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(liste at march 1, 2015)

THE NORD-PAS-DE-CALAIS REGION AND THE THIRD INDUSTRIAL REVOLUTION

by

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November 5th, 2014
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Overview

A meeting between Daniel Percheron (President of the regional council), Philippe Vasseur (President of the regional chamber of commerce and industry) and Jeremy Rifkin (author and visionary) was the catalyst which resulted in a surprising and dynamic project in the Nord-Pas-de-Calais region. Jeremy Rifkin's thesis is simple and galvanising. He claims that industrial revolutions are the result of a synergy between new communication technologies and new sources of energy. He contends that the first industrial revolution arose from the extraction of coal and the industrialisation of printing ; the second, from harnessing electricity and the emergence of methods of telecommunication ; and the third will come from the synergy between sources of renewable energy and the Internet. The Nord-Pas-de-Calais region experienced the first two revolutions, and Jeremy Rifkin is helping it to take the lead in the third. In 2013, Jeremy Rifkin, his team of experts and more than one hundred and twenty people from both public and private bodies in the region spent nine months devising a master plan. In 2014, the region and the regional chamber of commerce and industry started putting specific operations outlined in this programme into place.

TALK : Claude Lenglet

I was born in Lille and I am an engineer. I started working in the Paris region before moving to northern France in 1981 to continue my career in the construction industry as an engineering consultant, and then for an architect, in the Bouygues Group, and finally in the Rabot Dutilleul family-run company. I am committed to sustainable development. In this sector, I rediscovered people who were ambitious and enthusiastic, and found that politics and economics can often co-exist in an intelligent way. One day in 2009, Jean-François Dutilleul asked me to work with Philippe Vasseur, a former Minister of Agriculture and President of the 'Alliances' network which organises the yearly 'World Forum Lille'. Well-known personalities such as Muhammad Yunus and the Prime Minister of Bhutan have come to talk at this annual event, and with time it has gained recognition as an important debating platform for issues regarding corporate social responsibility. Having read Jeremy Rifkin's book 'The Third Industrial Revolution', Philippe Vasseur called me one day in 2012 and suggested that I ask Jeremy Rifkin to come to speak at the next World Forum Lille. This was how the project began.

Taking action now about climate

In order to understand what triggered the project, we should remember what happened in 2011 when information was brought to our attention by the intergovernmental panel on climate change. When I was born, there were 4 gigatons of carbon dioxide emissions per year. Today, the figure is approximately 35 gigatons of emissions annually. This situation, confirmed by numerous studies from various sectors, legitimately stirs up the debate especially about fossil fuels. A few years ago, there was talk of 'peak oil' because people predicted that the oil reserves would soon run out. Now, with shale gas extraction, the situation has changed, and everyone appears to agree to continue to use oil as we did before. However, if one looks at the situation over a long period of time, it is unthinkable that this model of development can possibly continue. Experts have estimated that from 1850 to 2000, we emitted approximately 1,000 gigatons of carbon dioxide, whereas in just thirteen years, from 2000 to 2013, the total amount of emissions was already 380 gigatons. If we do not want to increase global temperatures by two degrees, we must limit future emissions to 500 gigatons. Therefore, this only leaves us a few years before the planet will change radically and, in the long term, the survival of the human race is in serious jeopardy. As the President of the intergovernmental panel on climate change said, 'it is a quarter to midnight', in other words, we must act now, each at our own level of responsibility.

Faced with this challenge, the Nord-Pas-de-Calais region finds itself in a situation unlike that in any other French region, and it has certain characteristics. Despite being supplied with electricity due to the presence of the largest nuclear plant in northern Europe, it still has large carbon dioxide emissions from buildings which are in a poor state, road traffic, and factories. It is not efficient in terms of energy either : the region consumes 58 % more energy than the national average to produce one Euro of gross domestic product (GDP). It has reached the point that large industrial companies, such as Rio Tinto, are wondering whether their future competitiveness in Europe will be jeopardised because of an increase in energy costs. To provide a complete picture of the Nord-Pas-de-Calais, we must remember that our region has a GDP which is 19 % lower than the national average, and that the unemployment rate is 13 %. When one puts all these factors together, they constitute a significant handicap. Nonetheless, handicapped people can sometimes accomplish amazing feats, and so one should recognise that our region is perhaps in the process of accomplishing something which is very meaningful.

