desirable futures, key elements such as sobriety are combined with the most advanced technical solutions, which upsets our habits in terms of the notion of progress. The living conditions of future generations may be harsher than ours today, particularly in terms of the climate: for them, we must realize that today's technological innovation can only be seen as real progress if this innovation is truly "sustainable".

Many authors thus believe that the ecological crisis is an illustration of the death of a progressive paradigm that has had its day. In this context, the words of Pope Francis in his encyclical *Laudato si'* [FRA 15] resonate more strongly than ever: "It is not enough to reconcile the protection of nature and financial profit in a happy medium, or the environmental preservation and progress... It's about redefining progress. Technological and economic development that does not leave a better world and an integrally higher quality of life cannot be considered progress" (paragraph LS 194 in [FRA 15]). This progress is not to be confused with economic growth, with an increase in technological power, the accumulation of material wealth and an increase in GDP without neglecting these factors. "There are not two separate crises, one environmental and the other social, but a single and complex socio-environmental crisis" (paragraph L1 139 in [FRA 15]).

In the background of the work in ethics, questions of anthropology arise in a renewed way. It is neither more nor less our ways of seeing the world and "of being

in the world” which determine the technical and economic choices to make so we can take care of the common planet or choose not to, of biodiversity, of people in the diversity of their geographical, cultural circumstances and climate-related migrations. This is why we speak of an “integral ecology”, which is based on the relationship of human beings with their environment, integrating techno-economic development, social relationships, cultural and spiritual values and finally quality of daily life. The imbalance between these developments, relationships and values can be recognized as the anthropological root of the ecological crisis. Training in energy transitions thus goes hand in hand with openness to the spirit of integral ecology, to the humanism that such a vision is in the process of bringing out. We can already see it in the world of young people who are passionate about taking up the ecological challenge, despite slow reactions of major industrial countries. For example, a Climate Convention organized in the fall of 2022 at the Université Catholique de Lille will stimulate the entire institution: 100 students and 50 staff members will, with the support of many experts, work to propose possible decisions to be implemented so that the university can meet climate challenges.

In our universities, civic engagement has long been encouraged in the context of community life, and many student associations are thus invested in the ecological challenge. A new training pedagogy, named service learning, is beginning to take shape, this time at the heart of academic courses which train people for professions. The idea is to promote learning a profession by experimenting with a free service for people who are disadvantaged in the field in question. Thus, for example, undergraduate students in “sustainable development technology and management” from the Institut Catholique de Lille meet residents in the university district who have very poorly insulated housing. In dialogue with the inhabitants concerned and with experts in sustainable habitats, they offer technological solutions free of charge and possibilities of financial support in order to jointly meet the energy challenges of these inhabitants. The difficult question of the energy transition leads to new training pedagogies which should renew the interest of our students for their future professions.

In her book *Good Economics for Hard Times* ([BAN 20], in French), the 2019 Nobel Prize winner in Economics, Esther Duflo, recounts her experience as a member of the poverty reduction laboratory at the renowned Massachusetts Institute of Technology. With researchers from all over the world and members of NGOs, she shows that taking up the challenge of ecology and addressing the challenge of poverty and migration are one and the same. According to her, this opens up new intelligible horizons for a different world to be built, a world in which social friendship and fraternity could illuminate the paths of the future. “There is

always something to do to change the world” is the leitmotif and driving force of this committed economist. Such testimonies suggest that the challenges to which this book makes a very useful contribution will be met as far as the humanist audacity of our engineers, researchers, economists and lawyers is able to extend. Particularly, if they do not forget to engage in essential dialogue with all inhabitants of the territories concerned, including the most modest. There is our hope.

Thierry MAGNIN  
Deputy President-Rector for Humanities  
and student life at UC Lille



---

## References

---

- [ADE 18] ADEME, Trajectoires d'évolution du mix électrique 2020-2060, Ademe, 2018.
- [ADE 20] ADEME, Baromètre Ademe sur les représentations sociales du changement climatique, Ademe, July 2020.
- [ADE 21] ADEME, Transition(s) 2050, choisir maintenant, agir pour le climat, Ademe, 2021.
- [ADE 22] ADEME, Bilan GES organisation, available at: <https://bilans-ges.ademe.fr/fr/accueil/contenu/index/page/bilan%2Bges%2Borganisation/siGras/1>, 2022.
- [ARI 04] ARISTOTLE, *Politics: A Treatise on Government*, translated by William Ellis, available at: <https://www.gutenberg.org/cache/epub/6762/pg6762-images.html>, 2004.
- [ARN 16] ARNO A., THOMAS S., “The efficacy of nudge theory strategies in influencing adult dietary behaviour: A systematic review and meta-analysis”, *BMC Public Health*, vol. 16, no. 1, p. 676, 2016.
- [ASC 51] ASCH S.E., “Effects of group pressure upon the modification and distortion of judgments”, *Organizational Influence Processes*, vol. 58, pp. 295–303, 1951.
- [BAN 20] BANERJEE A.V., DUFLO E., *Economie utile pour les temps difficiles*, Le Seuil, 2020.
- [BAR 14] BARRE N., ROUBAUD M., *Les énergies renouvelables*, Éditions 10/18, Paris, 2014.
- [BAR 20] BARRAU A., *Le plus grand défi de l'histoire de l'humanité*, Michel Lafon, Neuilly-sur-Seine, 2020.
- [BAZ 13] BAZERMAN M., TENBRUNSEL A., *Blind Spots: Why We Fail to Do What's Right and What to Do About It*, Princeton University Press, Princeton, 2013.
- [BES 15] BESLAY C., GOURNET R., “Les professionnels du bâtiment face aux enjeux de la performance énergétique : nouveaux savoirs, nouveaux enjeux”, *Sociologies*, 2015.
- [BOO 22] BOOKCHIN M., *The Philosophy of Social Ecology: Essays on Dialectical Naturalism*, AK Press, Edinburgh, 2022.

