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Architects' perception of selected bio-based building materials in France and Gabon

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Introduction

As a part of a larger research project that examined bio-based building materials that are underutilized in the construction of non-residential buildings, the presented mail survey was conducted in France and Gabon to determine how architects specify selected bio-based building materials. This study provides a preliminary assessment of the potential segments of architects in practice based on their attitudes to the use of wood in non-residential construction.



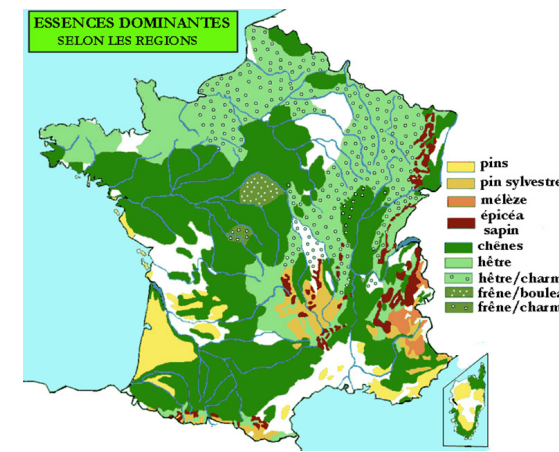
Among the most wooded countries, Russia ranks first (809 million hectares), then, Brazil (478 million hectares), Canada (310 million hectares), the United States (303 million hectares) ... In Europe, France occupies the fourth place - behind Sweden, Finland and Spain - with its 18 million hectares. It is a little less than 30% of the French territory. The French forest is very diverse, with 136 different species of trees. The area of French hardwood forests is 11.2 million hectares, or 71.2% of the forest. Private forest is dominated mainly by oaks, which occupy about 5 million hectares. Chestnut and poplar are specific species of the private forest. A little more than 4.4 million hectares are made up of coniferous forests with a great diversity of species: maritime pine, Scots pine, fir, spruce, Douglas-fir... The French forest employs 440,000 people, more than the automobile industry. It has a turnover of 60 billion euros per year, or nearly 3% of PIB (Produit Interieur Brut or GDP I think). The sector includes operators, sawmills, pulp mills, panel and furniture manufacturers, and firewood. A large part of the French forest is private: 3.3 million owners share it.



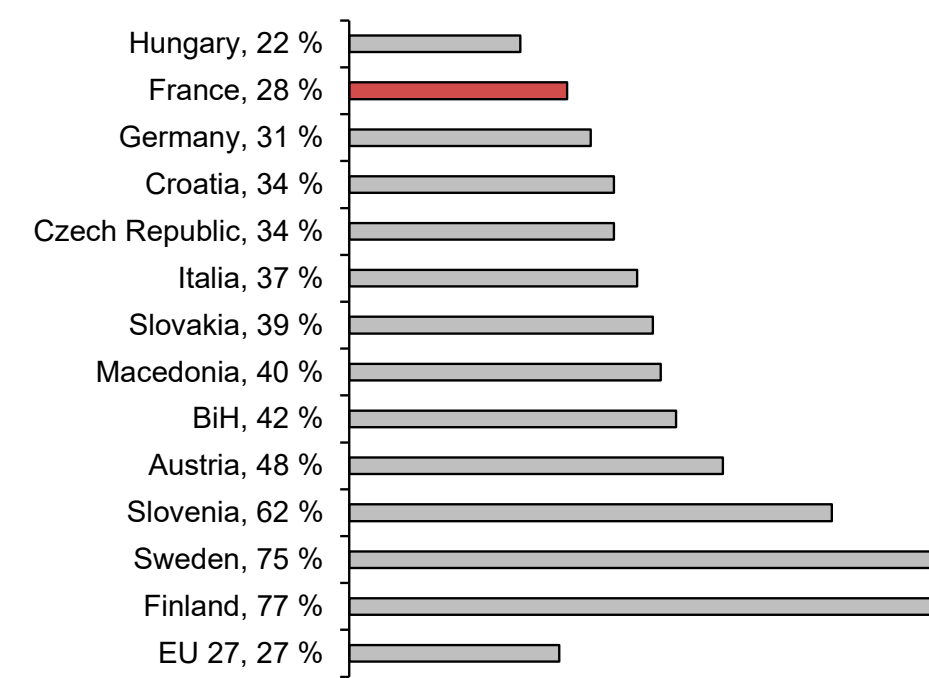
In Central Africa and particularly in equatorial region, the forest plays a key role in this regulation. In the year 2000, Gabon produced more than 4 million m³ timber, of which 72% was Aucoumea Klaineana Pierre (AKP). However, in 2004, only 1.6 million m³ was produced, of which 61% was AKP. This decrease in lumber production was due to a new regulations of exploitation of trees. In 2009, after the prohibition by the Gabonese government of the exportation of logs, more structures focalised on the study and the exploitation of wood were born. Since then, a particular attention is done on the mechanical characterization of some species which are usually used in timber structures. One of more those species is AKP which is an endemic specie in central Africa's forest which is a long time, associated at the life of locals. In the recent past, AKP represents 80% of annual wood's production in this country and 90% of this specie is exported all over the world and particularly in Europa and Asia. It is used largely for plywood in building, in veneer, finished or semi-finished products and in the design of the paper.



