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21st June 2021

CAPIEL/CECAPI position on How smart buildings and BIM contribute to CO2 reduction

Executive summary

In its evolution for a better common good, our world becomes also its worst enemy in producing an excessive amount of CO2. This paper describes how CAPIEL/CECAPI and the represented industry analysed the situation and committed to actively engage with all stakeholders in the confrontation of reduction of CO2 emissions where sector digitization communication and digitalization transformation will play a key role

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How smart buildings and BIM contribute to CO2 reduction

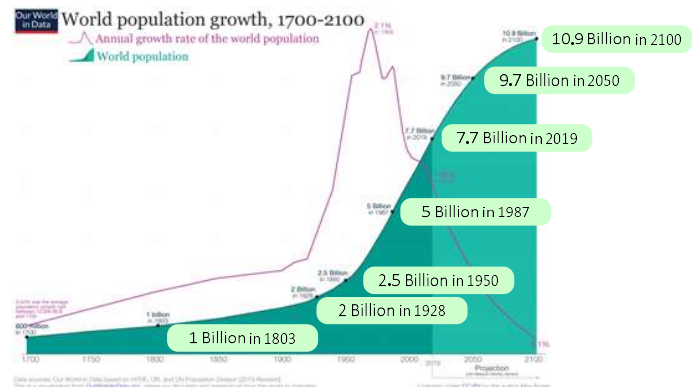
The statement highlighting the CO2 issue

We are living in a world of strong and fast evolution. This development is immensely evident over the last century and there is no doubt that this progression will continue, maybe even faster.

A key statement that can be made is that the population is quickly increasing and as a direct consequence, the associated need on energy and resource is intensifying with a similar trend. This overview statement would be incomplete without mentioning the CO2 emissions, contributing undoubtedly to climate change. This situation faces us with ever-increasing threats and challenges.

To better understand this phenomenon alongside the trends and the consequences mentioned above, we have to consider and acknowledge the facts and information available:

The world's population has shown a strong increase by the beginning of the 20th century. This is thanks to the improvement and advancement of medical knowledge. Even if the curve shows a reduction in its trend, the years to come will still see a large increase of the population.



<https://ourworldindata.org/world-population-growth>

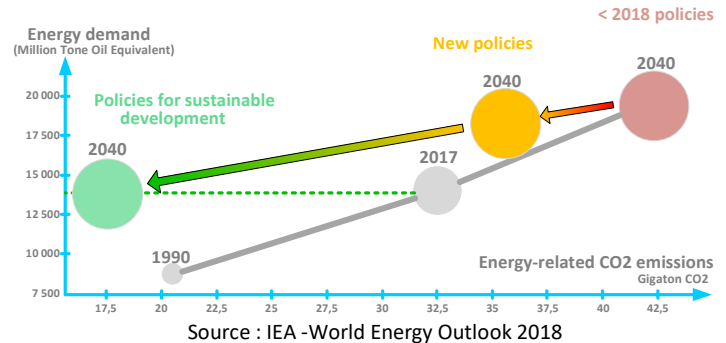
With the growth of the population, the worldwide activity, industry and agriculture requires energy and consequently, this heightens the CO2 production.

CO2 is recognised as the major contributor to climate change and most governments recognise the urgency to act and the requirement to reduce CO2 emissions to a sustainable level.

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This figure shows, with the grey line, the increase of the energy demand and the consecutive CO2 emission increase over time.

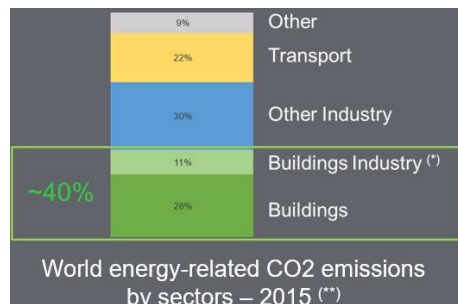
The coloured circles show the targets in terms of energy and CO2 that were defined based on the new policies and those which are necessary to achieve a sustainable way to manage a global environmentally friendly landscape.



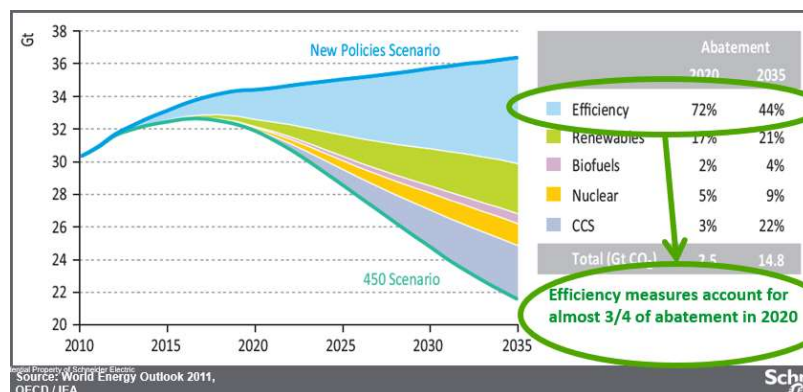
The main source of CO2 emissions

To reduce the CO2 sources, it is important to identify critical elements that are the major contributors. An analysis performed by the United Nations in 2017 highlighted that 40% of CO2 emissions originate in the construction and operation of buildings. The analysis includes the CO2 contribution from raw materials necessary for the construction of the asset.