- [BOV 09] BOVENS L., “The ethics of nudge”, in GRÜNE-YANOFF T., HANSSON S.O. (eds), *Preference Change*, Springer Netherlands, Dordrecht, 2009.
- [BOZ 16] BOZZO-REY M., “Enjeux et défis de stratégies d’influence obliques des comportements : le cas de la législation indirecte et des nudges”, *La revue Tocqueville*, vol. 37, no. 1, pp. 123–157, 2016.
- [BOZ 18] BOZZO-REY M., “Les nudges face au changement climatique”, in BAUDU A., SÉNÉCHAL J. (eds), *La conduite du changement climatique : entre contraintes et incitations*, LGDJ, Paris, 2018.
- [BRE 02] BRENNAN A., LO N.Y.S., “Environmental ethics”, in *The Stanford Encyclopedia of Philosophy*, Summer 2022 edition, ZALTA E.N. (ed.), available at: <https://plato.stanford.edu/archives/sum2022/entries/ethics-environmental/>, 2002.
- [BRI 13] BRISEPIERRE G., “Les ménages français choisissent-ils réellement leur température de chauffage ? La norme des 19 °C en question”, in *La sociologie de l’énergie 2 : pratiques et modes de vie*, BESLAY C. and ZELEM M.-C., Editions du CNRS, Paris, 2013.
- [BRO 12] BROOME J., *Climate Matters: Ethics in a Warming World*, W.W. Norton & Company, New York, 2012.
- [CAM 04] CAMERER C.F., LOEWENSTEIN G., RABIN M., *Advances in Behavioral Economics*, Princeton University Press, New York, 2004.
- [CAN 18] CANEY S., “Justice and posterity”, in KANBUR R., SHUE H. (eds), *Climate Justice: Integrating Economics and Philosophy*, Oxford University Press, Oxford, 2018.
- [CAN 20] CANEY S., Climate justice, available at: <https://plato.stanford.edu/archives/win2021/entries/justice-climate/>, 2020.
- [CAR 14] CARTWRIGHT E., *Behavioral Economics*, 2nd edition, Routledge, New York, 2014.
- [CAR 15] CARROLL A.E., “The failure of calorie counts on menus”, *The New York Times*, available at: [http://www.nytimes.com/2015/12/01/upshot/more-menus-have-calorie-labeling-but-obesity-rate-remains-high.html?hp&action=click&pgtype=Homepage&clickSource=story-heading&module=second-column-region&region=top-news&WT.nav=top-news&\\_r=0](http://www.nytimes.com/2015/12/01/upshot/more-menus-have-calorie-labeling-but-obesity-rate-remains-high.html?hp&action=click&pgtype=Homepage&clickSource=story-heading&module=second-column-region&region=top-news&WT.nav=top-news&_r=0), 2015.
- [CAS 20] CASSORET B., *Transition énergétique. Ces vérités qui dérangent*, De Boeck Supérieur, Louvain-la-Neuve/Paris, 2020.
- [CER 13] CERTU (Direction générale de l’aménagement, du logement et de la nature), *Réduire l’impact environnemental des bâtiments, agir avec les occupants*, BEAUREGARD S. (ed.), CERTU, no. 275, 2013.
- [COM 21] COMMISSION EUROPÉENNE, Mettre en œuvre le pacte vert pour l’Europe, available at: [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal\\_fr](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_fr), 2021.
- [CON 15] CONLY S., *Contre l’autonomie : la méthode forte pour inspirer la bonne décision*, Hermann, Paris, 2015.



- [CON 16] CONLY S., “When freedom of choice doesn’t matter”, *La revue Tocqueville*, vol. 37, no. 1, 2016.
- [CRE 13] CREDOC, “Comment limiter l’effet rebond des politiques d’efficacité énergétique dans le logement ? L’importance des incitations comportementales”, *La Note d’analyse*, no. 320, 2013.
- [DES 95] DE SHALIT A., *Why Posterity Matters*, Routledge, London, 1995.
- [DEV 16] DE VULPIAN A., *Éloge de la métamorphose. En marche vers une nouvelle humanité*, Saint-Simon, Paris, 2016.
- [DEV 19] DE VULPIAN A., DUPOUX-COUTURIER I., *Homo Sapiens à l’heure de l’intelligence artificielle. La métamorphose humaniste*, Eyrolles, Paris, 2019.
- [DUB 17] DUBRULLE L., “Quel sens donner à Live TREE”, *Live TREE Mag*, no. 3, November 2017.
- [DUR 20] DURILLON B., DAVIGNY A., KAZMIERZCAK S. et al., “Decentralized demand response considering residential profiles for load smoothing”, *Sustainable Cities and Society*, vol. 63, pp. 1–11, 2020.
- [DUR 21] DURILLON B., SALOMEZ F., DAVIGNY A. et al., “Consumers’ sensitivities and preferences modelling and integration in a decentralized two levels energy supervisor”, *Mathematics and Computers in Simulation*, vol. 183, pp. 142–157, 2021.
- [DWO 14] DWORKIN G., “Paternalism”, in *The Stanford Encyclopedia of Philosophy*, Fall 2020 edition, ZALTA E.N. (ed.), available at: <https://plato.stanford.edu/archives/fall2020/entries/paternalism/>, 2014.
- [ECO 09] ECONOMIST IMPACT, The European Green City Index measures the environmental performance of 30 major European cities, available at: <https://eiuperspectives.economist.com/sustainability/european-green-city-index>, 2009.
- [EKS 20] EKSTRÖM S., NOMBELA J.G., *Nous ne vivrons pas sur Mars, ni ailleurs*, Favre, Lausanne, 2020.
- [FAH 09] FAHLQUIST J.N., “Moral responsibility for environmental problems – Individual or institutional?”, *Journal of Agricultural and Environmental Ethics*, vol. 22, no. 2, pp. 109–124, 2009.
- [FER 08] FERONE G., *2030, le krach écologique*, Grasset, Paris, 2008.
- [FER 21] FERNBANK D., University of Reading Net Zero Carbon Plan 2021-2030, Report, University of Reading, 2021.
- [FLE 19] FLEURBAEY M., FERRANNA M., BUDOLFSON M. et al., “The social cost of carbon: Valuing inequality, risk, and population for climate policy”, *The Monist*, vol. 102, no. 1, pp. 84–109, Oxford University Press, Oxford, 2019.
- [FRA 15] FRANOIS, *Loué sois-tu*, Bayard, Montrouge, 2015.
- [FRA 21] FRAUNHOFER-INSTITUT FÜR SOLARE ENERGIESYSTEME ISE, *Forschen für die Energiewende*, available at: <https://www.ise.fraunhofer.de>, 2021.

