This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 691768

PVsites

BIPV market and stakeholder survey: Summary of results

About the PVSITES project

PVSITES is an international collaboration co-funded by the European Union under the Horizon 2020 Research and Innovation program. It originated from the realisation that although building-integrated photovoltaics (BIPV) should have a major role to play in the ongoing transition towards nearly zero energy buildings (nZEBs) in Europe, large-scale deployment of the technology in new constructions has not yet happened. The cause of this limited deployment can be summarised as a mismatch between the BIPV products on offer and prevailing market demands and regulations.

The main objective of the PVSITES project is therefore to drive BIPV technology to a large market deployment by demonstrating an ambitious portfolio of building integrated solar technologies and systems, giving a forceful, reliable answer to the market requirements identified by the industrial members of the consortium in their day-to-day activity.

Coordinated by project partner Tecnalia, the PVSITES consortium started work in January 2016 and will be active for 3.5 years, until June 2019. This document is part of a series of public reports summarising the consortium's activities and findings, available for download on the project's website at www.pvsites.eu.

The PVSITES consortium:

Tecnalia Research & Innovation	CTCV	FormatD2
Onyx Solar	Flisom	Vilogia
BEAR-iD	Cricursa	R2M Solution Research to Market
Nobatek	CEA	CADCAMation
Film Optics	Acciona Infraestructuras	WIP - Renewable Energies

Purpose and background of the survey

The survey was conducted in the summer of 2016 by Dr. Federico Noris and MSc Juan Manuel Espeche from R2M Solution as part of the PVSITES project, financed by the European Community grant n. 691768.

The goal of the survey was to help the consortium to identify the BIPV market perspectives, including its trends, key drivers and challenges from the point of view of the different stakeholders. 35 answers to the survey were received in total. The questions asked and the received answers are presented in the following pages. Key conclusions and a market outlook are provided in the last page.

The PVSITES consortium thanks all survey respondents for taking the time to contribute to the study.

Distribution Channels

The survey was distributed among the following selected channels and conferences:

Online:

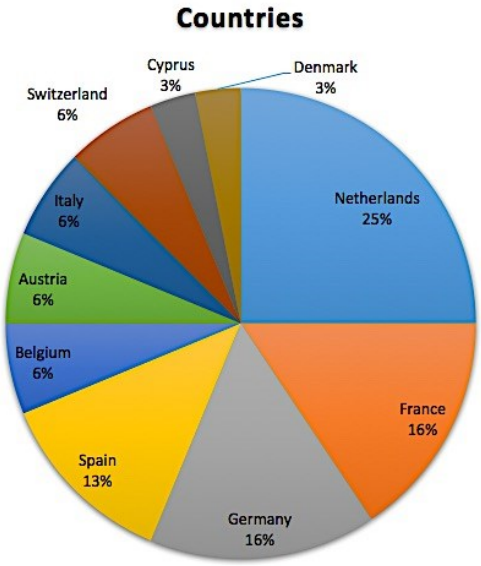
- *Advisory board of PVSITES*
- *GeoSmartCity project consortium*
- *CityGML Energy ADE Workshop participants*
- *'La recherche en Architecture' (French alliance for applied research in architecture schools) members*
- *Dem4BIPV project consortium*
- *ETIP PV working group on BIPV*
- *IEA PVPS Task 15 on BIPV*
- *Spanish Photovoltaic Platform (Fotoplat) website*
- *Architects' Council of Europe (ACE) members*
- *Norske Arkitekters Landsforbund (NAL) members*
- *'Ordre des Architectes - Conseil Francophone et Germanophone' Belgian Architects's Association Council*

Events:

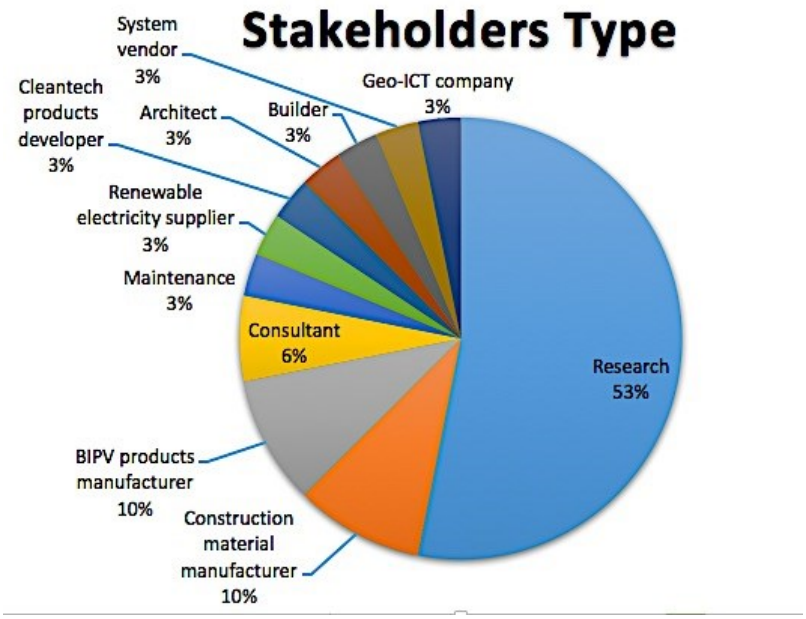
- *EUPVSEC Conference in Munich*
- *Intersolar exhibition in Munich*
- *EU PV Clusters in Barcelona*

Survey Results

A. For which country could you provide feedback on BIPV Market:



B. Which of the following stakeholder categories do describe best yourself - or your organization?



1. ***In its latest new report, industry analyst firm N-tech Research predicts the total market for building-integrated solar photovoltaic (BIPV) systems will grow from about $3 billion in 2015 to over $9 billion in 2019, and surge to $26 billion by 2022, as more truly "integrated" BIPV products emerge that are monolithically integrated and multifunctional.***

   Please indicate your level of agreement:

   Strongly Disagree: 1
   Strongly Agree: 5

   Level of Agreement: 3,15

2. ***The SET Plan and Energy Union both refer to the importance of energy efficiency and integration of renewable energies, and BIPV is an excellent option in this direction.***