A region inspired by a leader

We were inspired by Jeremy Rifkin's vision of the future and this helped us to plan the path we wanted to take. As he explains in his book 'The Third Industrial Revolution', his vision is based on five pillars. The first pillar is that the development of distributed renewable energy

can be found in our own back gardens. He says that the undeniable advantage of this energy, the most important of which is the sun, is that it is free and that it will be there for a long time. The second pillar involves transforming buildings into production tools. These buildings are what the professionals in the sector now call 'positive energy buildings'. The third pillar is the need to use smart energy grids. The fourth pillar involves the central and historical issues of energy storage. Jeremy Rifkin suggests that the planet should continue its attempts to encourage hydrogen catalysis as is already the case in Corsica where the Myrte project has proved to be successful. Finally, the fifth pillar is the need to facilitate the use of electromobility (clean and environmentally-friendly electric vehicle transportation, avoiding the use of fossil fuels and carbon gas emissions).

Inspired by this vision, Philippe Vasseur asked Daniel Percheron, President of the Nord-Pas-de-Calais regional council, to work with Jeremy Rifkin and to write a master plan for the region as Rifkin has done for other places in the world. The plan has two objectives : to put forward a long-term vision of a low-carbon economy ; and to get involved in an environmental and societal transition which would create jobs. We invited Jeremy Rifkin to the 2012 World Forum in Lille and asked him. He was attracted by our project and quickly calculated that the work would take nine months and cost 355,000 Euros. Starting with him on this new project, we quickly became aware of his professionalism. All the clauses of the contract were honoured both in terms of the quality of the documents produced and the deadlines. Another example of his professionalism is that the experts had to work more hours than had been written into their contract, and Rifkin personally paid this additional amount of money. He was very pleasant to work with.

More than a project : a big plan

One must not forget that carrying out our master plan was a group effort. In the beginning, there were eight work groups which included one hundred and twenty-five people from political and economic groups as well as associations which were concerned by the five pillars mentioned in Jeremy Rifkin's book, and also by energy efficiency which became the cornerstone of our approach. Half of those taking part contributed actively, and a quarter committed themselves seriously. Many other ideas were discussed in each of the areas, notably with regard to the functional economy and the circular economy. A three-day seminar, which was a pivotal point of the project, was organised to take stock of the work achieved, and on May 15th, 2013, all the suggestions were noted and submitted. Jeremy Rifkin's team studied these recommendations and drew up the first version of the master plan at the beginning of July. Our team was able to make various comments, and the plan was altered accordingly before it was formally submitted at the end of August. The end result is a master plan which is specific to the Nord-Pas-de-Calais region, and which sets out a variety of solutions over nearly four hundred pages. The best way to describe this document and all the wealth it contained is a 'sack of seeds' : there are a number of 'fields of innovation' and it is our job to make sure that the seeds in these fields grow.

We were very enthusiastic, but we were also very aware of the danger of jumping on the bandwagon. We had to make sure that we were not the only ones who had taken on this sort of project. Therefore, we set a benchmark, and looked at numerous initiatives which had been undertaken in neighbouring regions. We discovered that several German regions, notably Prignitz (north east Germany) and Dithmarschen (northern Germany) produce a great deal more energy in a year than they use, 261 % and 280 % respectively. Clearly, one must not forget the energy interactions which take place between the *Länder*, but it is also true that these regions do not receive more sun than we do. We also found out that other countries or places were also involved in rather ambitious projects. In Denmark, Copenhagen has a 'Zero-Carbon 2025' plan (a plan to have no carbon emissions by 2025), and the city has built more cycle lanes from the suburbs into the town centre. Likewise Sonderborg intends to be a 'carbon neutral' city by 2029. This is also the case in Switzerland with the project 'Société à 2000 watts' (the '2000-watt society') which is attempting to divide energy consumption per capita by four and achieving this by directly targeting personal habits and behaviour. With three Swiss cantons and six hundred towns already committed, it is already more than just a project.