- [FOU 66] FOUCAULT M., *Les Mots et les choses. Une archéologie des sciences humaines*, Gallimard, Paris, 1966.
- [GIO 14] GIORGINI P., *La transition fulgurante*, Bayard, Montrouge, 2014.
- [GIO 16a] GIORGINI P., ARÈNES J., *Au crépuscule des lieux*, Bayard, Montrouge, 2016.
- [GIO 16b] GIORGINI P., VAILLANT N., *La fulgurante récréation*, Bayard, Montrouge, 2016.
- [GIO 18] GIORGINI P., DEPRez S., WALD LASOWSKI A., *La tentation d'Eugénie. L'humanité face à son destin*, Bayard, Montrouge, 2018.
- [GIO 20] GIORGINI P., *La crise de la joie*, Bayard, Montrouge, 2020.
- [GIO 21a] GIORGINI P., MAGNIN T., *Vers une civilisation de l'algorithme ? Un regard chrétien sur un défi éthique*, Bayard, Montrouge, 2021.
- [GIO 21b] GIORGINI P., *The Contributory Revolution*, ISTE Ltd, London, and John Wiley & Sons, New York, 2021.
- [GIR 14] GIRAUD G., KAHRAMAN Z., How dependent is output growth from primary energy?, available at: <https://www.parisschoolofeconomics.eu/IMG/pdf/13juin-pse-ggiraud-presentation-1.pdf>, 2014.
- [GLO 21] GLOBAL MONITORING LABORATORY, Trends in atmospheric carbon dioxide, available at: <https://gml.noaa.gov/ccgg/trends/mlo.html>, 2021.
- [GOD 15] GODARD O., *La justice climatique mondiale*, La Découverte, Paris, 2015.
- [GOL 72] GOLDSMITH E., ALLEN R., ALLABY M. et al., “A blueprint for survival”, *The Ecologist*, vol. 2, no. 1, pp. 1–22, 1972.
- [GOS 04] GOSSERIES A., *Penser la justice entre les générations. De l'affaire Perruche à la réforme des retraites*, Aubier, Paris, 2004.
- [GRA 16] GRANDJEAN A., MARTINI M., *Financer la transition énergétique*, Les Éditions de l'atelier, Ivry-Sur-Seine, 2016.
- [GRE 13] GREENPEACE, Scénario de transition énergétique, available at: <https://cdn.greenpeace.fr/site/uploads/2017/02/Scenario-Transition-Energetique-Greenpeace-2013.pdf>, 2013.
- [GRÜ 12] GRÜNE-YANOFF T., “Old wine in new casks: Libertarian paternalism still violates liberal principles”, *Social Choice and Welfare*, vol. 38, no. 4, pp. 635–645, 2012.
- [HAM 20] HAMMARBY SJÖSTAD 2.0, Electricity, available at: <https://hammarbysjostad20.se/?lang=en>, 2020.
- [HAN 16] HANSEN P.G., “The definition of nudge and libertarian paternalism: Does the hand fit the glove?”, *European Journal of Risk Regulation*, vol. 1, p. 155, 2016.
- [HAU 10] HAUSMAN D.M., WELCH B., “Debate: To nudge or not to nudge”, *Journal of Political Philosophy*, vol. 18, no. 1, pp. 123–136, 2010.