   Strongly Disagree: 1
   Strongly Agree: 5

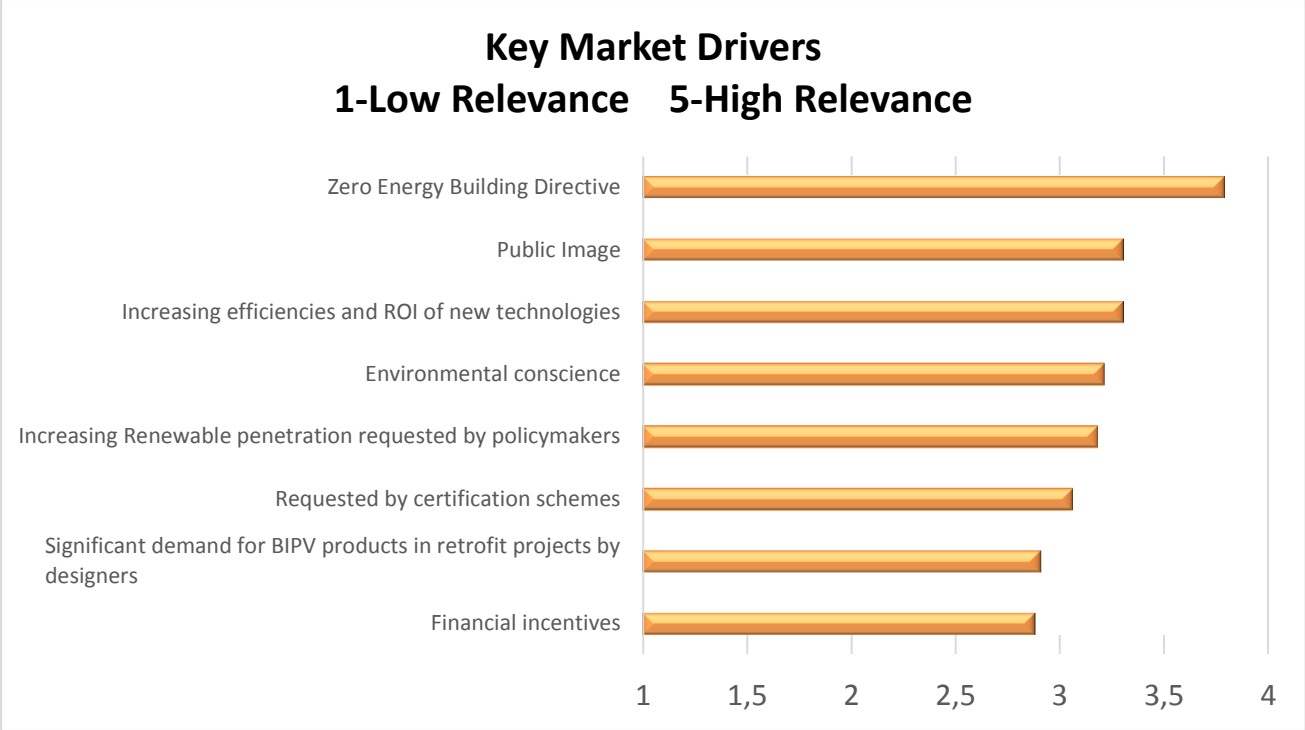
   Level of Agreement: 4,27

3. ***Regarding BIPV European perspectives, Europe will become a key player, new companies will arise and R&D investments will keep growing.***

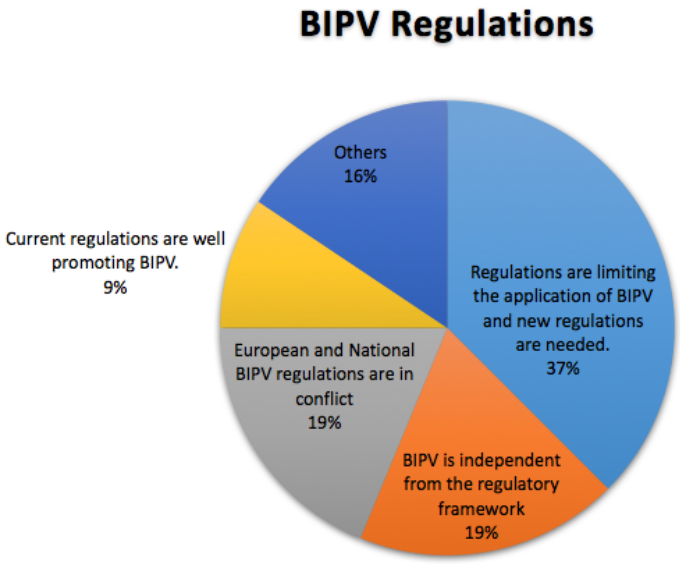
   Strongly Disagree: 1
   Strongly Agree: 5

   Level of Agreement: 3,36

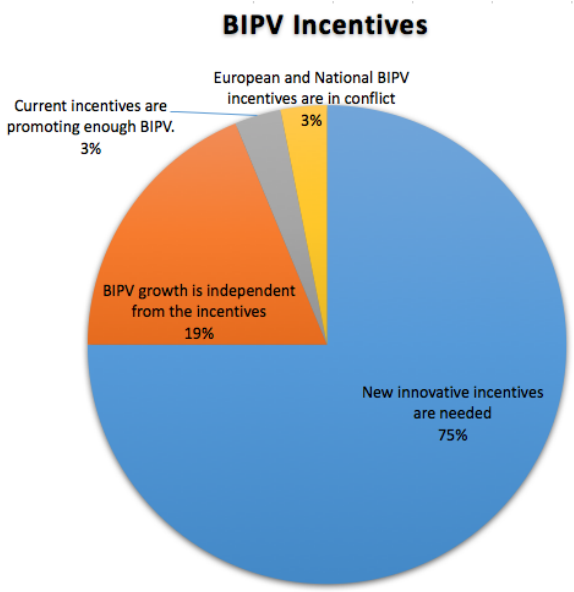
4. Please rank in terms of priority the BIPV key market drivers in your country.



5. Regarding BIPV regulations in your country, where regulations mean the national legislation on construction industry, building standards, etc.



