APPENDIX WORK PACKAGE 3

Appendix 3.1: Deliverable 3.1 Update of the mapping of insurance regimes

Based on the information gathered during the Elios 1 pilot project mapping, this study will first update the information about the current different regimes in force in the EU-27.

In a second time, we will extend this pure update of the legal framework made in Elios 1 to market considerations with the help of a questionnaire (preliminary version presented in appendix).

With the final objective of sharing valuable information between the actors of construction insurance the information presented should give answers to the following questions for the selected countries:

- What are the legal requirements in order to define the local risks of operation?
- What guarantees are mandatory? What is covered?
- How do I get insured (who to contact, what information is required, what quality signs are valued)?

1.1 Selected construction insurance schemes

Considering in first place the object of the study, i.e. eco-technologies, and according to the tender, we chose to ignore in our assessment property insurance guarantees. Those guarantees protect from risks that are not necessarily linked to inherent defects of the construction work, and therefore do not deal with the innovative character of the object of this study. The study will focus essentially on liability insurance, whether general Third Party Liability (TPL), Professional Indemnity (PI) or long term Inherent Defect Insurance (IDI).

Considering the purpose of the study, i.e. access to insurance for SME's, we also chose to ignore guarantees taking place before handover (completion of construction) that are widely common and not closely linked with the technology. Therefore we will not assess the Third Party Liability guarantees during construction. Manufacturers' product guarantees are also ignored for the same reasons.

We will also try to survey the existing tax incentives and more generally the regulatory framework regarding incentives for sustainable constructions, with the difficulty that these incentives can change from one day to the next.

Considering this scope for the study, we will focus our analysis toward the following guarantees, on its post completion part regarding Third Party Liability (see "how insurance works", 2012/04/17, by Insurance Europe[1]):

- Third Party Liability (TPL)
- Professional Indemnity (PI)
- Inherent Defect Insurance (IDI)

[1] http://www.insuranceeurope.eu/publications/publications-web

In order to clarify the content of those guarantees, please find hereafter some general definitions:

- Third Party Liability (TPL)

TPL is a liability that covers bodily injury and/or material damage caused by the insured, whether individuals or corporations (our case), to a third party as a result of action or inaction, or negligence, and which injury and/or damage must be remedied.

- Professional Indemnity (PI)

PI insurance, also called professional liability insurance, is a form of liability insurance that helps protect professional advice and service-providing individuals and companies from bearing the full cost of defending against a negligence claim made by a client, and damages awarded in such a civil lawsuit. The coverage focuses on alleged failure to perform on the part of, financial loss caused by, and **error or omission** in the service or product sold by the policyholder. These are potential causes for legal action that would not be covered by a more general liability insurance policy which addresses more direct forms of harm. Coverage does not include criminal prosecution, nor a wide range of potential liabilities under civil law which may be subject to other forms of insurance.

- Inherent Defect Insurance (IDI)

IDI is a long-term insurance covering damages to the construction which result from an inherent defect discovered after completion and after the owner has taken over the property.
Inherent Defect: any defect in the structural works which is attributable to a defect in design or workmanship or materials.

Structural works: all internal and external load bearing elements essential to the stability and strength of the premises (including subsidence / heave of the soil).

While those guarantees rely on the same basis, they may have differential characteristics depending on their local implementation. Thus, we may find the following cases:

- Existence of different liability regime based on legal or contractual obligations.
- Possible choice of an applying legal framework that is different from the framework of the Member State of the insured, considering the non-application of the "overriding mandatory provision" to insurance, according to the "Law applicable to contractual obligations (Rome I)"[2] (Article 7 - Insurance contracts, Article 9 - Overriding mandatory provision).
- The regime can be based on an obligation of result or obligation of mean. Within the same regime, the obligation can change depending of the type of insured (e.g. results for contractor and mean for the designers).
- Insurance can be compulsory or not.
- Scope of the guaranties :
  + Type of construction works concerned (by the law)
  + Amount covered / possibility to limit the indemnity
- Legal definition of "handover" or "date of completion", determining the time limits of the guarantees.
- Length of the guarantees (IDI can be of 5 to 12 years long).
- Liability based on no fault or on proven fault, determining where the burden of proof lies.
- Exemption clauses
- With or without Recourse

[2] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:177:0006:0016:en:PDF

- Claim management : claims made / risk attaching (see definitions in annex)
- Legal delays for claim management
- Limitation period to activate the guarantees

1.2 Energy performance guarantees

Energy performance guarantees is a particular case of insurance since our first findings show that Energy Performance Guarantees are almost inexistent in the European insurance market. This conclusion will of course need to be confirmed with further discussions with insurers.