- [HEY 16] HEYWARD C., ROSER D., *Climate Justice in a Non-Ideal World*, Oxford University Press, New York, 2016.
- [HOE 18] HOEGH-GULDBERG O., JACOB D., BINDI M. et al., Impacts of 1.5 °C global warming on natural and human systems, Report, IPCC Secretariat, 2018.
- [INS 22] INSEE, Émissions de gaz à effet de serre par activité, available at: <https://www.insee.fr/fr/statistiques/2015759>, 2022.
- [INT 18] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Global warming of 1.5°C, Summary for Policymakers, Report, IPCC, Geneva, 2018.
- [IPC 01] IPCC TAR, Climate change 2001: Synthesis report, IPCC, Geneva, 2001.
- [JAM 02] JAMIESON D., *Morality's Progress: Essays on Humans, Other Animals, and the Rest of Nature*, Oxford University Press, Oxford, 2002.
- [JAN 17] JANETOS A.C., *Recommendations of the Climate Action Task Force for Boston University's Climate Action Plan*, Boston University, Boston, 2017.
- [JAN 20a] JANCOVICI J.M., Qu'est-ce que l'équation de Kaya ?, available at: <https://jancovici.com/changement-climatique/economie/quest-ce-que-lequation-de-kaya/>, 2020.
- [JAN 20b] JANCOVICI J.M., Combien de gaz à effet de serre dans notre poubelle ?, available at: <https://jancovici.com/changement-climatique/les-ges-et-nous/combien-de-gaz-a-effet-de-serre-dans-notre-poubelle>, 2020.
- [JEV 66] JEVONS W.S., *The Coal Question: An Inquiry Concerning the Progress of the Nation and the Probable Exhaustion of Our Coal Mines*, Macmillan & Co, London, 1866.
- [KOE 07] KOEPEL, S., ÜRGE-VORSATZ, D., Assessment of policy instruments for reducing greenhouse gas emissions from buildings, A Report of UNEP Sustainable Buildings and Construction Initiative, United Nations Environmental Program and Central European University, Paris, 2007.
- [LAB 15] LABBOUZ-HENRY D., Bâtiments tertiaires performants et comportements favorables à l'environnement : le rôle de variables psychosociales et du contexte organisationnel, Social psychology PhD Thesis, Université Paris-Nanterre, Nanterre, 2015.
- [LAT 91] LATOUR B., CALLON M. (eds), *La science telle qu'elle se fait. Anthologie de la sociologie des sciences de langue anglaise*, La Découverte, Paris, 1991.
- [LAV 18] LAVERGNE R., "Climat et transition énergétique", *Annales des Mines – Responsabilité et environnement*, vol. 89, no. 1, pp. 39–43, 2018.
- [LEG 15] LE GRAND J., NEW B., *Government Paternalism – Nanny State or Helpful Friend*, Princeton University Press, Princeton, 2015.
- [LÉV 14] LÉVY J.P., ROUDIL N., FLAMAND A. et al., "Les déterminants de la consommation énergétique domestique", *Flux*, no. 96, pp. 40–54, 2014.
- [LIG 96] LIGHT A., KATZ E., "Introduction: Environmental pragmatism and environmental ethics as contested terrain", in LIGHT A., KATZ E. (eds.), *Environmental Pragmatism*, Taylor & Francis, London, 1996.

- [LLA 15] LLAVADOR H., ROEMER J.E., SYLVESTRE J., *Sustainability for a Warming Planet*, Harvard University Press, Cambridge, 2015.
- [MAN 20] MANCHESTER 1824, The University of Manchester: A review of ES performance, available at: <https://documents.manchester.ac.uk/DocuInfo.aspx?DocID=46576>, 2020.
- [MAR 07] MARKANDYA A., WILKINSON P., “Electricity generation and health”, *The Lancet*, vol. 370, pp. 979–990, 2007.
- [MCC 20] MCCORNASKY O., Copenhagen’s Zero Carbon Plan, available at: <https://zerocarbon2025.com/copenhagens-zero-carbon-plan/>, 2020.
- [MCK 17] MCKINNON C., “Endangering humanity: An international crime?”, *Canadian Journal of Philosophy*, vol. 47, nos 2–3, pp. 395–415, 2017.
- [MCM 81] MCMAHAN J., “Problems of population theory”, *Ethics*, vol. 92, no. 1, pp. 96–127, 1981.
- [MEM 16] MEMOORI, Smart Buildingx can be “The Nodes” of the smart grid, [www.memoori.com/smart-buildings-can-nodes-smart-grid](http://www.memoori.com/smart-buildings-can-nodes-smart-grid), 2016.
- [MÉR 21] MÉRITET S., “On pourra lire à ce propos l’article très éclairant paru dans le journal”, *Le Monde*, available at: [https://www.lemonde.fr/idees/article/2021/03/17/pannee-electrique-au-texas-c-est-la-complementarite-et-non-la-substitution-entre-marches-et-regulations-qu-il-faut-mettre-en-place\\_6073401\\_3232.html](https://www.lemonde.fr/idees/article/2021/03/17/pannee-electrique-au-texas-c-est-la-complementarite-et-non-la-substitution-entre-marches-et-regulations-qu-il-faut-mettre-en-place_6073401_3232.html), 2021.
- [MÉT 17] MÉTHOS, De l’usage des bâtiments performants en Région Bruxelles Capitale, Report, Méthos, Brussels, 2017.
- [MEY 12] MEYER L.H., ROSEN D., “Enough for the future”, in MEYER L.H. (ed.), *Intergenerational Justice*, Routledge, London, 2012.
- [MEY 21] MEYER L., Intergenerational Justice, available at: <https://plato.stanford.edu/archives/sum2021/entries/justice-intergenerational/>, 2021.
- [MIC 03] MICHELETTI M., *Political Virtue and Shopping: Individuals, Consumerism, and Collective Action*, Palgrave Macmillan, New York, 2003.
- [MIN 21] MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET DE LA COHÉSION DES TERRITOIRES, MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE, “Fit for 55” : un nouveau cycle de politiques européennes pour le climat, available at: <https://www.ecologie.gouv.fr/fit-55-nouveau-cycle-politiques-europeennes-climat>, 2021.
- [MIT 05] MITCHELL G., “Libertarian paternalism is an oxymoron”, *Northwestern University Law Review*, vol. 99, no. 3, pp. 1245–1277, 2005.
- [MOR 11] MORTON J.M., “Toward an ecological theory of the norms of practical deliberation”, *European Journal of Philosophy*, vol. 19, no. 4, pp. 561–584, 2011.
- [MOU 11] MOUHOUT J.F., *Des esclaves énergétiques*, Champ Vallon, Ceyzérieu, 2011.
- [MRM 21] MR MONDIALISATION, La Chine et son programme sans précédent de modification météo, available at: <https://mrmondialisation.org/la-chine-et-son-programme-sans-precedent-de-modification-meteo/>, 2021.