6. ***Regarding BIPV incentives in your country, where incentives mean financial schemes such as FIT; TAX Reduction, etc.***



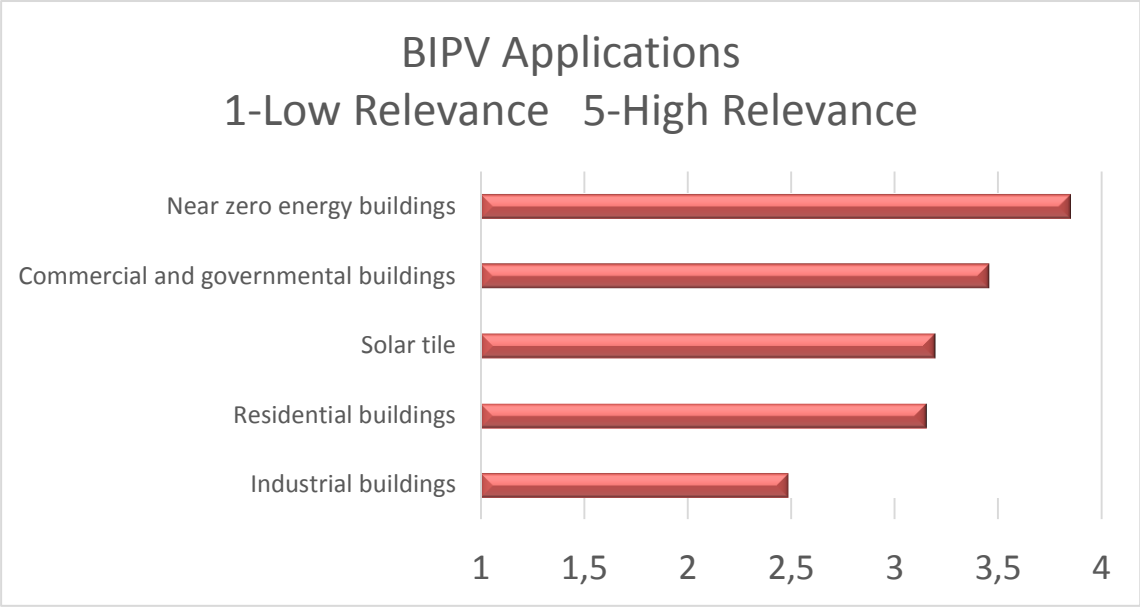
7. ***BIPV could rapidly find an economic justification per se, in the absence of any financial support scheme.***

