

# INVOLVEMENT OF CONSTRUCTION MANAGEMENT PROFESSIONALS IN PROPERTY LEVEL FLOOD ADAPTATION

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## ABSTRACT

*Flooding is a significant concern across the UK that has caused property damage, economic impact and health and safety concerns. The national climate change risk assessment for the UK projects the risk of flooding to increase in the future, and thus flood risk management is identified as an area that requires serious action. Whilst community level flood protection measures have been and are being put in places where there is an economic case for such intervention, the need for implementing property level flood adaptation (PLFA) is increasingly highlighted. This industry is worth £2.1 billion globally; with a forecasted UK growth at a rate of 7.1% by 2017-18. The aim of this research is to identify the ability of construction managers to provide PLFA advice to homeowners. Interviews were conducted with 10 professionals currently involved in flood adaptation product/service provision to gather their views on construction manager involvement within this niche area. Majority of participants interviewed accepted that construction managers could enter the PLFA industry. However, there has been a lack of evidence that suggest that construction managers have played a key role in this field. The paper suggests that there are several barriers that have resulted in the lack of involvement of construction managers in the PLFA industry. Previous research recognises lack of relevant skills and knowledge required to provide PLFA advice as a key barrier, this is supported by participants interviewed mentioning that the qualification, knowledge and training required were a barrier for construction managers to enter into the PLFA industry.*

**Keywords:** Construction Industry; Construction Managers; Flooding; Property Level Flood Adaptation; UK.

## 1. INTRODUCTION

Flooding is a global occurrence that has caused widespread destruction, economic damages and loss of human life. In 2010 alone; 178 million people globally were affected by floods (Jha *et al.*, 2012), and scientific evidence suggest that this increase is due to the combination of climate change, population growth and development pressures (Environment Agency, 2009; Jones *et al.*, 2013). This phenomenon has reflected on the UK, in England alone over 5.2 million properties are at risk of flooding (Environment Agency, 2009), and government data has shown that the situation is likely to worsen as average global temperatures increase, and properties continue to be built on flood risk areas (Soetanto *et al.*, 2008; Environment Agency, 2009). The concerning issue is that not only have these events have caused large scale property damages, they have had a physical and mental effect on homeowners (Ranger *et al.*, 2011).

The Environment Agency, on behalf of the UK Government, is working on building new and maintaining existing flood defences. However, there are an estimated 50% of homes in flood risk areas that still remain unprotected (Bichard and Kazmierczak, 2009). The costs of community-level flood protection measures and the inability to protect every home through these measures, the governments' aim is to shift people from relying on community-level solutions to more on property level flood adaptation (PLFA) (Environment Agency, 2009).

Flooding in the UK has required insurers to pay out £4.5 billion to people affected within a decade (ABI, 2010). According to the Association of British Insurers this pay-out is an increase of 200% on the £1.5 billion paid in the previous decade (ABI, 2010). UK insurers have always played a vital role in managing the financial risks of flooding (Crichton, 2008), but their liabilities are limited to the reduction of tangible

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impacts of flooding; whilst, the intangible impacts are left for homeowners (Rotimi, 2014). There is also the issue that not all homeowners have the availability of insurance as a result of being located at a high risk area. In June 2013 the UK Government and ABI announced a new system of insurance called 'Flood Re', guaranteeing the availability of insurance for homeowners at flood risk areas (DEFRA, 2013a). But the scheme appears to have less emphasis on the role of public risk management (Surminski and Eldridge, 2014), rather focusing on sharing the financial burden of flooding. The existence of 'Flood Re' may reduce the urgency to prevent and reduce risks, but the concept may lead to a false sense of security (ABI, 2016).

There is significant potential for construction managers to enter into PLFA market, but there is a lack of evidence to suggest that they have. An exploratory study was undertaken using both primary and secondary data to investigate the ability of construction managers to provide PLFA advice and identify the options, opportunities and barriers for construction managers in this sector. The objectives were to;

- Explore whether construction managers could enter the PLFA market,
- To assess the current level of involvement of construction managers at PLFA, and
- To investigate the enablers and barriers for construction managers to enter into the PLFA market.