- [MUL 11] MULGAN T., *Ethics for a Broken World: Imagining Philosophy After Catastrophe*, Routledge, Durham, 2011.
- [MUL 15] MULGAN T., “Utilitarianism for a broken world”, *Utilitas*, vol. 27, no. 1, pp. 92–114, 2015.
- [NAT 21] NATURE COMMUNICATIONS, Altered growth conditions more than reforestation counteracted forest biomass carbon emissions 1990–2020, available at: <https://www.nature.com/articles/s41467-021-26398-2>, 2021.
- [NEC 15] NEC The Global Commission on the Economy and Climate, *La nouvelle économie climatique. Une meilleure croissance, un meilleur climat*, Les Petits Matins, Paris, 2015.
- [NÉG 21] NÉGAWATT, La transition énergétique au cœur d’une transition sociétale, <https://negawatt.org/Scenario-negaWatt-2022>, 2021.
- [NOR 94] NORTON B.G., *Toward Unity among Environmentalists*, Oxford University Press, Oxford, 1994.
- [OGI 04] OGIEN R., *La panique morale*, Grasset, Paris, 2004.
- [ONE 92] O’NEILL J., “The varieties of intrinsic value”, *The Monist*, vol. 75, no. 2, pp. 119–137, 1992.
- [ORS 18] ORSENNA E., QUÉRÉ S., *La Fabrique du neuf*, Le Cherche midi, Paris, 2018.
- [PAG 07] PAGE E.A., *Climate Change, Justice and Future Generations*, Edward Elgar Publishing, London, 2007.
- [PAS 74] PASSMORE J.A., *Man’s Responsibility for Nature: Ecological Problems and Western Traditions*, Duckworth, London, 1974.
- [RAB 01] RABL A., SPADARO J.V., “Les coûts externes de l’électricité”, *Revue de l’énergie*, no. 525, pp. 151–163, 2001.
- [RAW 09] RAWLS J., *Théorie de la justice*, translated by AUDARD C., Points, Paris, 2009.
- [RAZ 86] RAZ J., *The Morality of Freedom*, Clarendon Press, Oxford, 1986.
- [RIF 12] RIFKIN J., *La Troisième Révolution Industrielle*, Les Liens qui libèrent, Paris, 2012.
- [ROB forthcoming] ROBYNS B. et al. *Smart Grids and Buildings for Energy and Societal Transition*, ISTE Ltd, London and John Wiley & Sons, New York, forthcoming.
- [ROB 15] ROBYNS B., FRANÇOIS B., DELILLE G. et al., *Energy Storage in Electric Power Grids*, ISTE Ltd, London, and John Wiley & Sons, New York, 2015.
- [ROB 16] ROBYNS B., SAUDEMONT C., HISSEL D. et al., *Electrical Energy Storage in Transportation Systems*, ISTE Ltd, London, and John Wiley & Sons, New York, 2016.
- [ROB 19] ROBYNS B., DAVIGNY A., BARRY H. et al., *Electrical Energy Storage for Buildings in Smart Grids*, ISTE Ltd, London, and John Wiley & Sons, New York, 2019.

- [ROB 21] ROBYNS B., DAVIGNY A., FRANÇOIS B. et al., *Electric Power Generation from Renewable Sources*, 2nd edition, ISTE Ltd, London, and John Wiley & Sons, New York, 2021.
- [ROS 02] ROSS D., *The Right and the Good*, Oxford University Press, Oxford, 2002.
- [ROS 16] ROSER D., SEIDEL C., *Climate Justice: An Introduction*, Routledge, Abingdon, 2016.
- [ROZ 20] ROZEBOOM G.J., “Nudging for rationality and self-governance”, *Ethics*, vol. 131, no. 1, pp. 107–121, 2020.
- [RTE 21] RTE, *Futurs énergétiques 2050*, Report, RTE, 2021.
- [SCH 13] SCHEFFLER S., *Death and the Afterlife*, Oxford University Press, Oxford, 2013.
- [SCH 19] SCHMIDT A.T., “Getting real on rationality – Behavioral science, nudging, and public policy”, *Ethics*, vol. 129, no. 4, pp. 511–543, 2019.
- [SÉN 20] SÉNAT FRANÇAIS, *Pour une transition numérique écologique*, Report, Sénat, 2020.
- [SHA 21] SHAHROUR I., *Voyage au cœur de la ville intelligente*, Édition Isam Shahrour, 2021.
- [SHU 88] SHUE H., “Mediating duties”, *Ethics*, vol. 98, no. 4, pp. 687–704, 1988.
- [SHU 14] SHUE H., *Climate Justice: Vulnerability and Protection*, Oxford University Press, Oxford, 2014.
- [SIN 15] SINGLER E., *Green nudge : réussir à changer les comportements pour sauver la planète*, Pearson Education, Montreuil, 2015.
- [STE 20] STEPHANT M., ABBES D., HASSAM-OUARI K. et al., “Increasing photovoltaic self-consumption with game theory and blockchain”, *EAI Endorsed Transactions on Energy Web*, vol. 8, no. 34, pp. 1–12, 2020.
- [STE 21] STEPHANT M., ABBES D., HASSAM-OUARI K. et al., “Distributed optimization of energy profiles to improve photovoltaic self-consumption on a local energy community”, *Simulation Modelling Practice and Theory*, vol. 108, pp. 1–13, 2021.
- [STO 22] STOCKHOLM UNIVERSITY, *Stockholm University Climate Roadmap for the period 2020-2040*, available at: <https://www.su.se/staff/organisation-governance/governing-documents-rules-and-regulations/environment/stockholm-university-climate-roadmap-for-the-period-2020-2040-1.536900>, 2022.
- [SUB 09] SUBRÉMON H., *Habiter avec l'énergie, pour une anthropologie sensible de la consommation énergétique*, PhD thesis, Université Paris-Nanterre, 2009.
- [SUB 15] SUBRÉMON H., AUBRY-BRÉCHAIRE M., BOUSQUET P. et al., “Coriolis à l'usage : un bâtiment performant sous tension”, *Métropolitiques*, available at: <http://www.metropolitiques.eu/Coriolis-a-l-usage-un-batiment.html>, 2015.
- [SUN 03] SUNSTEIN C.R., THALER R.H., “Libertarian paternalism is not an oxymoron”, *The University of Chicago Law Review*, vol. 70, no. 4, pp. 1159–1202, 2003.