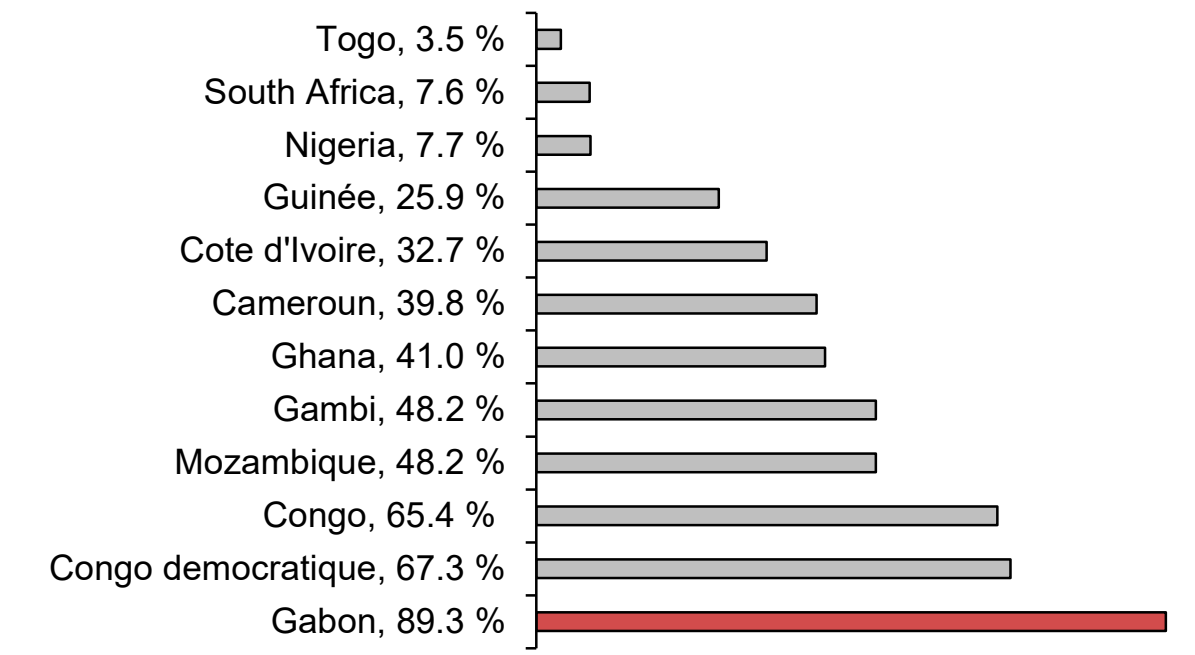
Forest in France



Forest in Gabon



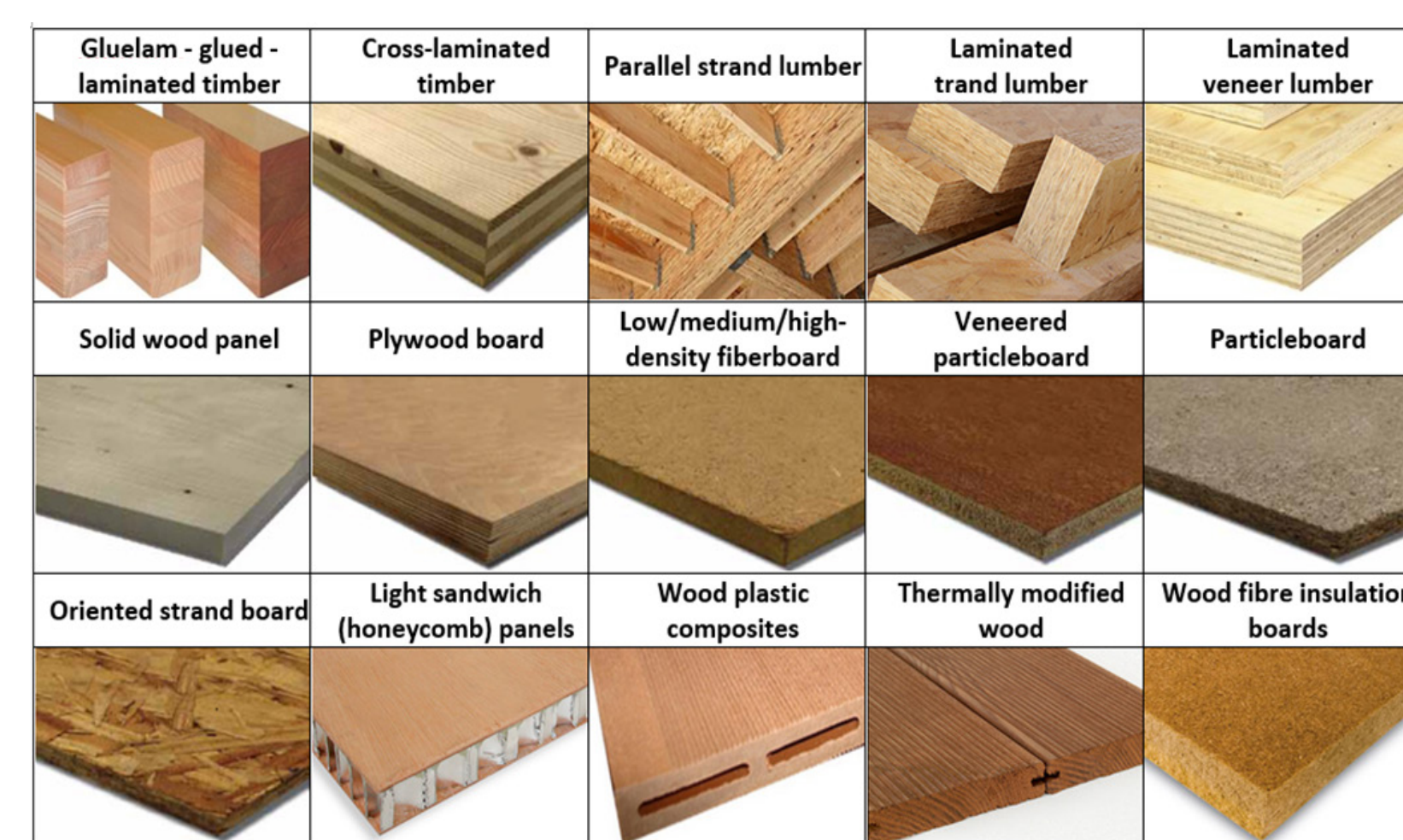
Forest area %: selected EU countries



Forest area %: selected African countries

Forest in numbers in France and Gabon, 2015

	France	Gabon
Surface area of forested land (ha)	16.70 · 10 ⁶	22.00 · 10 ⁶
Forest area (%)	30	80
Public owned (ha)	4.10 · 10 ⁶	(concedé) 18.00 · 10 ⁶
Private and other (%)	12.60 · 10 ⁶	(classées) 3.00 · 10 ⁶
Growing stock (m ³ /ha)	162 · 10 ⁶	400 · 10 ⁶
Tree species	137	> 400
Annual harvest (m ³ forest)	37.41 · 10 ⁶	3.6 · 10 ⁶ (2009)



Engineered wood products (EWPs)

Only recently has wood been developed to form a range of products that are increasingly functional, based on a combination of performance and sustainability requirements.

Objectives of the study

- To evaluate the perceived experience and regional trends of Engineering Wood Products (EWPs) by architects in Slovenia, Croatia, and Bosnian construction market;
- to identify the use of EWPs in loadbearing and non-loadbearing systems;
- to characterize information sources and their perceived value used by architects;
- to identify EWPs information needed by architects; and
- to evaluate cooperation between architects, wood engineers and civil engineers.