## **2. LITERATURE REVIEW**

### **2.1. FLOOD RISK AND PLFA IN THE UK**

Flooding in the UK has caused extensive damages, impacting both the economy and human lives. In England alone, one in six (over 5.2 million) properties are at risk of flooding (Environment Agency, 2009). The government data has shown that the situation is likely to worsen as average global temperatures increase, and properties continue to be built on flood risk areas (Soetanto *et al.*, 2008; Environment Agency, 2009). The major floods in the UK have been estimated to put £200 billion of asset at risk of flooding (Treby *et al.*, 2006; Hardaker and Collier, 2013). According to Association of British Insurers (ABI) this pay-out is an increase of 200% on the £1.5 billion paid in the previous decade (ABI, 2010). It has resulted in UK insurers to pay out £5.8 billion since 2000, and a total of £8.43 billion since 1990 in insurance claims (ABI, 2014). UK insurers have played a vital role in managing the financial risks of flooding (Crichton, 2008), but their liabilities are limited to the reduction of tangible impacts of flooding on households; whilst, the intangible impacts are left for homeowners (Rotimi, 2014).

Traditionally, flooding has been included as a standard feature in general property insurance in the UK. This has allowed property owners to use general property insurance as the primary source of risk management against flooding. But the continuous increase of pay-outs has caused the insurance industry to review this practice, and introduce specific arrangements for flood insurance. In June 2013 the UK Government and ABI announced a new system of insurance called 'Flood Re', which is scheduled to start in 2016. The aim is an industry-run, not for profit scheme, which will cap the maximum amount paid by the 2% (350,000) of households who will meet the eligibility criteria (DEFRA, 2013a; ABI, 2016). Although the scheme guarantees the availability of insurance for homeowners in flood risk areas (DEFRA, 2013a), there are exclusions. Properties built after January 1st 2009, will not be covered by the scheme, as the government believes not to incentivise home-building in flood risk areas after that period (ABI, 2016), as this will reduce developers justifying and selling their properties in flood risk areas. There has also been several reports against this scheme, stating that it appears to have less emphasis on the role of public risk management (Surminski and Eldridge, 2014), but rather focusing on sharing the financial burden of flooding. This is not a sustainable solution going forward, especially in a changing climate and rising flood levels (ABI, 2016). The existence of an insurance scheme may reduce the urgency to prevent and reduce risks, but the concept may lead to a false sense of security (ABI, 2016), so PLFA methods are an urgent need.

An estimated 120,000 houses are built in England each year (DCLG, 2014), 25% of which may be at risk of flooding (BRE, 2014). According to BRE (2014), due to pressure on land and the need to encourage economic growth, development take place in flood risk areas. The growing concern is that local planning regulations in the UK take minimal or no consideration of flood adaptation. Planning may necessitate the need for some restrictions in regards to resistance or resilience measures, but these are not always adhered

to at the construction stage (BRE, 2014). A government review, led by Lord Taylor, recommended that “planning practice guidance on climate change and flood risk should be a priority for re-issue in an updated and streamlined form, helping to make the planning system swifter and more accessible” (DCLG, 2013).

The Environment Agency, on behalf of the UK Government, is working on building new and maintaining existing flood defences, but given that, there are an estimated 50% of homes in flood risk areas that still remain unprotected (Bichard and Kazmierczak, 2009). The government admits that not all areas could be protected due to cost and practical reasons. Its aim is to shift people from relying on government solutions and more on PLFA (Environment Agency, 2009). Although theoretically this shift seems quite promising, there is little evidence to suggest that any significant action plans have emerged to implement this in practice (Ingirige and Wedawatta, 2014). DEFRA (2013a) states that every £1 spent on adaptation represents four times its value in potential damages avoided. It will allow homeowners to be better prepared for future flood events, improve their safety and minimise financial losses. It will also encourage insurers to reassess flood-adapted areas in order to provide more affordable insurance. Therefore, there is an urgent need for PLFA and for individual property owners to take action.