Nonetheless some financial protection seems to be existing, essentially in Germany. That situation is assessed in the 2nd deliverable, "Financial mechanisms for protection of investors' interest".

At the moment, under the growing trend of sustainable development construction, notably through its Grenelle laws, and its very extended inherent defect guarantees (unfit for use), France institutions are in a process of reflexion and definition of how energy performance could be guaranteed.

For now, major insurers offer guarantees on malfunctioning of equipment, or machinery breakdown (MB), with possible business interruption (BI) extensions, but not on real performance guarantees.

Some brokers are proposing some energy performance guarantees, for specific markets such as the installation of efficient boilers within private renovation works, but it did not find commercial success yet, mainly because of a lack of the demand.

In Germany, if a small offer exists, proposed by a few brokers or reinsurers (Munich Re) the number of contracts appears to be small and the targeted client to be essentially big manufacturers.

Nonetheless a real activity of performance guarantees seems to exist outside of insurance. We are expecting to exchange with the EIFER institute to explore the real activity on this market in regard of SME's operations.

1.3 Mapping of insurance regimes results

For information, the update of the "mapping of insurance regimes" information, gathered during the Elios 1 study, can be found in the Appendix.

Note: as Croatia is preparing to join the EU on 01/07/2013 the update of the mapping shall include it.

Preliminary results of the survey made through the questionnaire, is that there is no specific insurance market designed for self-employed builders and small building firms in the field of eco-technology. These are considered like the others stakeholders involved in the business of construction. The insurance market doesn't currently take into account the specificities of their own actions.

In that framework, the results of the survey reflect the situation of the building insurance market in the European Union: it varies according to the different countries, especially when it comes to the insurance market after construction handover.

1.3.1 Guarantees Before handover

Indeed, before handover, some rather similar covers are available in most countries (except for financial loss coverage not directly related to the material damage). The whole building can be covered in case of material damages, with low levels of deductibles.

The Cover of damages caused by the contractor to third parties before construction handover is available everywhere in Europe in a voluntary basis (except in Slovenia where such cover is mandatory).

These types of insurance covers are generally called CAR or EAR (Contractors All Risk Insurance or Erection All Risk insurance). The CAR policy may be issued by the parties involved in the project but primarily by Principal or by the Contractor engaged for the work and usually encompasses all sub-contractors including self-employed builders and small building firms in the field of eco-technology.

Insurances of financial loss directly related to the material damage are also generally available. However in certain countries, these kinds of covers aren't so easily found (Czech rep, Ireland, Italy).

In summary:

- On the contrary, a cover of financial loss not directly related to the material damages less frequent. This kind of cover exists particularly in France and in the United-Kingdom.
- From a legal perspective, the amounts covered can be limited, but with an exception: in the Netherlands, the minimum amount covered is 1 M€.
- Most of the times the deductibles are affordable, even for self-employed builders and small building firms (between 500 € and 2 500 €).
- Damages to the building under construction are insurable everywhere (exc. Ireland), the amount covered is equal to the cost of building.
- Completion of the construction in case of failure of the contractor isn't guaranteed in most countries, (except France, Romania, Slovenia and the Netherland, where the guarantee is delivered by banks).

1.3.2 Guarantees After handover

After handover however, some significant differences appear concerning the insurance market and the types of cover of the inherent defects that could affect the building. Nevertheless, the liability of the contractors in case of damage caused by their work to third parties is covered, on a voluntary basis, throughout the European Union as before hangover. On this subject, the insurance markets are comparable, because the legal regimes are quite similar.