Energy at the heart of the problem

We were reassured that our approach was well-founded, and felt confident in our master plan. Consequently, we presented it to the World Forum Lille on October 25th, 2013, and immediately started working on the operational phase of the third industrial revolution in the Nord-Pas-de-Calais region. I was asked to join the team and to lead the project, and, above all, to establish the regional roadmap. We focussed on four core areas : the choice of priorities ; financing ; accompanying the projects ; and governance. With regard to the choice of priorities, there were three important ones. The first is the major problem our region faces with energy efficiency. Action needs to be taken both with regard to industry and buildings. Our aim is to decrease overall consumption from 160,000 gigawatts per hour to 64,000 gigawatts per hour between now and 2050. The second priority is the development of what we refer to as 'smart renewable energy', bringing together renewable energy which may or may not be distributed, changes in smart grids, and storage. We hope that we will be able to avoid some of the problems encountered by our German neighbours. The third and final priority concerns the evolution of mobility which we want to tackle both on an individual and a professional level, and to address the associated problems of logistics. The question is even more pressing because it concerns each and every one of us on a personal and professional basis.

As well as the priorities which we have discussed, we also had the problem of finance. The politicians in our region did not waste any time, and the President of the regional council, Daniel Percheron, had already earmarked the region's money for TIR (Third Industrial Revolution) projects. We shall also be asking the banks for support. Philippe Vasseur and the regional chamber of commerce and industry have also put forward ideas such as 'crowdfunding' (the practice of funding a project by raising small amounts of money from a large number of people, usually via the Internet) which are now in place. Another idea they have implemented is the launch of a savings account specifically created to fund projects. This will soon be operational. They are setting up a 'fund of funds' combining public and private capital in the framework of an approach supported on a European level, and run with the European Investment Bank. Our third core area is overseeing the projects. We have put in place a team of about ten people who are in charge of co-ordinating contact between the various people involved in the projects. In the longer term, we may collaborate with the Fraunhofer Society or with other experts in Jeremy Rifkin's circle. We are currently devising a way to monitor projects. Those leading the project will be given a minimum list of commitments (such as the indicators they will need to provide, the appropriate ethical approach, and so on) using a set of guidelines. This brings me to the fourth priority which is governance. We set Jeremy Rifkin a specific task. In a short time, he advised us to speed up the rehabilitation of our industrial wastelands, to look more closely into crowdfunding, to involve young people more, and above all to dare to be an experimental laboratory.

The future is now

To date, about thirty key projects have already been launched. Their level of ambition sets them apart from the other one hundred and fifty initiatives identified in the region. They can be divided into three large groups : demonstrator projects, urban development projects, and structural projects. The first group aims to demonstrate the feasibility and the ability to replicate projects. There are two examples of these demonstrator projects : the Alcatel-Lucent project, which involves recycling copper transatlantic cables and is therefore a good example of a circular economy approach ; and the 'Power to gas' project (otherwise known as GRHYD), devised by GDF Suez, which involves the production of hydrogen from excess renewable electrical energy which, when mixed with natural gas, forms a 'greener' gas called hythane which can be used to heat premises and be a fuel for buses. In the second group, urban development projects, there are several such projects. Some intend to use positive energy in neighbourhoods and others include innovative ways of urban mobility or networks. Finally, in the third structural projects category, there are all the projects whose size or scale of investment necessitates the involvement of public authorities. Examples include the plan in the Nord-Pas-de-Calais region to rehabilitate dilapidated housing (the '100,000 residential housing' programme), or the construction of two offshore wind fields which are necessary for

the energy mix predicted in 2050, according to a study made by members of the regional economic, social and environmental council. There is also the programme of the seven universities in the region to create a carbon-neutral university. In the future this might lead to the creation of a network of universities which we have named the 'Sustainability University Network' (SUN).

The Nord-Pas-de-Calais region has already launched itself into the future. This is the beginning of a new era : the third industrial revolution.

DISCUSSION

Confident and combative politicians

Qestion : *The Nord-Pas-de-Calais region is historically home to industrialists and bankers who conduct their affairs without a political agenda. This explains why the region lacks prominent politicians. Your project goes against the norm, and that can only arouse mistrust.*

Claude Lenglet : I do not agree with you when you say that there are no politicians of any stature in our region. A few years ago, Francis Ampe (who is here tonight) and I were both present when three politicians united and sang the praises of Lille as a candidate for host city for the 2004 Olympic Games. They were Pierre Mauroy, Marie-Christine Blandin and Jacques Donnay : a left-wing MP, an ecologist senator, and a right-wing MP. The situation is the same today with President Percheron who has taken on the mantle and united everyone behind this master plan. Today, the MPs have addressed this challenge and the new presidents of the Lille and Dunkerque urban communities are taking the lead by putting forward projects for the Third Industrial Revolution programme. Everyone recognises that, once again, this is a real opportunity for our region.