## **2.2. PROPERTY LEVEL FLOOD ADAPTATION (PLFA)**

PLFA measures are categorised into either resistant or resilience measures. Resistance measures can be either manual or automatic measures, which are designed to keep out, or at least minimise, the amount of water that enters a building (DEFRA, 2005). Resilience measures seek to reduce the consequence of flooding and the cost of repairs after the flood (DEFRA, 2005). Its aim is to minimise damage to the structure, interior and furnishing of a building when floodwater enters the premises (Pitt, 2008). The benefits of PLFA measures can be gained by different stakeholders; for insurers it’s the tangible benefit of reduction in future claims (Joseph *et al.*, 2011). In the case for the government is that it will allow them to focus on critical locations for large scale flood defence developments. For homeowners there are several benefits including financial cost and the reduction or elimination of intangible impacts such as:

- Reduction in stress and anxiety rate (Reacher *et al.*, 2004);
- Reduction in the deterioration of physical and mental health (Reacher *et al.*, 2004);
- Reduction in depression cases following flood event (Reacher *et al.*, 2004);
- Inability to move house immediately after flooding (Warren *et al.*, 2011);
- Stress of living in alternative accommodation (Warren *et al.*, 2011).

Although there are several benefits of PLFA measures to be gained by different stakeholders; barriers have drastically reduced the current uptake of them. A report by DEFRA (2008) reveals that homeowners are deterred from installing PLFA measures due to them being unattractive and a constant reminder of the flood risk they have to live with. A report by LCCP (2009) states that retrofitting of buildings may be held back by barriers which are partly due to planning and hidden costs and partly due to the lack of information and incentive available. While government involvement can be the solution to behavioural barriers and market failure, government processes and public policy failures can themselves be a barrier to adaptation. Additionally, the lack of availability of competent construction professionals who can provide valid PLFA advice to home owners has also been identified as a barrier in previous research (DEFRA, 2008; Wedawatta *et al.*, 2012).

## **2.3. CONSTRUCTION MANAGERS AND THEIR INVOLVEMENT IN FLOOD ADAPTATION**

Construction Management is recognised for being associated with the ‘Built Environment’ sector (CIOB, 2010). A construction manager has the role of overall planning, coordination, and control of a project from beginning to completion (Dictionary of Architecture, 2012). The functions of a construction manager typically include the following (PM Hut, 2008):

- Specifying project objectives, performance requirements and selecting project participants,
- Maximising resource efficiency through procurement of labour, materials and equipment,
- Implementing operations through effective co-ordination and control of planning, design, estimating, contracting and construction of the whole project,

- Developing effective communication and mechanism for conflict resolution.

A construction managers' skill-set such as planning, designing and implementing, would be highly effective in PLFA. An example is demonstrated in the study carried out in developing countries whereby UK construction managers provided aid after a natural disaster (Jones *et al.*, 2009). The report showed that using construction managers more widely in disaster mitigation was highly successful and that the relevant professional skills and expertise of construction managers can be applied at all stages of disaster management, including flooding. This practice has not been the case in the UK; there has been some progression in the form of including construction managers in debates regarding climate change and sustainability, however there has been minimal involvement of construction managers in regards to PLFA (Bosher *et al.*, 2007; ABI, 2010). According to Bosher *et al.* (2009) and Haigh and Amaratunga (2010) construction managers can play a vital role in PLFA. Their involvement in the industry is important in understanding a resilient built environment, especially in the increase of flooding. A study by Emissions Strategy Solutions (2011), found that construction managers advice could be effective in raising awareness for PLFA. It would not only create a potential income source but also a value addition for their service. To support this statement, a survey by Wedawatta *et al.*, (2012) says that in the future communities will rely more on the advice and assistance of building contractor - i.e. construction managers.