- [SUN 06] SUNSTEIN C.R., “Preferences, paternalism, and liberty”, *Royal Institute of Philosophy Supplements*, vol. 59, pp. 233–264, 2006.
- [SUN 08] SUNSTEIN C.R., THALER R.H., *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press, London, 2008.
- [SUN 14] SUNSTEIN C.R., “Nudging: A very short guide”, *Journal of Consumer Policy*, vol. 37, no. 4, pp. 583–588, 2014.
- [SUN 15] SUNSTEIN C.R., *Why Nudge? The Politics of Libertarian Paternalism*, Yale University Press, Yale, 2015.
- [THA 15] THALER R.H., *Misbehaving: The Making of Behavioral Economics*, W.W. Norton & Company, New York, 2015.
- [THE 19] THE GUARDIAN, Inside Copenhagen’s race to be the first carbon-neutral city, available at: <https://www.theguardian.com/cities/2019/oct/11/inside-copenhagens-race-to-be-the-first-carbon-neutral-city>, 2019.
- [THØ 09] THØGERSEN J., CROMPTON T., “Simple and painless? The limitations of spillover in environmental campaigning”, *Journal of Consumer Policy*, vol. 32, no. 2, pp. 141–163, 2009.
- [UNI 22] UNIVERSITY OF BRITISH COLUMBIA, UBC Vancouver Climate Action Plan 2030, University of British Columbia, 2022.
- [UNE 21] UN ENVIRONMENT PROGRAMME, Over 1,000 universities and make net-zero pledges as new nature initiative is unveiled, available at: <https://www.unep.org/news-and-stories/press-release/over-1000-universities-and-colleges-make-net-zero-pledges-new-nature>, 2021.
- [UNI 19a] UNIVERSITÉ CATHOLIQUE DE LILLE, “Ville vs nature ? La biodiversité des initiatives de l’université”, *Live TREE Mag*, no. 5, pp. 12–21, 2019a.
- [UNI 19b] UNIVERSITÉ CATHOLIQUE DE LILLE, “Associations étudiantes”, *Live TEE Mag*, no. 5, p. 24, June 2019.
- [VIL 18] VILLABLA B., SÉMAL L., *Sobriété énergétique : contraintes matérielles, équité sociale et perspectives institutionnelles*, Quae, Paris, 2018.
- [WAR 20] WARNOCK G.J., *The Object of Morality*, Routledge, London, 2020.
- [WHI 13] WHITE M.D., *The Manipulation of Choice: Ethics and Libertarian Paternalism*, Palgrave Macmillan, New York, 2013.
- [WHI 21] WHITFORD E., Global Universities announce carbon neutrality alliance, available at: <https://www.insidehighered.com/quicktakes/2021/11/02/global-universities-announce-carbon-neutrality-alliance>, 2021.
- [WIK 20a] WIKIPEDIA, Électricité en Europe, available at: [https://fr.wikipedia.org/wiki/C3%89lectricit%C3%A9\\_en\\_Europe](https://fr.wikipedia.org/wiki/C3%89lectricit%C3%A9_en_Europe), 2020.

[WIK 20b] WIKIPEDIA, Sobriété énergétique et effet de serre, 2020.

[WIK 20c] WIKIPEDIA, Énergie et effet de serre, available at: [https://fr.wikipedia.org/wiki/%C3%89nergie\\_et\\_effet\\_de\\_serre](https://fr.wikipedia.org/wiki/%C3%89nergie_et_effet_de_serre), 2020.

[WIK 20d] WIKIPEDIA, Recherche-action, available at: <https://fr.wikipedia.org/wiki/Recherche-action>, 2020.

[WIL 13] WILKINSON T.M., “Nudging and manipulation”, *Political Studies*, vol. 61, no. 2, pp. 341–355, 2013.

[WWF 16] WWF/HEAL/CAN EUROPE/SANDBAG, Europe’s Dark Cloud: How coal-burning countries are making their neighbours sick, Report, WWF/HEAL/CAN Europe/Sandbag, 2016.



---

# Index

---

## A, B

acceptability, 20, 35, 129, 176  
action, 4, 15, 25, 31, 59, 73, 76, 83,  
84, 86, 90, 92, 93, 97, 104, 123, 129,  
140, 146, 147, 151, 186, 187,  
196–198, 204, 205, 209, 213, 214  
automation, 103, 138, 139, 188  
autonomy, 45, 46, 135, 155, 211, 212,  
214, 215, 218  
behavior, 32, 38, 40, 45, 70, 72, 90,  
130, 138, 165, 166, 197, 204–206,  
208, 210, 212, 213, 216  
benefit, 111, 146  
biases, 205, 206, 210, 212, 216  
building, 30, 33, 68–70, 72, 97,  
102–111, 113, 114, 130, 135–139,  
142, 145–148, 151, 152, 155–161,  
163, 165–167, 169–176, 179–186,  
188–194  
smart, 102–105, 137–139, 189,  
190, 192  
business/profession, 106, 192, 193

## C

carbon neutrality, 2, 20, 21, 29, 33, 51,  
52, 54–57, 67, 75, 77, 79, 82, 84–86,  
89, 91, 92, 94, 95, 97, 98, 100

choices, 12, 22, 32, 42, 48, 50, 62, 66,  
67, 139, 178, 180, 182, 188, 189,  
197, 202, 209–212, 214–216  
architect, 210, 214, 215  
architecture, 210, 212, 213, 216  
city, 51–58, 72, 76, 77, 80, 85, 91, 93,  
97, 100, 102, 123, 125, 130, 131,  
139, 140, 205  
return of nature to the city, 94, 124  
smart, 139, 140  
climate, 2, 3, 15, 17, 18, 20, 26, 40,  
48, 62, 83, 86, 89, 92, 94, 100, 101,  
130, 149, 200, 205  
common, 18, 68, 201, 213, 216