After construction handover, damages caused by the contractor's work to third parties are covered on a voluntary basis almost everywhere. The levels of deductibles are generally low, between € 500 and € 2 500, even if these deductibles, from a legal standpoint, are allowed without any limit.

Damages to the whole building after handover are covered in very different ways according to the different countries. Basically, it is possible to cover these kinds of risks on a voluntary basis, and in certain countries, like France or Spain (in case of housing), it is mandatory. Names of cover are rather different, reflecting the variety of systems.

In contrast, the coverage of the damages to the work carried out by the contractor themselves seem to be unavailable in many countries (such as the Germany, Czech Republic, Greece, Slovakia, ...). And when it is present, it is usually limited to mechanical resistance and stability (except in France) with some possible extensions on waterproofing (United Kingdom, Spain).

In summary:

- From a legal point of view, the amounts covered can be limited.
- There are systematically deductibles allowed and implemented in these covers, most of the time they don't exceed € 2 500.

- There isn't any cover for the guarantee of the builders' obligation to complete the work or put right any defects of the works right after handover, except in France, Greece, Romania and Slovenia, and on a voluntary basis only.
- Hygiene, Health and/or Environment liability may be covered according to the country.
- Safety and accessibility of the building (for defects arising from the construction) aren't covered in most countries (except Romania, Slovenia and France, in the framework of the decennial liability).
- Sound insulation, like safety and accessibility of the building, isn't covered in most countries (except in Belgium, Luxembourg and France, again in the framework of the decennial liability).
- Lack of energy performance is generally not covered.
- It's possible to find a limited and specific cover of lack of energy performance almost exclusively in Germany, France, Belgium and Luxembourg) when the failure is caused by a malfunction of the system. The level of energy performance (consumption) is usually not covered (except in Belgium and Luxembourg).
- There is no cover for energy savings and heat retention nor for noncompliance / conformity with standards (except in France, in the framework of the decennial liability and only if the non-compliance or conformity with standard causes an obstacle to the use of the building).
- Financial loss directly related to the material damage can be covered in many countries, like United-Kingdom, France, Romania, Slovenia, the Czech Republic, Belgium ...
- The type of construction covers offered to foreign companies is mainly on single cover, but in certain countries, annual cover or even open cover are available.

1.3.3 Energy performance guarantees

As for the energy performance, there is no real cover except in case of material damage and only in very few countries.

1.4 Overview of the different situations

In order to focus our analyses and define more precisely the object of the Elios study we will first make a classification of the different legal frameworks situations and insurance situations.
The extent of the mapping toward "the insurance market state of play" should support the choice of the categorization criteria of the different national situations.

Based on the Elios 1 "overview of national liability and insurance systems in 27 EU Member States", we can already draft two important categories of situations: countries where an Inherent Defect Insurance (IDI) long term cover is widespread or even mandatory and other countries, with no post completion covers or very limited covers.

Countries with "widespread" IDI:

Belgium	Denmark	Finland	France	Ireland
Italy	Latvia	Netherlands	Spain	Sweden
United Kingdom				

Other countries:

Austria	Bulgaria	Cyprus	Czech Republic	Estonia	Germany
Greece	Hungary	Lithuania	Luxembourg	Malta	Poland
Portugal	Romania	Slovakia	Slovenia		

It is also interesting to point out that the existence of IDI on a market is disconnected from the national legal schemes.

Thus we encounter a legal compulsory system in the following countries:

Denmark	Finland	France	Italy	Latvia
Netherlands	Spain	Sweden		

While in the following ones the insurance is voluntary:

Ireland	United Kingdom

1.5 Construction Insurance Market

As indicated we should be able to present a "market state of play" in order to highlight existing differences, including:

- Total national volume of construction insurance for Inherent Defect Insurance (IDI). Third Party Liability (TPL) and Professional Indemnity (PI) level of premiums are usually embedded in the General Liability numbers and are not specifically available for construction;
- Scope of the covers, including: description of covered works, definition of "equipments" (what is really covered), existence of limits;
- Example of covers;
- Recourse mechanisms with identification where final responsibilities lie (use of subrogation);
- Use of Freedom to Provide Service;
- Use of Project by project policy vs. open covers;
- Systemic risk (serial);
- What is the covered value: value of a new work, rebuilt value, aged value?