Q. : *Your project stands out as a strong political act. It is the embodiment of amazing progress where what is happening on a regional level is at last taking precedence over what is happening on the national level. How do you manage to organise people in the region and in local authorities ?*

C. L. : In order to organise mobilisation and coordination, three large governance structures were set up. The first is the policy forum which acts as a kind of authority for this approach. Four different populations are represented : a political group which brings together the elected representatives of the region, the two *départements*, and the public services ; an economic group which is made up of representatives from the Medef (Movement of the Enterprises of France) and the four chambers of commerce and industry ; a societal group led by the economic, social and environmental regional council and the trade unions ; and finally, a 'Universities and Research' group. There is another category of participants which we have added more recently : they are representatives from the Architects' Association, the ADEME (environment and sustainable energy agency), Eléctricité de France, Gaz de France, and a few other similar bodies involved in sustainable development issues. In total, there are about seventy people who meet three times a year under the aegis of a president, Philippe Vasseur, a vice president, Jean-François Caron, and Daniel Percheron. This form of mobilisation allows us to face the challenge of 'territorialisation' which in recent times has undergone some major upheavals notably on a *département* level. Because the two general councils and the three urban groups joined forces from the beginning of the work groups, all the politicians voted unanimously in favour of the project from the very first vote. The region is aware of its difficulties and its strengths. We already envisage Dunkerque as the energy hub of the future, Valenciennes as the operations hub for new mobility, and the Lille metropolitan area as the workplace for tomorrow's 'smart city'. People in Boulogne are already talking about marine energy, and Calais city council has discussed investment in the Internet and logistics. This demonstrates the spirit behind the approach ; to launch the movement and to help those involved to take ownership of it.

Q. : *To what extent can your approach be widened to include other areas, and just how essential is Jeremy Rifkin's input to the ideas which, on the whole, are acceptable to most people ?*

C. L. : Currently, the Pays de la Loire region has adopted the same approach as us with a project entitled 'The Third Industrial and Agricultural Revolution'. It is moving forward in the same direction but without Jeremy Rifkin. This is also true of the ADEME which has adapted its national programme to two regions, the Pays de la Loire and the Nord-Pas-de-Calais with help from Pierre Radanne. Reports show that these projects have reached the same conclusions on a number of points, apart from a few differences with regards to the technological solutions. This proves that the approach is feasible and that it will help to create jobs between now and 2050. Jeremy Rifkin may not be an essential element, but why should we not have him to help us ? He wrote a book which had a wide readership and generated a considerable momentum for our project. This enabled us to create a master plan in a short space of time and to attract more than two thousand people to our presentations. Without putting Jeremy Rifkin on a pedestal, one has to admit that he has an amazing capacity to generate reactions and mobilise people. I remember a few years ago when we invited him to a meeting of people from the European branch of the Scientific and Technical Centre for Buildings, he was welcomed with relative indifference. Now it is the professionals in the building sector who are inviting him to their annual convention !

Convincing society to change

Q. : *What proportion of mobility will be electrical and digital when one realises that in the future we will move around less and will work more from home ?*

C. L. : Other forms of electrical mobility as well as the electric car are envisaged. We are lucky to have the Alstom and Bombardier companies in our region, and several projects are currently under way with regard to public transport. Working from a distance (or 'teleworking') is one of the seeds we are sowing, but there will still be a need for movement for professional reasons. It was mentioned that people still need to be in contact with one another.

Q. : *Your project will cause wide-ranging changes in society, notably in terms of behaviour. How do you think you will convince people to change their attitude ?*

C. L. : One must firstly bear in mind that changes are taking place. In just a few years, bicycles have taken over Lille city centre, and every day I discover new associations and organisations which have started spontaneously in one or several of the sectors of sustainable development. Finally, the young generation are not the same sort of consumers as the older generation : for example, they do not necessarily buy a car to go from one place to another. Having said this, we make sure that our projects are acceptable and we spare no effort to change people's attitudes. This is why, when renovating buildings to improve energy efficiency and comfort, but not to lower rents, the social landlords make the effort to work with sociologists who explain all the issues and the changes to the renters. It is a lengthy project which on average takes a year, but we think that it is essential for all generations. An equally remarkable example is the approach taken by the chambers of commerce and industry assisted by their advisors. The week before the last municipal elections, they visited more than one thousand SMEs, shopkeepers and self-employed artisans, and gave them information on the subject explaining the Third Industrial Revolution to them. As a result of these meetings, one hundred and fifty new ideas and practical field projects were noted.