Methods

- Gabon: 10 architects members of Conseil National de l'Ordre Gabonais des Architectes, France: 78 architects from Conseil National de l'Ordre des Architectes of France
- The study methods included a two stage survey; in the first stage, personal interviews with a selected group of ten architects from architects professional organization were conducted. Based on the information from these in-person interviews, an exploratory web-based survey was subsequently designed for France and in-person interviews for Gabon
- Survey questionnaire was developed by international group of architects;
- Data were collected through on-line survey in France and personal interviews in Gabon
- We sent 320 questionnaires France, expecting a response rate of about 30% and a sampling error of 10 percent (Dillman, 2000).
- The first send-out was followed by two e-mail survey reminders in France and Gabon. In Gabon there was no answer on-line, so we continue with in-person interviews conducting from Conseil National de l'Ordre des Architectes of Gabon
- The survey process took place from 11.2016 to 1.2017.

Results

General perceptions and familiarity of EWPs

	France		Gabon	
	No	Yes	No	Yes
GLT Glued-laminated timber	5	73	7	3
	6,4%	93,6%	70%	30%
CLT Cross-laminated timber	11	67	5	5
	14,1%	85,9%	50%	50%
PSL Parallel strand lumber	30	48	5	5
	38,5%	61,5%	50%	50%
LSL Laminated strand lumber	44	34	4	6
	56,4%	43,6%	40%	60%
LVL Laminated veneer lumber	17	61	3	7
	21,8%	78,2%	30%	70%
SWP Solid wood panel	13	65	2	8
	16,7%	83,3%	20%	80%
PW Plywood board	9	69	1	9
	11,5%	88,5%	10%	90%
LDF/MDF/HDF fiberboards	4	74	2	8
	5,1%	94,9%	20%	80%
VP Veneered particleboard	27	51	4	6
	34,6%	65,4%	40%	60%
PB Particleboard	19	59	3	7
	24,4%	75,6%	30%	70%
OSB Oriented strand boards	3	75	3	7
	3,8%	96,2%	30%	70%
LS Light sandwich (honeycomb) panels	55	23	4	6
	70,5%	29,5%	40%	60%
WPC Wood plastic composites	45	33	5	5
	57,7%	42,3%	50%	50%
TM Thermally modified wood	12	66	5	5
	15,4%	84,6%	50%	50%
WFI Wood fibre insulation boards	11	67	3	7
	14,1%	85,9%	30%	70%