The increase in climate change, the global market for PLFA is worth £2.1 billion (DEFRA, 2013b), and the forecasted UK growth in this area is at a rate of 7.1% by 2017-18 (DEFRA, 2013b). The market is expanding and it is an area where construction managers will benefit substantially, but there is a lack of evidence that suggest that they have. A statement by Economics of Climate Resilience Project, suggests that this gap is due to construction managers lacking in the relevant knowledge and competencies to carry out PLFA advice (DEFRA, 2013b). There is also no formally recognised qualification, national training or approved standard for PLFA (DEFRA, 2014).

### **3. RESEARCH METHOD**

#### **3.1. DATA COLLECTION**

A qualitative approach was adopted in conducting the primary research for this paper. This method has been known to provide details about human behaviour, emotions, and personality characteristics that quantitative studies cannot match. Research sought to obtain complex textual description of construction managers' experience and knowledge in PLFA, whilst simultaneously obtaining their personal opinions and emotions. Semi-structured interviews were conducted, as the research questions in hand favoured this method. Semi structured interviews allowed to pursue an idea or response in more detail (Gill *et al.*, 2008). This form of gathering information has been successful in previous studies where professionals were questioned on disaster related issues, for example Malalgoda *et al.* (2016). Themes covered in semi-structured interviews included flood adaptation products/services provided, knowledge requirements to provide these, barriers and enablers to entry, how to provide flood adaptation knowledge and qualifications, etc.

#### **3.2. INTERVIEW SAMPLE**

There were a total of ten participants that were interviewed, all from different organisations and are actively involved in providing flood adaptation products/services, and are from companies specialised in those aspects. Out of these, 4 respondents had over 5 years of experience working in the flood industry. Although approximately half of the interviewees had around 2 years of experience in the flooding field, there were no significant differences among the responses provided. The sample is consistent with the expansion of flood adaptation industry during recent years, where new/experienced professionals have entered the industry quite recently.

Table 1: Interview Participants

Code	Job Title	Qualifications	No. of Years in Construction Industry	No. of Years in the Flood Industry
Participant 1	UK Manager	<ul style="list-style-type: none"> <li>▪ MA in language – French, English and History</li> </ul>	5 Years	5 Years
Participant 2	Operations Manager	<ul style="list-style-type: none"> <li>▪ No formal qualifications</li> </ul>	25 Years	2 Years
Participant 3	Divisional Director	<ul style="list-style-type: none"> <li>▪ Masters in Civil and Environmental Engineering</li> <li>▪ Member of ICE and CIWEM</li> </ul>	23 Years	17-18 years
Participant 4	Director/ Construction Manager	<ul style="list-style-type: none"> <li>▪ NVQ in bricklaying</li> <li>▪ Flood Professionals BSI KiteMark course</li> </ul>	20 Years	10 Years
Participant 5	Associate in Civil Structures	<ul style="list-style-type: none"> <li>▪ CEng MICE</li> </ul>	18 Years	7 years
Participant 6	Director/ Construction Manager	<ul style="list-style-type: none"> <li>▪ BEPEC Course</li> <li>▪ BSI Accredited Surveyor</li> </ul>	27 years	4 Years
Participant 7	Director/ Construction Manager	<ul style="list-style-type: none"> <li>▪ BSI Accredited Surveyor</li> <li>▪ BPEC Certified</li> </ul>	8 Years	2 Years
Participant 8	Marketing and Advertising in Flood Adaptation	<ul style="list-style-type: none"> <li>▪ BSc Communication Studies, Marketing Communications</li> </ul>	5 years	2 Years
Participant 9	Director/ Construction Manger	<ul style="list-style-type: none"> <li>▪ Qualified Joiner</li> <li>▪ BEPEC Accredited</li> <li>▪ BSI Kitemark Accredited</li> </ul>	37 years	4 Years
Participant 10	Director/ Construction Manager	<ul style="list-style-type: none"> <li>▪ No formal qualification</li> </ul>	20 Years	2.5 Years

### 3.4. DATA ANALYSIS

The data obtained were analysed using a thematic analysis approach. It is a qualitative analytic method for identifying, analysing and reporting patterns (themes) with data (Braun and Clarke, 2006). This method allowed organising and describing the qualitative data obtained from the semi-structured interviews in detail and interpreting various aspects of the research topic. Using themes, enabled to capture important data in relation to the research question and represent levels of patterns with the data obtained from semi-structured interviews. An example where this has been carried out is a report by DEFRA (2012) on the evaluation property level flood protection scheme, where it worked really well. In the analysis, determining the percentage for each products or service is based on the number of interviewees that mention each product/service. For instance out of 10 participants interviewed, if 7 participants mention a certain products/service, it is then classed as 70%.