Q. : *Obviously the sun can be used for free, but the development of new intermittent energies means that new networks must be put in place, and this is often the source of important regional and social issues. How do you intend to deal with this ?*

C. L. : Personally, I remain pragmatic about the overall vision of distributed energy announced by Jeremy Rifkin which I find a little utopian in the very short term. I believe more in sources of mixed, concentrated and distributed renewable energy. We should not

deprive ourselves of the perspectives which these energies offer, and the industrialists in the sector need no convincing ! In the course of our meetings with the Network of Electricity Transmission (RTE), Dominique Maillard, its President, told us he was looking for a test area to extend the smart grids with respect to the job he was given for the '34 industrial plans' programme to try to create a new industrial France. This is an opportunity for each and every one of us. Naturally, no-one can ignore the challenges posed by changes in infrastructure, and accepting them will be a major worry. However, one must consider the progress possible with underground cables, and understand that these new grids require much less infrastructure and therefore are more satisfactory than high-voltage power lines. We involved all those concerned as much as possible in order to ensure that the most innovative and acceptable solutions were found. Consequently, we contacted universities and young people in general. We are in the process of mobilising students from all walks of life, and intend to create the means by which they can give us feedback about our structure of governance.

The end of the nuclear era ?

Q. : *How do you think that energy production and consumption curves can converge in the context of intermittent energy production ? And who will pay for the permanent energy supply available to the entire general public ?*

C. L. : As long as the system allows RTE, ERDF, GDF SUEZ and the ADEME to work together, not to mention the numerous academics in the region who can potentially contribute, I think that we can become a true centre of excellence regarding energy, and especially energy storage. The fact remains however that we are moving towards a pattern of mixed energy where companies such as ERDF will be in charge of providing a permanent and readily available public service. Apart from these choices, I think we should stop looking at the past and turn towards the future. A good example is the Myrte platform in Corsica which is demonstrating what is possible with hydrogen.

Q. : *There is some of your talk which seems a bit like a fairy tale, and this makes it look suspicious. The consultant Jeremy Rifkin is clearly talented as he is the inspiration behind a revolution using grids and renewable energy. It is not the first time that there has been talk about a revolution using grids where there is confusion between the need for communication and the need for human relations. The Internet bubble is a good example. It is easy to prove that wind turbines consume more carbon dioxide than nuclear power plants because they are a source of intermittent energy, and because of this, old carbon-fuelled factories need to be restarted from time to time.*

C. L. : It would be wrong to reduce the master plan to a technological plan focussed on networks and energy. We are more ambitious than that, and we clearly embrace Jeremy Rifkin's vision both concerning these subjects as well as the functional economy, the circular economy, the importance of co-operative financing, and involving young people. There are clearly people who are enthusiastic, but if we do nothing, who will ? We must build a new economic model, but it will not be easy. We have carried out risk analysis which has concluded that it would be costlier to do nothing than to do something. We have brought in important industrialists and they are very aware of the issues at stake, for example energy efficiency.

A billion Euros per year for thirty years

Q. : *You have hardly mentioned the financial issues which are fundamental. What is the size of the investment ?*

C. L. : I am not the person in charge of the finances. A small committee was formed to deal with the financial side, and it includes members from the board of the chamber of commerce and industry and the region's financial management team. Let me give you some figures to clarify the situation. A few years ago, the national debate on energy transition concluded that the overall cost to French society was two thousand billion Euros. When we have finished our work on the Nord-Pas-de-Calais region, Jeremy Rifkin's teams estimate the expenses will be

two hundred billion Euros over thirty years, in other words six billion Euros per year to be allocated over the long term. We may be enthusiastic, but these sorts of numbers make you think. In the current crisis, this is a considerable sum of money. In the end, we agreed that initially we should aim to amass one billion Euros per year from various sources. This is still a huge challenge and it is why we are pushing ahead with negotiations with the European Investment Bank and the Caisse des dépôts et consignations as quickly as possible. They both show signs of being very interested in certain projects such as financing universities or mobility. We are certainly not going as fast as Jeremy Rifkin would like us to, but at least we are starting to see the light at the end of the tunnel.