Figure 1. The question regarding the familiarity of EWPs

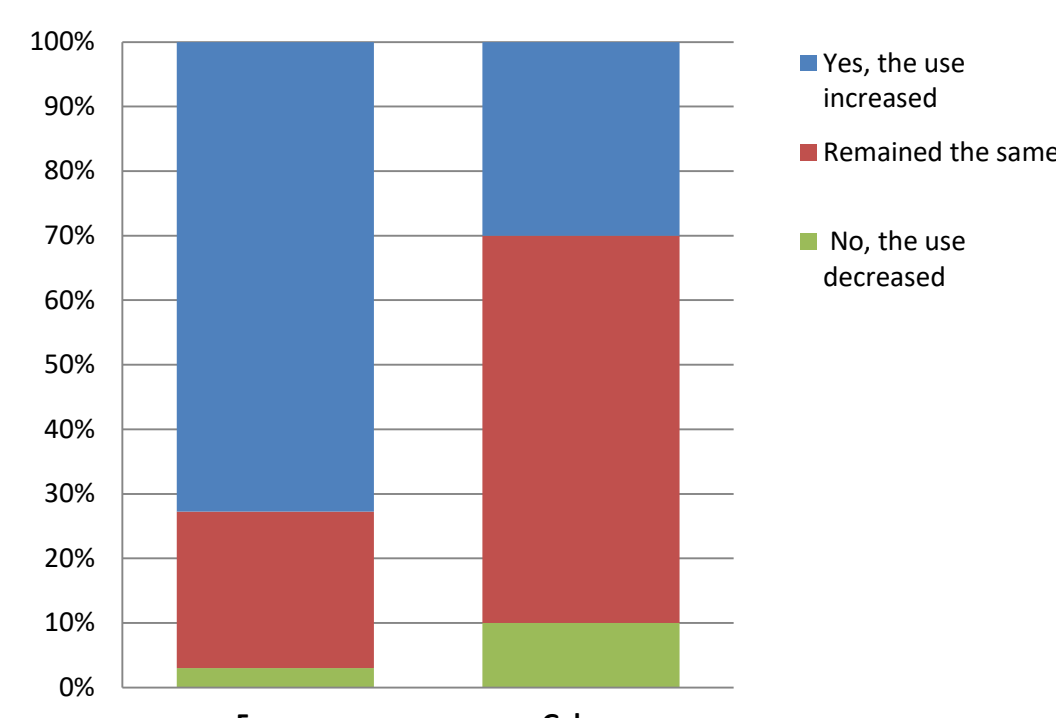


Figure 2. In your opinion, is there increased use of new EWP in your country in the last 5 years?

Use of EWPs in Non-load and Load-bearing systems

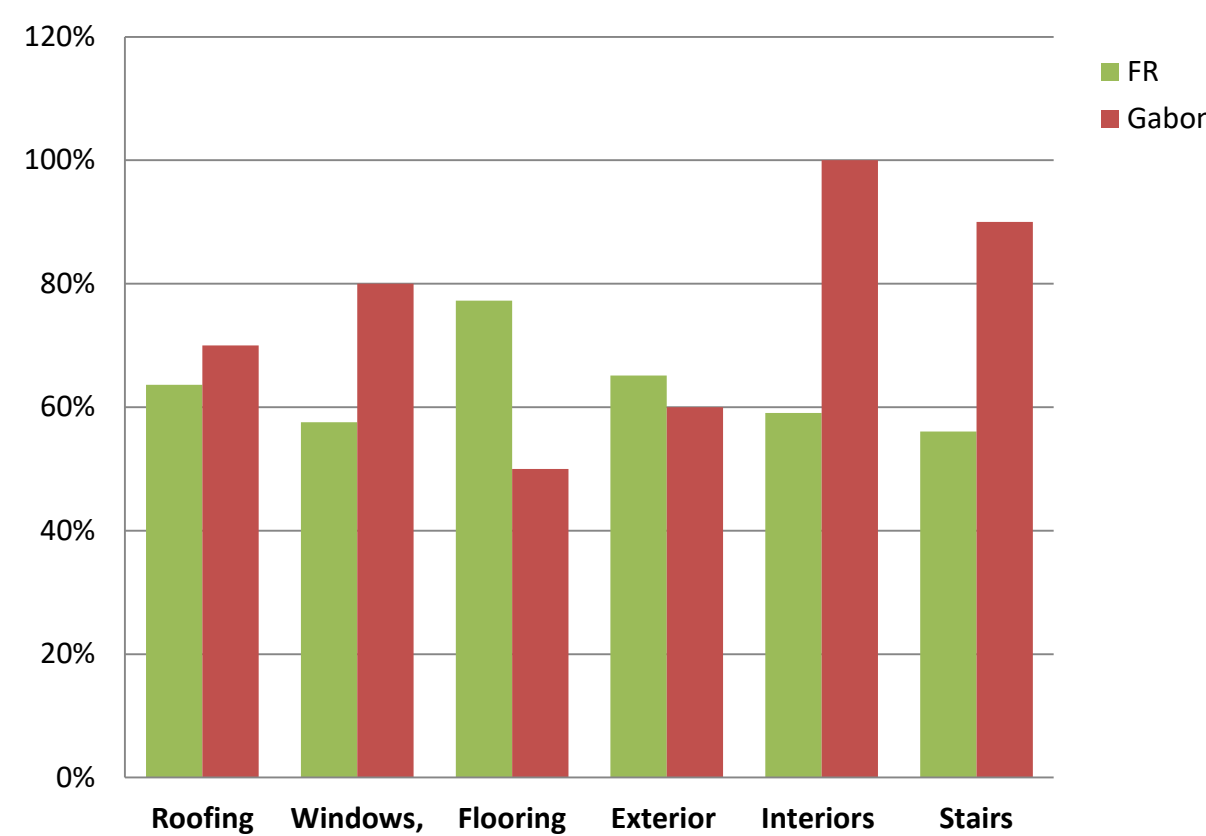


Figure 3. Please select the building components where you use EWPs - Non-load bearing systems.