Supported by the "State of the art of insurance schemes in the EU-27 and transition paths" analysis, it should appear that the main criterion to distinguish the situations is the general development of the country, whether it be from a wealth point of view or the size of the insurance markets based on an historic development of quality in construction.

This assumption is notably based on the fact that insurance is expensive and that insurers are mainly interested by what they call mature markets or wide spread products which can generate profits. If more emerging markets might be of interest for an insurer it is by their growing potential, but never at the expense of a limited and controlled risk.

This development criterion is reflected at a European level by a clear distinction between western and eastern countries. Eastern countries seem to rely on simple liability with limited covers while western countries implemented more extended covers like IDI (with the notable exception of Germany which developed a specific set of responsibilities in order to achieve quality in construction).

As already underlined, within western countries, each country seems to have very specific insurance schemes, mostly around IDI covers. Hence a 2nd criterion of classification seems to be the type of IDI coverage those rich countries have historically found through their custom practise of insurance.

Interestingly beyond our acknowledgement of independency between legal framework and existence of IDI, we observe that compulsory insurance does not necessarily means widespread subscription of IDI by the public. Italy is in this regard a good example, while theoretically IDI is compulsory on housing, the market stays very small. On the contrary Spain's market is now nearly inexistent because of the economic situation and not the consumers' behaviour. The IDI Spanish direct premiums were around 400 M€/year a few years ago.

In comparison, with its historic leadership regarding IDI, France maintain a level of direct premium of 2 500 M€.

1.6 Links with single points of contact

As expressed in the Services Directive 2006/123/EC:

"(48) In order to further simplify administrative procedures, it is appropriate to ensure that each provider has a single point through which he can complete all procedures and formalities (hereinafter referred to as 'points of single contact'). [...]
Art. 21 [...] Where appropriate, advice from the competent authorities shall include a simple step-by-step guide. Information and assistance shall be provided in a clear and unambiguous manner, shall be easily accessible at a distance, including by electronic means, and shall be kept up to date. [...]"

In other words, each country should provide accessible information notably about insurance subscription on its territory through a point of single contact.

One of the major difficulties in providing centralized information regarding insurance through this "single points of contact" is that the requirement of the service directive applies to "the competent authorities" of the countries. It is the governments that must provide information, about all procedures, including insurance. Consequently the insurance federations are not directly involved in the procedure, but rather subcontractors providing information to feed the "single points of contact".

Hence, even though the list of "single points of contact" can actually be found on the related European Commission internet site[3], the information provided by the governments regarding insurance suffers some serious problems of clarity and readability for non-specialists. Some drawbacks were already pointed out in an EC study called "*The functioning and usability of the Points of Single Contact under the Services Directive - State of Play and Way Forward*", Deloitte and Tech4i2, 21/01/2012[4].

In fact, to our knowledge, companies prefer to contact insurers or insurance federations directly without knowledge of this access tool or of the linked national information. Nonetheless, from the Elios 2 perspective, the EC internet site is a great opportunity of providing centralized access to information about insurance throughout Europe. We therefore recommend sharing and promoting this internet resource (see deliverable 3.6).

[3] http://ec.europa.eu/internal_market/eu-go/
http://ec.europa.eu/internal_market/eu-go/index_en.htm

[4] http://ec.europa.eu/internal_market/services/docs/services-dir/study_on_points/final_report_en.pdf

Appendix 3.2: Deliverable 3.2 : Financial mechanisms for protection of investor's interest

Based on the first results of our exchanges with insurers, this task involves the following processes, carried out in parallel with the update of the mapping:

a) Identification of the different existing financial instruments aimed to the protection of construction works, notably other than insurance. This covers a wide range of public and private steering instruments such as insurance schemes, regulation, subsidy schemes, etc.

b) We will outline of the specific hurdles existing in the insurance of construction innovation and how the industry did in the past to handle innovation through a case study. The chosen technology is "structural sealant glazing" (SSG) now widely used in curtain walls.