Q. : *Can you clarify how you allocate resources, and explain how you are going to finance the projects ?*

C. L. : The finance for the projects will come from many sources. Part of it will come from existing budgets as is the case for the one hundred and eighty-six *lycées* in the region whose surface area represents three million square metres of the region's building stock which could be renovated in part by re-allocating current credit. As far as the rest of the financing is concerned, we must find innovative ways of finding the funds, and we could take inspiration, for example, from the British JESSICA (Joint European Support for Sustainable Investment In City Areas) project which is financed by a 'fund of funds' as well as private funds. As far as this is concerned, we have, for example, contacted the pension managers of local authorities who find it normal and interesting to finance projects like ours despite the administrative problems which this raises. Other financing will certainly come from the Caisse des dépôts et consignations which has become something of an expert in these issues, and the European Union via the European Investment Bank. Ultimately, we shall have to raise funds using all resources which are available. We are still in the process of working out the selection criteria to determine how we will allocate the money to our different projects. The issue is to build a savoir-faire which will make it possible to pinpoint the projects precisely and objectively. This job of differentiating the projects has been given to a work group made up of people from the chamber of commerce and industry and the region, and has already been in place for several months. We must build an intelligent system which finances an ambition, and not any project put forward by the ecosystem.

Q. : *What link do you make between the transition and problems of employment and training in each of your projects ?*

C. L. : We are of course in contact with the training sector, but we do not want to launch any projects too quickly as we want to avoid making mistakes regarding the choice of training programmes. The master plan from now until 2050 predicts the creation of one hundred and sixty thousand new jobs which is consistent with the ADEME's estimates. This will not solve the problem of unemployment completely, but it is one of the rare projects intended to create jobs which we have on a regional level. Therefore, we are going to keep a close eye on these projects which will create jobs. With regard to energy transition in general, I suggest looking at the precise estimates which are regularly published by economists, especially Philippe Quirion who works closely with the négaWatt association (which advocates less consumption of fossil fuel and nuclear power).

Politics vs. general interest

Q. : *One must be aware that any public investment is a strong political act in which every citizen relinquishes a part of his individual freedom in favour of the general good. The question of costs is not just a simple matter of accountancy, but a fundamental ethical responsibility. How do you deal with this ?*

C. L. : Choices will of course have to be made and it will be the elected representatives' job to make them. We must decide if we want to choose to go down the path of 'energy sobriety' and well-being, or continue to consume energy at low cost as we have done for the past fifty years. I think we must be aware that whatever choice we make, whether it be wind-powered, hydrogen-based or nuclear, energy prices will not drop. In fact, it is most likely that they will

rise. It is unrealistic to think that with the techniques we have today we will be able to produce low-cost energy tomorrow. Perhaps, in the end, we will master nuclear fusion : if we do, so much the better. But, in the meantime, we have to rely on heat networks, the biomass, and all forms of alternative energy. It is also a way to learn not to be dependent on energy, and reduce our dependence in comparison to countries which are large suppliers of energy, such as Russia. However, I repeat, it is a political choice which will be made by our elected representatives.

Q. : *Is it not surprising that at a time when society is up in arms about multiple initiatives taken on its behalf, and against the tax increases which they cause, a plan which is so costly and structuring over the long-term should be so freely launched by a few politicians, experts and famous industrialists without the population having any means of opposing them ?*

C. L. : In our country where people are constantly complaining, challenging certain people is the norm. In our region, I see that Jean-François Caron has strong legitimacy as he regularly has 'Stalin-like' scores at elections and was recently re-elected unanimously, with 100 % of the votes ! I should remind you that he is the key politician in this project and is very committed to renewable energy, sustainable construction, and so on. I think that legitimacy should and can be created by involving economic and industrial structures and ultimately by the commitment and being aware of their co-workers involved in the projects.

Presentation of the speaker :

Claude Lenglet : engineering graduate (Centrale Paris), and MSc in engineering (University of Colorado). Having worked in an engineering structural design company and then in a technical consultancy, in 2009 he worked for an architectural consultancy firm. He was technical director of Norpac in 1998. From 2006 to 2009, he was in charge of research activities and development at Bouygues Construction and worked on the European Construction Technology Platform and jointly led the European Energy Efficient Buildings project regarding energy efficiency of buildings. Afterwards he became scientific director of the Rabot Dutilleul group. In 2013, he managed the team in charge of facilitating communication between Jeremy Rifkin's various teams in the Nord-Pas-de-Calais region's master plan. He is currently project manager of the Third Industrial Revolution in the regional council.

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