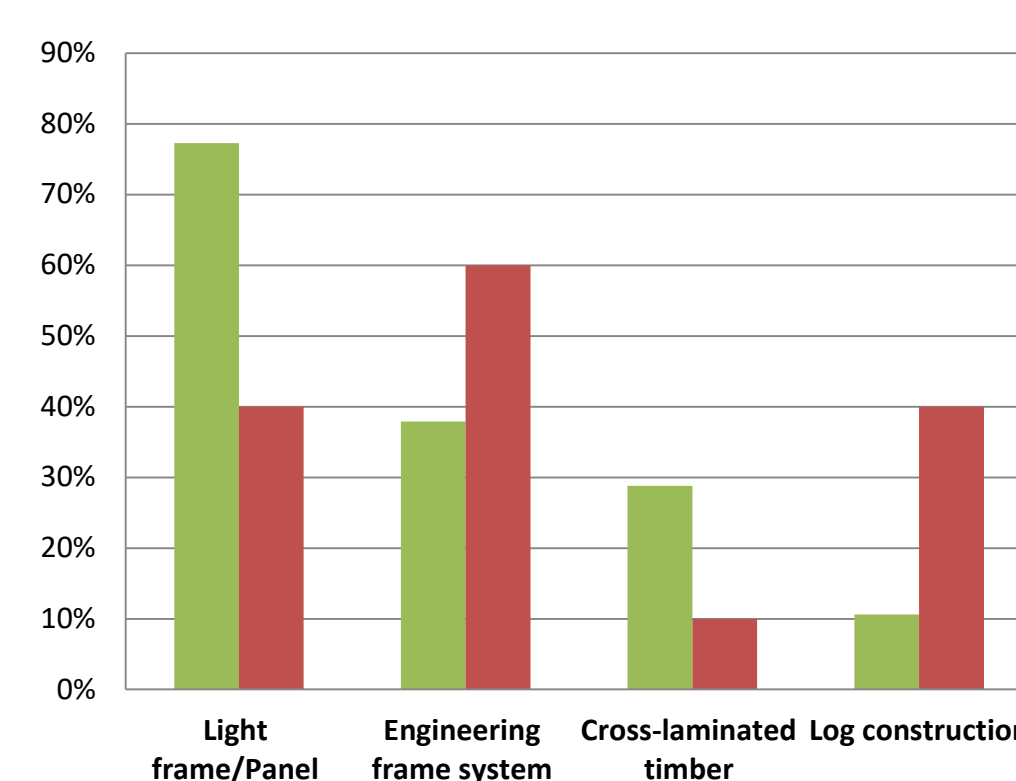


Figure 4. Please select the load bearing systems that you use the most.