## 4. FINDINGS AND ANALYSIS

### 4.1. CONSTRUCTION MANAGERS AND FLOOD ADAPTION INDUSTRY

Participants were asked whether they thought construction managers could enter the PLFA industry, and 9 out of 10 participants felt that they could. Participant 4 commented “*construction managers could definitely enter this industry; they have the right background knowledge and skill set to enter.*” Participant 6 supported the statement by mentioning that “*construction managers can definitely enter this area; they*

*have the building knowledge and the skills to deal with complex and sophisticated projects on demand.”* Although there is a lack of evidence that suggests that construction managers have played a key role in flood adaptation, the opinions of fellow construction professionals suggest that they could play a key role within this industry. Furthermore, the reports by Haigh and Amaratunga (2010); Emissions Strategy Solutions (2011) and Wedawatta *et al.*, (2012) back the participants’ statement that construction managers’ involvement within this industry could be highly beneficial for both the industry and the professionals themselves.

The remaining participant interviewed did not entirely disagree with this view. For instance, Participant 5 mentioned that *“it’s not that construction managers won’t be able to enter this industry, it’s just that their skills set would come to better use on larger projects.”*

#### 4.2. FLOOD ADAPTATION PRODUCTS

In order to identify the ability required for construction managers to provide PLFA advice, participants were asked the products and services they or their organisation provided in relation to PLFA.

Table 2: Flood Adaptation Products

Products	Participants who mentioned they provide this product(%)
Flood Barriers	70%
Flood Sump & Pump System	100%
Flood Walls	60%
Flood Doors	70%
Flood Gate	90%
Flood Accessories	100%
BSI Kitemark Products	50%
Both Resistance & Resilience Measures	90%

Table 2 identifies the most common products mentioned by all participants; the products identified are from the interview data; the percentage gives the identification of the number of individuals that mentioned each product. The results showed that organisations provided similar products; the variation was that some firms used BSI Kitemark products, whilst others either manufactured their own or used various different manufacturers. The interesting notion was the contrasting opinion on the standard of products between some participants. For instance, participant 1 who works for a flood barriers manufacturing firm mentions that *“We manufacture our own products; they have been tested to meet the highest standard and efficiency in comparison to what is out there.”* However, other participants felt completely different; participant 4 stated that *“We provide our customers with only BSI Kitemark products, because we feel they provide the highest standards.”* This is supported by participant 6 who stated *“I only use Kitemark products because I find they actually work”*. There is a conflict of opinion in which products are the most effective to use in PLFA. There could be several reasons behind this, one which is mentioned by participant 7 and 8 that flood products are not off the shelf; they are bespoke, so every house would have different measurements and requirements. As a result, it is difficult to have one set of product for everyone; it all depends on the property, area, and flood conditions. An alternative reason could be that the flooding issue is relatively new in the UK especially in some districts, and there are no set guidelines by the government or agencies to what type or standard a flood product should adhere to. Instead professionals are working on the basis of their personal experience and manufacturers’ influences. If this is the case, it is not the most effective way forward for the industry, as a report by the Environment Agency and DEFRA (2012), reveals that construction professionals lacked the necessary experience and training to deal effectively with flood related products and services, and may not yet have the skills necessary to understand the standard that is required for PLFA products. Additionally, participant 9 mentioned that *“All manufacturers think their products are best on the market, while it may be for certain situations, it might not be for others. So it needs to get away from the manufacturers and more into independent advisory.”*

The difference in opinion regarding products could be the source of confusion for construction professionals and homeowners. There is a requirement for the government or regulatory body to implement a standard of quality and efficiency for manufacturers to work against and for PLFA professionals to adhere to. The principle could be similar to building standards and regulations, and this will allow homeowners to have confidence in the products available on the market.