Construction industry is therefore recognised as the main contributor among all CO2 sources to be managed as a key priority.



One complementary study made by the IEA (International Energy Agency) – World Energy Outlook 2011, highlighted that the main priority to reduce the CO2 emission would be to concentrate effort on the building energy efficiency process. Alternative actions based on greener energy sources are considered of a lower impact.



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Another study from the IEA (<https://www.iea.org/reports/digitalisation-and-energy>) showed that the highest potential impact on the energy demand requiring the lowest effort is related to the building controls (smart thermostats, occupancy sensors, optimised process control).

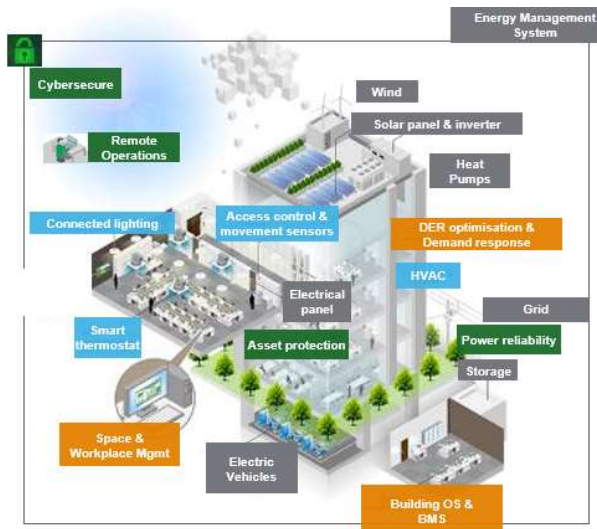
Therefore, as an intermediate strong conclusion, it clearly appears that buildings must evolve in their fabrication, construction and operation to contribute to a sustainable world.

Some complementary considerations

The target for buildings to become more efficient and sustainable is clear. This action plan must also consider that ~90% of our time is spent indoors. Therefore, the optimum layout of the internal structure of buildings and its impact on the well-being of its occupants is an essential piece of the complete project.

In order to achieve the optimum well-being for occupancy, the following elements will need to be considered:

More comfort	heating/cooling, lighting, etc, management adapted to the preferences of the occupants
More digital	high-speed data/HD video, local/global building management
More security	controlled access, internal security camera networks and cybersecurity, etc
More safety	improved protocols and automatic alarm reporting systems
More efficiency	transparency in data and system management for heating, lighting, energy recycling and local power generation, etc



The improvement of buildings in their operation should also consider their environment and more specifically their connection to the grid. To achieve the best optimisation, buildings must interact with smart grids in:

- exchanging data about the energy used and the predicted power consumption
- being able to manage peak-shaving
- being able to feedback some energy to the grid.

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The new orientation for buildings and design tools

To achieve the above features, multiple sensors that monitor temperature, presence, light, humidity, wind, fire, smoke, energy consumption and water consumption etc. Control and switchgear will be required.

To manage so much information, the right tools/Software are needed to analyse the data and to act on the building to optimize its energy efficiency in combination with the best comfort for occupants.

Only smart buildings designed and developed for this purpose will be able to provide such features. This requires the whole lifecycle of the building to become more digital from the very beginning (programming) to the very end (either decommissioning, demolition or renovation). This is where BIM (Building Information Modelling) is necessary.

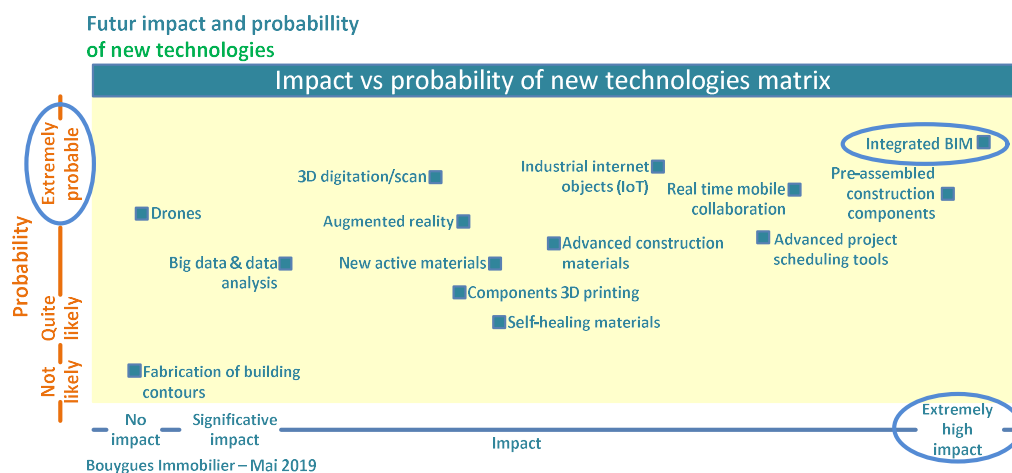
BIM: The necessary tool

BIM provides a digital vision of the building in all its dimensions and domains describing a complex interconnected system, facilitating and optimizing its design, operations and end-of-life.