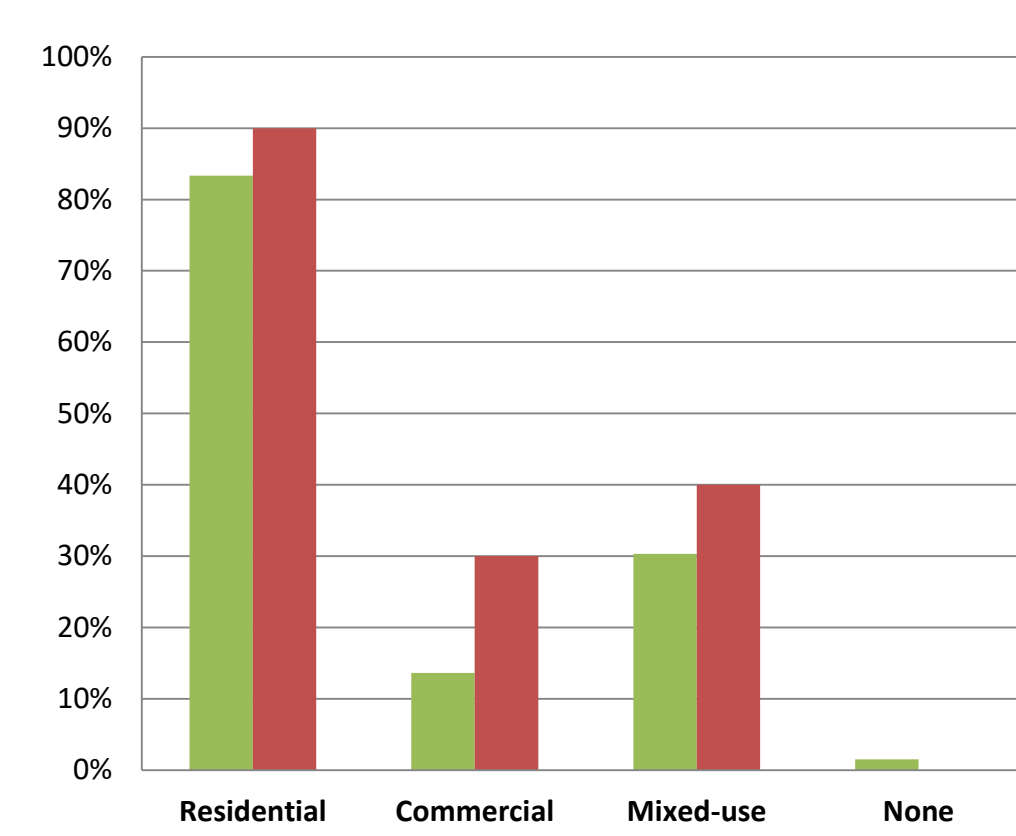


Figure 5. Type of building is where you use the EWP the most.

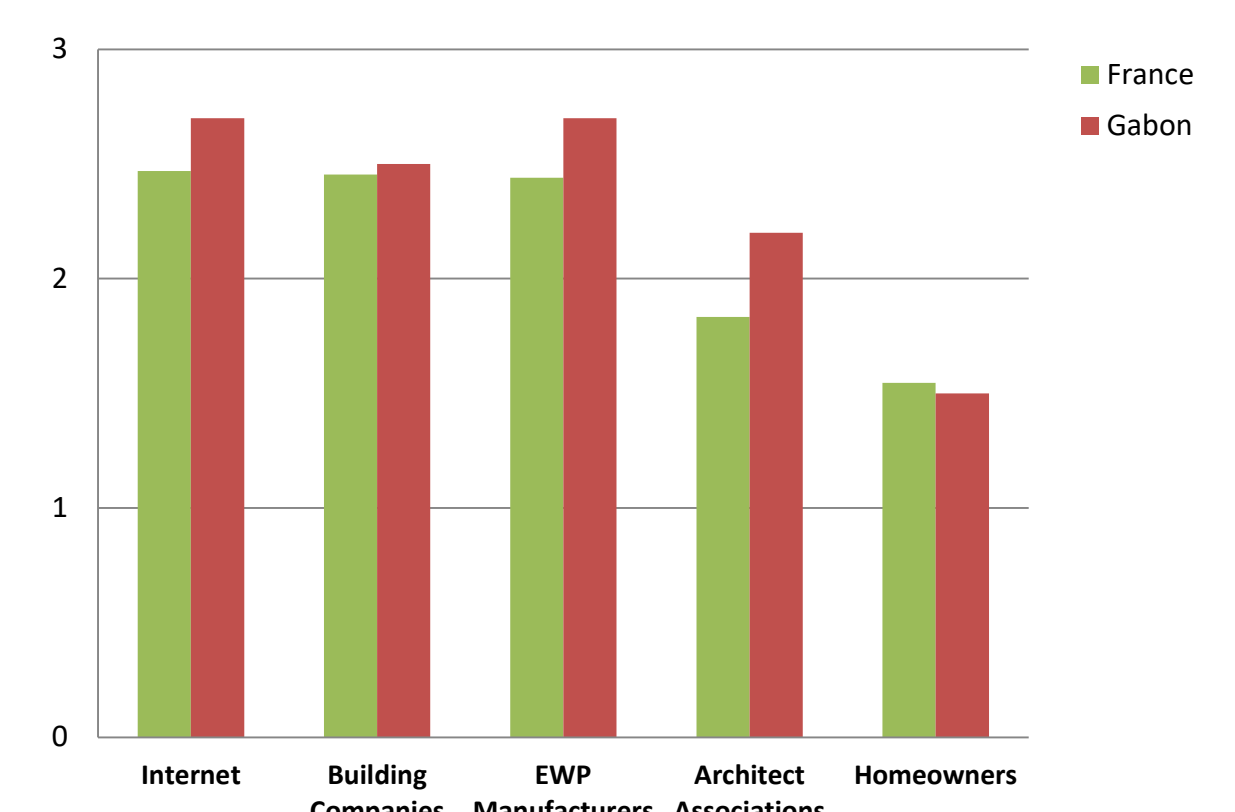


Figure 6. Effectiveness of various information sources: There are several ways of getting information about Engineered Wood products (EWPs). How important are they for you? Not important - 1, Important - 3