#### 4.3. FLOOD ADAPTATION SERVICES

Participants were all asked the services they or their organisation provided in regards to flood adaptation. Table 3 depicts the most common services mentioned by participants; the services identified are from the interview data; the percentage gives the identification of the number of individuals that mentioned each service.

Table 3: Flood Adaptation Services

Services	Participants who mentioned they provide this service (%)
Flood Surveys & Advice	100%
Environmental Impact Assessment	40%
Flood Training Service	30%
Feasibility Study	40%
Detail Designs	60%
Technical Design	40%
Drainage Design	70%
Fluvial and GIS Modelling	40%
Risk Assessment and Site Investigations	60%
Structural Work	60%
Hydrology, Ecology and Water Quality	50%
Groundwater and Catchment Management	60%

The results indicated that there are several similarities between participants in relation to the services they provided, for example flood surveys and advice. However, what was noticed was the correlation between participants who worked for SME's mentioned similar services (flood surveys/advice, detail and drainage designs, and ground/catchment management), and participants who worked for large organisation did the same (environmental impact assessments, feasibility studies, technical design, risk assessment/site investigations, structural work and hydrology, ecology and water quality). These results give an indication about the flood industry, and the service that could be provided may depend on the size of the organisation. This could be due to several reasons, one which could be that SME's have limited capital and resources to provide complex and sophisticated service in comparison to larger firms. For instance, larger firms may have a variety of experienced employees from different backgrounds which enables them to provide different services. This variation could make it difficult for professional such as construction managers to understand what specific knowledge or competencies are required in order to provide PLFA advice. The industry as a whole, including the government and agencies will need to address this issue to ensure that smaller businesses have the opportunity to learn and develop key skills to be able to provide a variety of service to compete within the industry. This will also make it clearer for professionals entering the industry the specific knowledge and competencies required to enter the market.

#### 4.4. BARRIERS FOR CONSTRUCTION MANAGERS IN PLFA INDUSTRY

Participants were asked the barriers they felt that prevented construction managers to enter into the PLFA industry. The findings show that a wider majority of participants recognised market failure and lack of information as key barriers. Participant 1 mentioned that *“the flooding issue is relatively new within the UK in comparison to other countries, resulting in the lack of information available for construction professionals to take a step towards entering this market professionally and legally.”* Participant 2 supports this by stating that *“the information and guidance out there is limited to give a clear indication*

*for construction managers to enter into the PLFA market.”* Participant 4 continues this further stating that *“not all professionals understand the processes and legalities involved to enter this industry. I was fortunate to find Flood Professionals BSI KiteMark course that helped explain all that, but these courses aren’t accessible around the country. The government and agencies involved haven’t done sufficient enough to provide the relevant information and guidance for professionals to take a step into this industry without taking a personal risk.”* Participant 2 continues to say that *“the market failure has prevented professionals such as construction managers to enter the industry and stay within their comfort zones, but this is not the underlining issue, the lack of professionals has encouraged the so called unprofessional builders to enter and provide low quality workmanship which not only cost consumers additional money to rectify but puts their lives at risk.”* The statements from participants in the PLFA industry suggest that in the UK there has been a lack of support, processes and guidance for construction professionals to enter into PLFA market. The professionals in the industry have mentioned that *“it has not been an easy”* process to enter, but have been down to their perseverance and determination that has enabled them to enter the industry.

