

SUSTAINABLE CONSTRUCTION OF BUILDINGS: \$1.2 MILLION FOR A NEW RESEARCH GROUP

A CEGEP TEACHER WANTS TO PRINT HOUSES

ROUYN-NORANDA (May 2, 2023) — A consortium of researchers led by a teacher at the Cégep de l'Abitibi-Témiscamingue, David Laliberté, Eng., wants to construct sustainable modular buildings through 3D printing. This project has gathered more than 10 Quebec researchers, and the Fonds de recherche du Québec—Nature et technologies (FRQNT) is backing it financially for around \$900,000 dollars over three years. (*See the list of researchers and partners at the end of the press release.*)

According to a study undertaken by the Canada Housing and Mortgage Corporation (CMHC) published in June 2022, there will be a deficit of around 600,000 housing units in Quebec in 2030. In a context of labour shortages that affect several economic sectors, including the construction industry, the province must thus accelerate the growth rate of its housing stock with a similar workforce, if not a smaller one.

One of the objectives of the all-new Regroupement innovant pour l'impression d'immeubles durables (RI³D-FRQNT or Innovative Group for the Printing of Sustainable Buildings) is to be able to construct apartments with fewer staff and to erect more affordable dwellings at the end of the next three years. The team will assemble and design the operational prototype, a modular building printed in Québec, in 2025 for Habitat for Humanity Québec.

"We are proposing the assessment of potential gains of an emerging technology, that is to say large-scale 3D printing, and to use it to print modules that will be assembled to construct a building. Printing in a factory enables the construction of small and large buildings 12 months a year as production costs decrease, and the pace of construction accelerates, all of this with the aim of increasing access to property for Quebecers," advanced David Laliberté.

This technology, which is already in use elsewhere in the world, makes it possible among other things to

- produce the structural part of the building more quickly as compared to more traditional practices,
- require less labour per dwelling constructed,
- reduce costs by using fewer materials and
- make round forms that are more structurally sound.

In Canada, and more precisely in Ontario, some buildings have already been printed on-site in 2022. The approach proposed by RI³D-FRQNT is, however, different since it proposes the impression of modules in a factory that will be transported and assembled on-site later.

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"This method offers several advantages according to our hypotheses, for instance by the use of a smaller printer, which means fewer costs, by not moving the printer, which means time savings, and by the construction of large buildings through the multiplication of modules that might favour the densification of the built environment," upheld for his part the Technical Service Director of l'Association des professionnels de la construction et de l'habitation du Québec (APCHQ or Association of Quebec Construction and Dwelling Professionals), Marco Lasalle.

RI³D-FRQNT must, however, look into the materials used by this new technology since concrete has a rather disappointing carbon footprint. "The group aims to research more environmentally friendly concrete, alternative printable materials and the energy efficiency of printed buildings," qualified nonetheless Professor Ammar Yahia, the Industrial Research Chair of the Natural Sciences and Engineering Research Council of Canada (NSERC) on flowable concrete with adapted rheology.

It is an ambitious project, and this is the reason for which a team endowed with very impressive expertise, to say the least, that includes various complementary competencies such as engineering, architecture, cementitious materials, timber materials, rapid prototyping, logistics and handling, environment, etc., will begin extensive scientific research over the course of the coming weeks.

The competencies of six CEGEPs, two universities and no fewer than six College Centres for the Transfer of Technology will be put to use.

To see this project through, David Laliberté's team will thus count on \$900,000 in financing from the FRQNT, and to this a range of partners will add financial and in-kind contributions estimated at \$300,000 over three years, for a total of \$1.2 million. "We are very happy to have the support of the FRQNT and could not have considered this project without it," commented the teacher.

"I am quite pleased about the support granted by the FRQNT to Mr. Laliberté for the implementation of RI³D-FRQNT," declared its Scientific Director, Janice Bailey. "The scientific expertise that we find in our research groups as well as the excellence and competitiveness that they demonstrate puts them at the forefront of their fields. I salute the fact that they will conduct research within this new college group concerning sustainable buildings in an inter-order, multidisciplinary and inter-research group manner, which is a preferential means to reinforce and develop the Quebec research ecosystem, in my opinion."

**LIST OF COMMUNITY PARTNERS
COMPETENCY MATCH OF RI³D-FRQNT MEMBERS**

| NAME | STRENGTHS AND COMPETENCIES | PARTNER |
|----------------------|--|--|
| David Laliberté | Passive house; industrial, mechanical and structural engineering; management | Cégep de l'Abitibi-Témiscamingue |
| Abdelmajid Rakib | Use of industrial waste to improve concrete | Centre technologique des résidus industriels |
| Louis-Étienne Rose | Architecture, building envelope and building design | Cégep André-Laurendeau |
| Richard Lang | Optics and glass production | Optech (Cégep de La Pocatière) |
| Othmane Dayi | Industrial engineering, handling and logistics | InnovLOG |
| Anas Harraq | Civil engineering, structure and concrete | Cégep régional de Lanaudière |
| Elisabeth Laroche | 3D printing and rapid prototyping | INÉDI (Lanaudière CCTT) |
| Ammar Yahia | Printing of concrete, structure, civil engineering | Université de Sherbrooke |
| Dahai Qi | Building envelope, passive house and fire-extinguishing systems | |
| David Myja | Chemical modification and creation of fibrous products | Innofibre (Cégep de Trois-Rivières) |
| Franz Segovia Abanto | Development of wood-based composite materials | SEREX (Cégep de Rimouski) |
| Ivanka Iordanova | Lean construction, BIM | ÉTS |
| Shirlane Day | Clients' needs | Habitat for Humanity Québec |
| Marco Lasalle | Building envelope expert | Association des professionnels de la construction et de l'habitation du Québec |
| Annie Languedoc | Construction labour relations expert | Québec |

About Us

The Cégep de l'Abitibi-Témiscamingue commits to its educational mission and invests in it by accompanying student population members of any origin in the success of their life project. At the dawn of this twenty-first century, the CEGEP proposes innovative and flexible approaches to meet the needs of the student population, the job market and society through its training and research activities that allow the institution to have a stake in the development of our region.

The mission of the CEGEP consists in competency development to learn, innovate and contribute to society in an environment marked by openness and proximity.

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