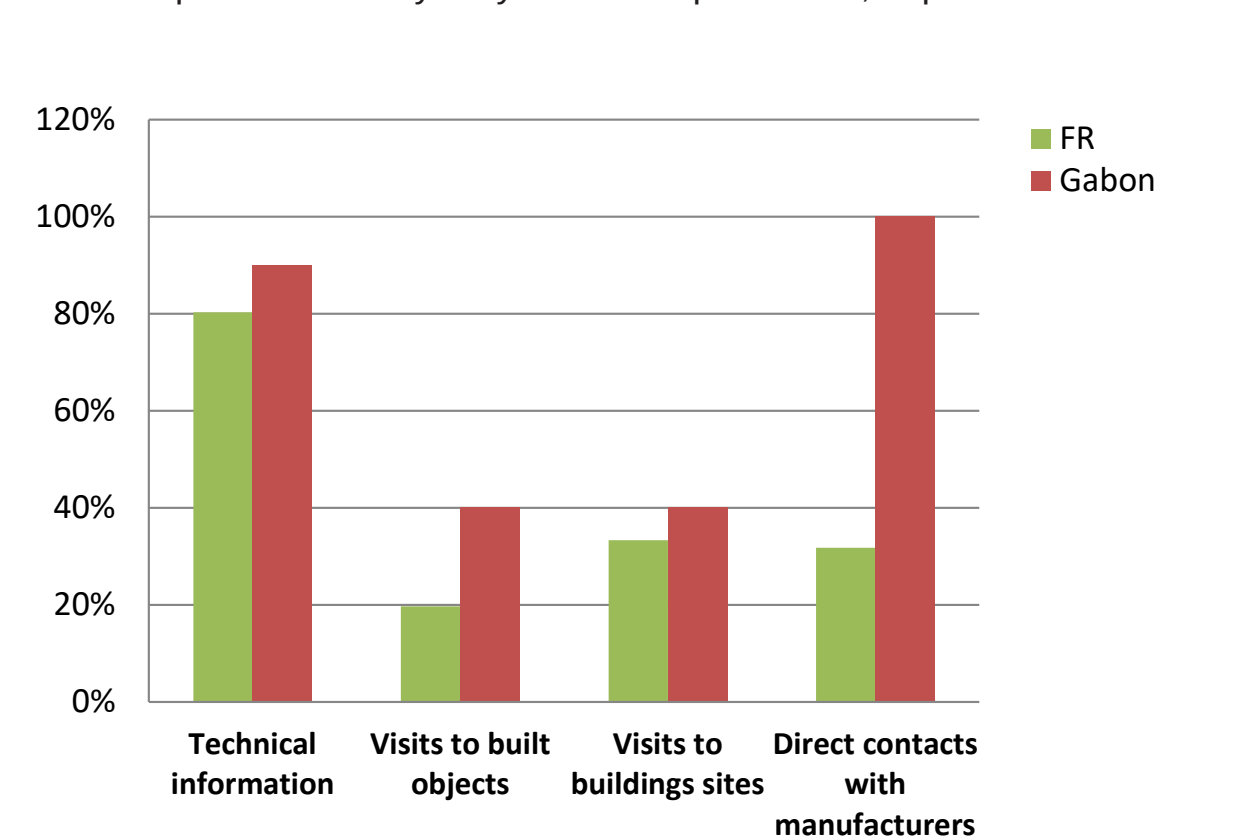


Figure 7. Please indicate what kind information about EWP would you like to have.

Discussion

Using the information obtained in this study will contribute to an understanding of the probability that bio-based building materials are chosen in residential and non-residential buildings and to an understanding of the drivers and barriers for increased use. Change is difficult – the barriers to wood are complex and the building industry is both averse to risk and slowed by inertia – but with the right focus, the wood industry can make a difference. The study is extended to selected European countries and the US, as well as to Central Africa. The study is extended to selected European countries and the US, as well as to Central Africa. The first results show that several architects in Gabon have not given response the survey due to the difficulty to have computer and excellent web connection. However, the obtained results are very interesting and promised. These results will help the architects to choose efficiently the wood product for civil engineering constructions.

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