## D, E

decision-making, 23, 64, 76, 84, 189,  
193, 202, 203, 205, 206, 209–212,  
214, 215, 217  
demonstrator, 77, 102, 104, 105, 109,  
110, 112, 115, 120, 171, 173  
digital (technology), 17, 21, 28, 29,  
64, 69, 71, 96, 97, 102, 105, 127,  
134, 135, 139, 156, 157, 170, 173  
duty, 95, 200

economy/economics, 1, 8, 15–17, 20, 24, 26–28, 30, 32, 33, 37, 40, 60, 62, 64, 65, 68, 70, 71, 82, 90, 93, 97, 104, 126, 129, 153, 210, 216

econs, 213

energy/fuel

consumption, 12, 25, 27, 54, 60, 105, 106, 124, 127, 148–150, 152, 158, 160–162, 164, 165, 172, 202

nuclear, 5, 6, 10, 13, 29

renewable, 6, 20, 24, 62, 97, 98, 109, 115, 140, 156

environment, 18, 20, 33, 42, 49, 93, 95, 107, 123–126, 135, 140, 153, 155, 161, 164, 167, 173, 175, 176, 181, 182, 185, 192, 193, 195–205, 213, 214, 216

ethics/ethical, 16, 18, 32, 95, 122, 127, 129, 196–198, 202–204, 209, 214, 217

## **F, G, I**

fossil fuel, 1, 4, 6, 29

freedom, 17, 154, 211, 214, 215, 218

greenhouse gases, 1, 3, 7, 10, 12, 15, 21, 27, 28, 32, 33, 38, 46, 71, 77, 97, 145

influence, 83, 146, 161, 166, 167, 169, 200, 204, 206, 209

information, 12, 17, 32, 43, 51, 102, 104, 115–117, 130, 134, 136, 140, 142, 156, 192, 197  
system, 102, 115

institutions, 43, 50, 92, 195, 196, 204, 211, 216, 217

intelligence, 47, 49, 71, 72, 103, 109, 116, 135, 146–148, 150, 168, 185, 188, 189, 191

interests, 65, 129, 133, 134, 197, 199, 200, 210, 211, 215, 218

internet, 27–29, 43, 44, 71, 102, 115, 122, 131, 142

irrationality, 210, 213

## **L, M, N**

law, 17, 208

hard, 208

soft, 208

legitimacy, 49, 197

meaning, 12, 23, 31, 94, 157, 197, 201, 203

mobility, 2, 21, 23, 46, 47, 51, 55, 57, 59, 61, 71, 76, 83, 85, 94, 122–124, 136, 140, 142, 153

nature

return of nature to the city, 94, 124

nudge, 127, 197, 206, 209, 210, 212–214, 216, 217

## **O, P**

obligation, 196–199, 201, 202, 204, 217

paternalism, 208–212, 214, 216

libertarian, 210–212, 214

performance, 53, 54, 61, 66, 79, 105, 106, 108, 130, 148, 152, 154, 157, 158, 160, 170–172, 174, 179–181, 184, 188–193

energy, 105, 130, 148, 152, 154, 157, 170, 181, 189, 191, 193

environmental, 79

usage, 189, 193

politics/political/policy, 18, 24, 57, 62, 63, 71, 79, 80, 82, 83, 87, 89, 130, 150, 153, 195, 197, 202, 209, 211, 216–218

primary need, 161

## **Q, R**

quality of use, 146, 147, 157, 170, 173, 175, 177, 188–192

rationality, 31, 210, 213, 214  
 responsibility, 93, 101, 193, 196, 199,  
 201–204, 217  
   backward-looking (retrospective),  
   202  
   forward-looking (prospective), 202,  
   203  
 rev3, 37, 61–66, 171

## S

self-  
   consumption, 25, 29, 30, 72, 97,  
   102, 109–111, 113–116, 129,  
   134, 135, 138, 140, 157, 171  
   production, 97, 102, 109, 111, 134,  
   140  
 sensor, 103, 172, 181, 182  
 smart  
   building, 28, 31, 33, 102, 105–108,  
   116, 129, 131, 133, 137, 140,  
   145–148, 154, 156, 157, 165,  
   169–171, 173, 175, 176, 183,  
   188, 193, 194  
   city, 60, 102, 133, 139, 140, 141  
   electric network, 103  
   grid, 28, 30, 35, 44, 61, 68, 102,  
   109, 112, 115, 124, 129, 131,  
   133–137, 140, 146, 173  
   user, 31, 143, 147, 173, 193  
 sobriety, 20–25, 27, 32, 70, 71, 96, 97,  
 152, 153, 158, 160, 161, 165–169  
 socio-technical, 104, 105, 147–149,  
 152, 154, 156–159, 175–182, 184,  
 188–193  
 state, 108, 146, 147, 200  
 sustainable development, 1, 18, 19, 24,  
 75, 79, 80, 82, 83, 94, 126, 127, 216