BIM is for Smart Building what Industry 4.0 is for Smart Manufacturing.

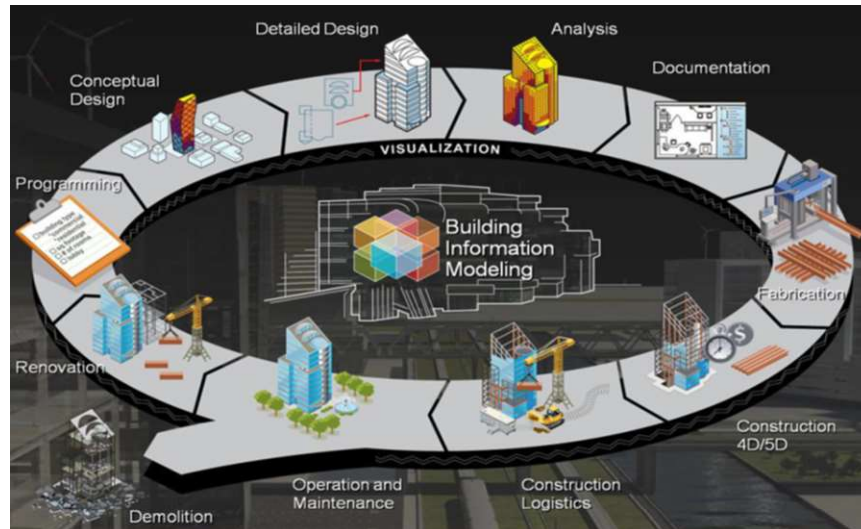
CAPIEL and CECAPI manufacturers are embracing the best in class developing technology to offer industry leading products and tools to fulfil our customer's needs.

All stakeholders involved in a buildings' construction are convinced that this is the right approach. They have made some analysis about the predictable impact of new technologies that may influence this activity. BIM clearly appears to be a key factor, very likely to happen and impacting on the full asset lifecycle. The following diagram is about the analysis conducted by Bouygues Construction.



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Many large companies have already invested in BIM related tools and education in order to optimise the process being part of the full lifecycle.



Elements within a BIM process for example should consider:

- programming where the needs are identified considering the country, type of weather, regulations etc
- conceptual design where elements having a major impact are considered: large parts, main supplies (water, electricity transformer etc)
- detailed design where only one part of the general information is used when worked to a detailed level so that subcontractors can find the useful information in their traditional format
- data analysis to predict the intended future performance of the building based on the first hypothesis
- fabrication, scheduling and supply at the right time
- communication, compatibility and interoperability through sector systems (e.g. smart systems and mechanical systems)
- data and operation to monitor and maintain the building over its operational life

The digital way to work on the building of the future is also an entrance for the inputs coming from the circular economy:

- during supply stages with greener raw materials
- during maintenance and renovation stages where parts can be recycled or valorised as a fuel replacement.

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During the operation stage, a systematic approach (e.g. based on ISO 50001) can be used to measure and to improve processes from the building. This improvement can be made with tools such as PDCA (Plan DO Check Act management method).



An efficient management process can make asset operation greener, more comfortable, closer to the need of the user and more human centric.

Based on adequate monitoring, the consumption of electricity, gas, water and other utility services can provide the data for analysis with the purpose of improving the performance of the building.



Integrated digital
building technology,
the power to control
our future.



Conclusion

Consistently with other organizations, CAPIEL & CECAPI are committed to contribute in the effort toward the CO2 reduction by promoting the BIM concept and the related digital processes. This digital concept makes smart buildings achievable with optimised cost and schedule, acting as a very valuable contribution to the challenge of CO2 reduction while thoughtfully maintaining and complimenting the environment designed for humans.

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About CAPIEL

CAPIEL is the Coordinating Committee for the Associations of Manufacturers of Switchgear and Control gear equipment for industrial, commercial and similar use in the European Union, that work in the range of voltages until 1 kV a.c. of 1,5 kV d.c..

CAPIEL members are national associations representing small, medium and large-sized companies that in total employ more than 100.000 people directly in Europe. Their scope covers all the equipment, products fittings, systems installed and services required for operations of low voltage switchgear and control gear (products, systems and assemblies).

<http://www.capiel.eu>

About CECAPI

Cecapi is the European coordinating committee representing the Associations of Manufacturers of Electrical Installation Equipment within the member states of the European Union and the EFTA region.

Cecapi was established in 1967 and it covers all the equipment and components for electrical installations for residential and commercial use. It includes, but is not limited to, components for electrical installations and appliances (such as plugs, sockets, boxes, switches, fuses), cable management systems, home and building electronic systems products, intercom and video-intercom, circuit breakers and residual current devices.

Cecapi represents nine national trade associations, in turn representing almost 500-member companies with a combined sales turnover of 16,1 Billion Euros and employing more than 120.000 employees.

<http://cecapi.org/>