Strongly Disagree: 1

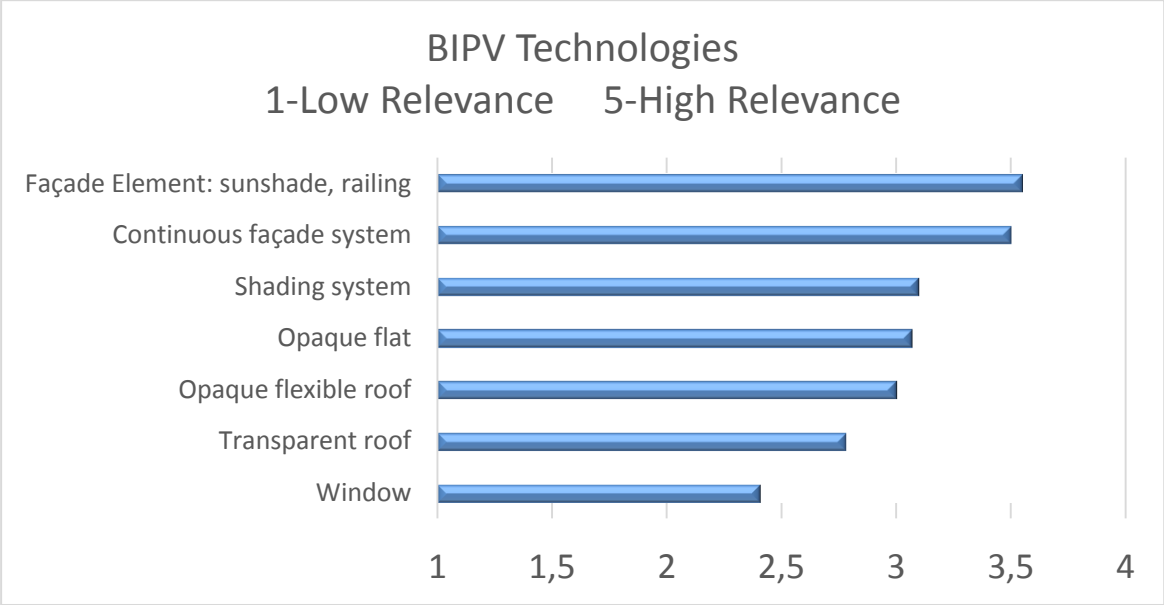
Strongly Agree: 5

Level of Agreement:	**3,21**

8. Please rank in terms of relevance the BIPV applications in your country.



9. Please rank in terms of relevance the BIPV technologies.

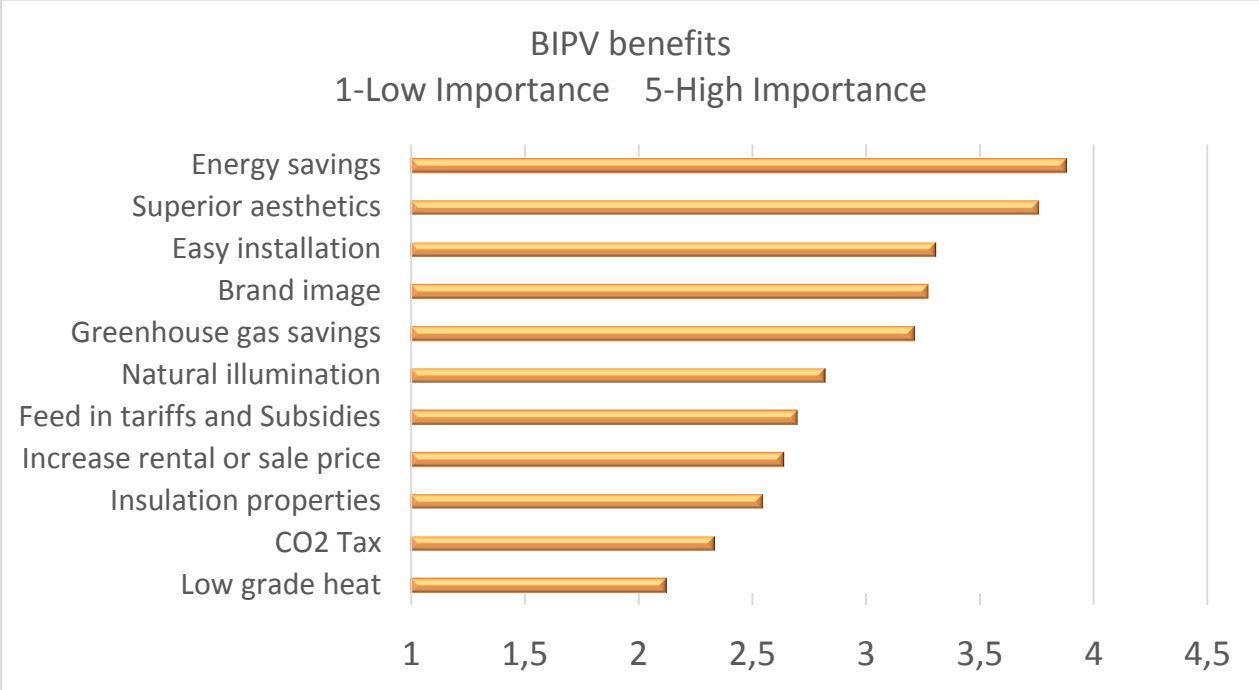


10. Further development of BIPV will require the definition of new "business models" regarding the operations and financing of the projects.