## T, U, V

technosciences, 1, 16, 30  
 territory, 30, 61, 64, 66, 68, 76, 97,  
 100, 145  
 Third Industrial Revolution, 27, 60,  
 64, 71, 72, 92, 134, 171  
 threshold, 38, 152, 200  
 transition, 2, 14, 16, 17, 27, 31–33, 35,  
 37, 45, 47, 50, 59, 60, 63–71, 73,  
 75–77, 80, 84, 85, 94, 95, 101, 102,  
 126–129, 133, 143, 195–197,  
 199–206, 208, 209, 215–217  
 university, 75–77, 79–89, 91–102,  
 104, 105, 108, 110, 111, 113, 115,  
 120, 122–124, 126–131, 148, 159,  
 162, 170  
 use, 7, 10, 12, 20, 22, 32, 38, 41, 52, 59,  
 61, 70, 72, 82–84, 87, 90, 103–105,  
 107, 147, 149, 152, 153, 157,  
 161–163, 165, 173, 175–177, 179,  
 181–183, 185–190, 193, 215, 217  
 user, 173, 176, 182, 193  
 value, 7, 13, 17, 39, 54, 58, 59, 79, 84,  
 111, 128, 140, 141, 146, 150, 183,  
 186, 195, 196, 198, 199, 201, 214  
 instrumental, 198, 199  
 intrinsic, 198, 199, 214



---

Other titles from

**ISTE**

in

Energy

---

## 2022

ABOUELATTA Mohamed, SHAKER Ahmed, GONTRAND Christian  
*Smart Power Integration*

BOUTAUD Benoit

*Energy Autonomy: From the Notion to the Concepts*

## 2021

ROBYNS Benoît, DAVIGNY Arnaud, FRANÇOIS Bruno, HENNETON Antoine,  
SPROOTEN Jonathan  
*Electricity Production from Renewable Energies (2<sup>nd</sup> edition)*

## 2020

BOISGIBAULT Louis, AL KABBANI Fahad

*Energy Transition in Metropolises, Rural Areas and Deserts*

SOUALHI Abdenour, RAZIK Hubert

*Electrical Systems 1: From Diagnosis to Prognosis*

*Electrical Systems 2: From Diagnosis to Prognosis*

## 2019

BENALLOU Abdelhanine

*Energy Transfers by Convection*

*(Energy Engineering Set – Volume 3)*

*Energy Transfers by Radiation*

*(Energy Engineering Set – Volume 4)*

*Mass Transfers and Physical Data Estimation*

*(Energy Engineering Set – Volume 5)*

LACHAL Bernard

*Energy Transition*

ROBYNS Benoît, DAVIGNY Arnaud, BARRY Hervé, KAZMIERCZAK Sabine,

SAUDEMONT Christophe, ABBES Dhaker, FRANÇOIS Bruno

*Electrical Energy Storage for Buildings in Smart Grids*

## 2018

BENALLOU Abdelhanine

*Energy and Mass Transfers: Balance Sheet Approach and Basic Concepts*

*(Energy Engineering Set – Volume 1)*

*Energy Transfers by Conduction*

*(Energy Engineering Set – Volume 2)*

JEMEÏ Samir

*Hybridization, Diagnostic and Prognostic of Proton Exchange Membrane*

*Fuel Cells: Durability and Reliability*

RUFFINE Livio, BROSETA Daniel, DESMEDT Arnaud

*Gas Hydrates 2: Geoscience Issues and Potential Industrial Applications*

VIALLET Virginie, FLEUTOT Benoit

*Inorganic Massive Batteries*

*(Energy Storage – Batteries, Supercapacitors Set – Volume 4)*

## 2017

BROSETA Daniel, RUFFINE Livio, DESMEDT Arnaud

*Gas Hydrates 1: Fundamentals, Characterization and Modeling*

LA SCALA Massimo

*From Smart Grids to Smart Cities: New Challenges in Optimizing Energy Grids*

MOLINA Géraldine, MUSY Marjorie, LEFRANC Margot

*Building Professionals Facing the Energy Efficiency Challenge*

SIMON Patrice, BROUSSE Thierry, FAVIER Frédéric

*Supercapacitors Based on Carbon or Pseudocapacitive Materials  
(Energy Storage – Batteries, Supercapacitors Set – Volume 3)*

## 2016

ALLARD Bruno

*Power Systems-on-Chip: Practical Aspects of Design*

ANDRÉ Michel, SAMARAS Zissis

*Energy and Environment*

DUFOUR Anthony

*Thermochemical Conversion of Biomass for the Production of Energy and Chemicals*

## 2015

CROGUENNEC Laurence, MONCONDUIT Laure, DEDRYVÈRE Rémi

*Electrodes for Li-ion Batteries  
(Energy Storage – Batteries, Supercapacitors Set – Volume 2)*

LEPRINCE-WANG Yamin

*Piezoelectric ZnO Nanostructure for Energy Harvesting  
(Nanotechnologies for Energy Recovery Set – Volume 1)*

ROBYNS Benoît, FRANÇOIS Bruno, DELILLE Gauthier, SAUDEMONT  
Christophe

*Energy Storage in Electric Power Grids*

ROSSI Carole

*Al-based Energetic Nanomaterials  
(Nanotechnologies for Energy Recovery Set – Volume 2)*

TARASCON Jean-Marie, SIMON Patrice  
*Electrochemical Energy Storage*  
(*Energy Storage – Batteries, Supercapacitors Set – Volume 1*)

## **2013**

LALOUI Lyesse, DI DONNA Alice  
*Energy Geostructures: Innovation in Underground Engineering*

## **2012**

BECKERS Benoit  
*Solar Energy at Urban Scale*

ROBYNS Benoît, DAVIGNY Arnaud, FRANÇOIS Bruno, HENNETON Antoine,  
SPROOTEN Jonathan  
*Electricity Production from Renewable Energies*

## **2011**

GAO Fei, BLUNIER Benjamin, MIRAOUI Abdellatif  
*Proton Exchange Membrane Fuel Cell Modeling*

MULTON Bernard  
*Marine Renewable Energy Handbook*

## **2010**

BRUNET Yves  
*Energy Storage*

## **2009**

SABONNADIÈRE Jean-Claude  
*Low Emission Power Generation Technologies and Energy Management*

SABONNADIÈRE Jean-Claude  
*Renewable Energy Technologies*