The finding also shows that a majority of participants mentioned that the lack of support towards qualifications, knowledge and training required were a barrier for construction managers to enter into the PLFA industry. Participant 1 mentions that *“construction managers have an all rounded knowledge of the built environment, but the PLFA sector requires specific qualifications, training and knowledge, not having the support in obtaining these criteria’s will defer any professional.”* Participants 6 continue this further by stating that *“not understanding the qualifications, knowledge and training required to enter this industry could be a huge barrier for not only construction managers, but for any construction professional. It will prevent them from understanding if they have the capabilities and knowledge to take a step towards this industry.”* This is something the government and agencies will need to address in order to attract professionals towards this industry and prevent cowboy builders dominating the field.

Finally, the two other barriers mentioned by participants were behavioural barriers and lack of incentive. Regarding behavioural barriers participant 1 stated that *“professionals may feel that as they have never worked in this industry, they may not have the capabilities or expertise- thus they don’t wish to explore this area.”* In regards to the ‘lack of incentive’ barrier, participant 2 states *“if the government provided some sort of training grant or equipment funding scheme, it would have encouraged construction managers to take a leap into this area”*. Participant 3 continues this and states that *“better government incentive schemes need to be introduced to encourage construction managers to enter into the PLFA market, otherwise they will continue to stay within their markets they feel comfortable.”*

## 5. CONCLUSION

Research from several reports and participants interviewed suggest that construction managers can play a vital role in PLFA. Their involvement could be effective in understanding a resilient built environment and raising awareness for the industry. Additionally it would not only create a potential income source but also a value addition for their service. The primary research suggests that a wider majority of participants in the PLFA field believe that construction managers could enter the PLFA industry and that future communities will rely more on their advice and assistance. However, there has been a lack of evidence to suggest that they have played a key role. What has been identified is that there has been some progression in including construction managers in debates regarding climate change and sustainability, however there has been minimal involvement in regards to PLFA.

There are several barriers that have resulted in the lack of involvement of construction managers in the PLFA industry. The primary research suggests that a majority if participants recognised market failure and lack of information to be key barriers. It has not only resulted in construction managers to stay within their comfort zones, but has also encouraged unprofessional builders to enter the industry, adding health and safety risks as another concern. The recommended option would be for the government to provide the relevant information required for construction professionals regarding the industry. Secondly, put in place strategies to control, support and monitor construction professionals to enter the PLFA industry with the relevant qualifications, insurance and documentations.



The lack of support towards qualification, knowledge and training required were mentioned by both primary and secondary data as barriers to PLFA industry. The recommendation would be that the government and relevant professional bodies to address this issue by implementing recognised qualifications, national training or approved standard for PLFA. Not only that, it needs to be formally available and accessible to all professionals in order to attract them towards this industry and prevent cowboy builders dominating the field.

Finally, behavioural and lack of incentive were mentioned by participants as barriers to enter into the PLFA market. In order to mitigate this and attract construction managers, the government and appointed bodies need to implement strategies to provide information, guidance and support to educate construction professionals about the PLFA market and how their skill-set could be relevant within the industry. Furthermore, an incentive programme towards helping professionals start in this industry will encourage them to take the initial step.

To understand the ability required for construction managers to provide PLFA advice, participants were asked the products and services they provided in relation to PLFA. The results showed various opinions to which products are the most effective. With this in mind, the recommendation would be for the government or regulatory body to implement a standard of quality and efficiency for manufacturers to work against and for flood adaptation professionals to adhere to. The principle could be similar to building standards and regulations, and this will allow homeowners to have confidence in the products available on the market. In relation to services, the difference noticed is the separation in the services that is provided in relation to the size and resources of an organisation. Based on this the recommendation would be for the government to ensure that smaller businesses have the opportunity to learn and develop key skills to be able to provide a variety of service to compete within the industry. Additionally, it will make it clearer for professionals entering the industry the specific knowledge and competencies required to enter the market.

For further research, the recommendation would be to look into the knowledge and competencies required for construction managers to provide PLFA advice, because the research obtained indicates that at the moment construction managers' lack of relevant knowledge and competencies required to provide PLFA advice. Another recommendation would be suitability and effectiveness of flood adaptation products; because this research indicates that at the moment there is a difference of opinion between professionals to what products are suitable for certain flood adaptation measures.

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