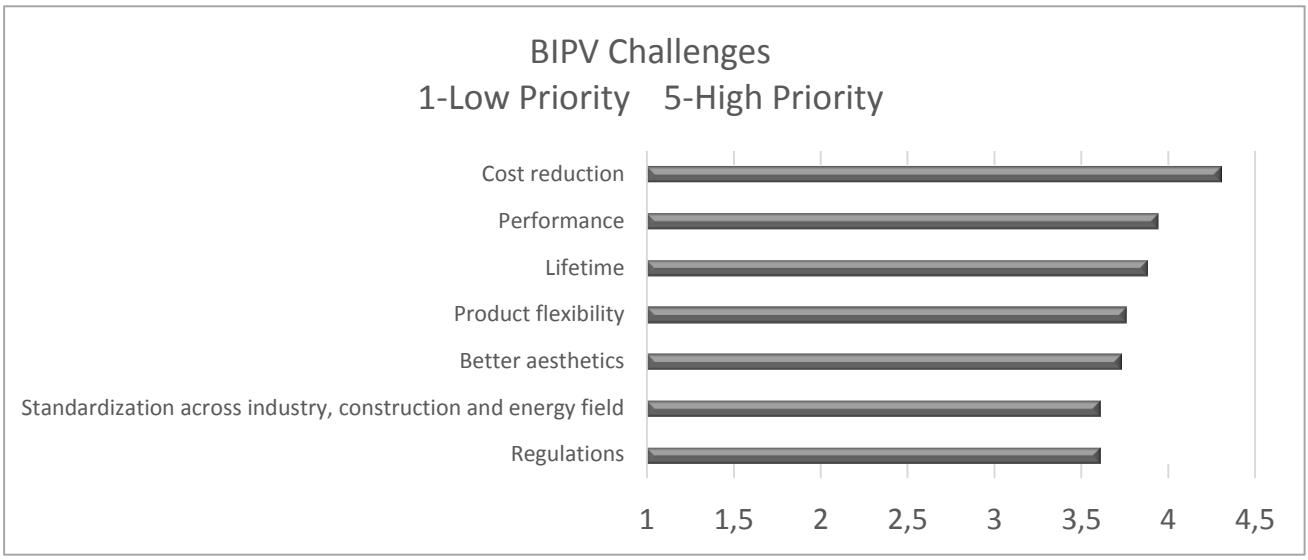
Strongly Disagree: 1
Strongly Agree: 5

Level of Agreement:	**4,09**

11. Please rank in terms of importance the benefits of BIPV in your field and profession.



12. Please rank in terms of priority the challenges of BIPV in your field and profession.



13. Most architects remain unfamiliar with PV, which they often see as an additional source of complexity, of project risk and an additional architectural constraint. By what means and with which tools do you see BIPV becoming for architects a usual construction technique, such as super isolating glass or HVAC.

1. Availability of easy to understand specific product performance information. 2. Independent understandable ranking or comparison of products. Without deep understanding of (BI)PV technology. 3. Easy availability of product specific technical drawings/details. 4. Extensive product libraries and calculation tools for use in regular used BIM software.	With CAD tool which guide Architects to find adapted PV solutions
Education at University stage. Lack of a big company (and related marketing) that sells BIPV solutions	There should be good design cases available, BIPV producers have to look at their product as a component integrated in the building with other materials, and deliver examples of these solutions.
We need to include architects in BIPV product development, and bring BIPV to building schools	Reduce complexity of mounting systems and electrical connection systems; increase flexibility in colors, shapes and forms

Increase in awareness and education. Innovative products which are also nice aesthetically.	1st: availability of many different BIPV solutions from building element industry. 2nd: education and promotion of these products
Not a question of tools: BIPV has to be as easy to install, needs a long term guarantee and requires more awareness from architects and builders (a very conservative industry)	Training, communication, incentives and laws
Providing very flexible products in terms of design, aesthetics, colors, shapes...	Education and awareness -raising
Regulations for compulsory use of BIPV products in newly built houses for energy saving	Develop specific components for and adapted to building construction
Neutral energy building regulations. Familiarization of architects with new BIPV products.	Architects should be consulted by an BIPV engineer for design and organization.
Architects do not use PV enough since it does not offer the flexibility in size and shape they need. As soon there are more variants in standard sizes (such as now is the case for other building materials), architects will start looking for these products. In general architects just simply use google-search to find products they need, but showing products in a construction market is also very useful. Some people suggest that PV products should be included in BIM-files if you want the PV to be used as a standard construction material.	The combination of functionality (e.g. insulation, electricity supply) gives benefits on the one hand side but additional complexity for the different planners. While facade planners take normally care about the Windows and facades a BIPV facade requires to get Involvement from other planners e.g. electrical and HVAC. This is against traditional planning processes and requires more alignment and interaction. So it's not the architect Problem but a building planning Problem.

14. Can you please explain the main challenges that have limited the applications of BIPV with respect to your field and in general. Any suggestions for how to overcome them.

There is not enough collaboration between the construction industry and PV industry with regard to the product application. BIPV is just 'a' building product for the construction industry. Application should be simplified and better match with the normal construction system.	Urban planning regulations and economic incentives
Cost. No suggestions	Apart from standard Si-cell based modules, aesthetically appealing and technically "easy to handle" BIPV systems have to enter the market
Cost	BIPV should be like a building element (on demand, flexible size and color). More investment in manufacturing techniques for building products that allow to build in the PV functionality. Government could give incentives to the building industry (not to PV industry) to develop such products, because building industry is not familiar with 'technological development'
Customer´s investment capacity to be solved through new business models	Cost, aesthetics
Lack of sufficient awareness of the benefits. Culture. Nonexistent incentive schemes to encourage investments.	Regulation and costs
Lack of industrial development	All leakage problems and durability solution suggested in R13
Cost, reliability, products are not standardized and not aesthetic enough	Complex DMU with lack of understanding of BIPV: overcome by training/marketing

Aesthetics, complexity, myths.	- PV panel cost, but this cost is decreasing structurally - Reluctance of architects and project master, it may be exceeded by regulation - Global PV brand image was degraded by the French PV policy since 2010, this sector must be more supported by French policy and European policy - French thermic regulation must impose PV in building
High cost of BIPV products, lack of incentives, lack of regulations, lack of awareness by customers	Integrated process
No obligation and no state incitation	We require BIPV panels with an electronic MPPT concept on panel level and easy stringing. Currently the cost of installation with BIPV as a system (not on panel Level) is more difficult than conventional PV panels.
Awareness, the price, complex design process.	Price difference between standard PV and BIPV caused on lower market share.
The costs	Prices, design, support from the government
Cost and regulation. Cost will be reduced through R&D, mostly. Improvements in regulation will be needed from the nation's government.	BIPV vs. Standard solar module (price)

I am currently working in the field of research and innovation management, but I have a background in architecture and building Physics. What I noticed is that the main challenges are: too high TCO for current BIPV systems, unawareness of key decision makers (house owners, architects and even installers) about what products are available, uncertainty about life-span. Costs are a big thing: working closely together with people in the construction world (that are already used to making roofs and facades) helps to optimize BIPV design. Currently you often see that BIPV products are designed and developed from a PV point of view, instead of optimizing the products based on a construction point of view. Unawareness about the products is also a big challenge: the question is: how did this awareness grow for BAPV systems? And can we learn from that? Apparently the most effective way to grow awareness amongst house owners is to show them examples ('when my neighbor has it, I want it too!)	costs factors

Key conclusions and outlook

- In the past years, market penetration of BIPV has been overestimated by analysts. One of the main reason why the estimations failed was the **price drop of regular PV**, making it a more profitable business, with lower RoI than BIPV.

- Although past estimations failed, it is expected that the global **BIPV market will grow** in the following years. This growth will be more conservative in the period 2016-2018 and it will likely increase faster in the following years. It must be noted that within the PV market, the BIPV technologies will remain a niche market with **no more than 8% of the total PV shipments by 2020**, reaching 5 GW by 2020.

- **Europe is foreseen as the BIPV market leader** along with the USA with approximately 3.5B$ invested in each. Regulations toward near zero energy buildings, better incentives schemes and citizen consciousness are the main drivers for the optimistic forecast for the BIPV economy in Europe.

- The stakeholder analysis has shown the need for an integration/collaboration between actors to reduce complexity and costs in the value chain. Contractors, architects and BIPV manufacturers are the main stakeholders and a close collaboration between them will exploit their synergy bringing benefits to the rest of the actors involved in the BIPV market.

In order to continue supporting the market penetration of BIPV, the following aspects will continue gaining importance:

- BIPV must be considered as a constructive element generating electricity, therefore combining both functions of constructive element and energy harvesting technology

- Clear message to the construction (designers and owners) and Real Estate Sectors regarding the benefits and possible business models to capture the complete value of BIPV and overcome some barriers.

- To understand the BIPV “green value” for the different stakeholders and the channels to communicate with them.

- Reliability, liability, performance, aesthetics, costs, maintenance and flexibility will continue to be critical element in order to ensure support from the different actors involved in the decision process and operation.