2.1 Energy Performance Insurance

2.1.1 Energy Savings Insurance (ESI)

For instance, the EC report "Financing Energy Efficiency: Forging the link between financing and project implementation"[5] made in May 2010, indicates:

"Energy Savings Insurance (ESI) is a formal insurance contract between an insurer and either the building owner or third-party provider of energy services. In exchange for a premium, the insurer agrees to pay any shortfall in energy savings below a pre-agreed baseline, less a deductible. Pricing is typically expressed as a percentage of energy savings over the life of the contract, although it is sometimes expressed as a percentage of project cost. The premium is paid once, in the first year of operation. Such policies are non-cancellable, so the owner is guaranteed to have access to the insurance for the originally agreed contract term. Energy saving insurances typically insures annual savings expectations (a "volumetric" approach). Energy-savings insurance can reduce the net cost of energy-saving projects by reducing the interest rates charged by lenders, and by increasing the level of savings through quality control. [...]
ESI is widely practiced in Canada and in the US; in Europe the global market of risk transfer is slowly growing up, but insurance products such as ESI are still limited. In the US several insurance companies already offer ESI, which traditionally has been used to guarantee power reductions at retrofitted buildings. State governments have led ESI efforts, with several requiring such insurance from firms that provide energy management services in state-owned facilities."

2.1.2 Equipment Performance Insurance

On the contrary to ESI, it appears that some real performance insurance exists on specific equipment. It is essentially the case for photovoltaic panels, which are the object of a quite extensive offer (ex: Solar Insurance & Finance - Solarif[6], which operates in various European countries).
Even though this insurance offer may appear as a success, it remains focused on a specific system and can hardly be extended to a whole construction. The problem of insuring performance of a building is far more complex and represents a huge challenge as we will see in the following paragraphs.

2.1.3 Inherent Energy Performance Guarantees

[5] http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf
[6] http://dev.solarif.com/sites/all/bestanden/fck/brochure%20Performance%20output%20warranty.pdf

A new type of guarantees may appear on the French market which is in the process of excluding pure Energy Performance Guarantee from its decennial compulsory regulation.

This Inherent Energy Performance Guarantee should be limited to Energy Performance failure caused by the elements of the building therefore excluding all losses linked to use of appliances or heating habits.

The exclusion from the legislation is not yet completed, but some developments should be done before the end of this study.

2.2 Energy Performance Contracts (EPC)

If ESI is an insurance protection, other forms of contractual financial protection exist, commonly referred to as Energy Performance Contracts (EPC).

"An EPC is a performance-based procurement method and financial mechanism for building renewal whereby utility bill savings that result from the installation of new building systems (reducing energy use) pay for the cost of the building renewal project. A "Guaranteed Energy Savings" Performance Contract includes language that obligates the contractor, a qualified Energy Services Company (ESCo), to pay the difference if at any time the savings fall short of the guarantee."[7]

Indeed EPCs are very attractive since for the customer the cost of the improvements' investment is paid back from the savings, while the risk of the savings falling short is bared by the ESCo.

For more explanations see "A guide to Energy Performance Contracts and Guarantees"[8] from the Sustainable Energy Authority of Ireland.

It is clear that EPC market is essentially aimed to the industrial and corporate buildings, where:

- The construction process is often a Build-Operate-Transfer (BOT) project type, where design, construction methods and building operation (including maintenance) are totally integrated and assessed as a whole (from the very beginning of the project).
- The energy use of the building is organized, with a defined range of "normal activity". Single users' behaviour have nearly no impact on the effective energy consumption, hence performance, of the building.

Therefore this type of protection doesn't totally satisfy one of the underlying goals of the Elios project which is to promote eco-technologies' activity, including when intended for housing.

Even though, as stated out here before, apart from self-financial protection, i.e. auto-insurance, at this stage of the study, Energy Performance Guarantees appear to be the only existing non-insurance general protection in Europe.

On the other hand, the need for an equivalent insurance protection grows rapidly in conjunction with the development of Energy Performance Contracts throughout Europe[9], at the moment, pure insurance offer seems to fail in its attempt to cover completely these new requirements.

We will see in following paragraphs the reasons underlying this situation and where non insurance solutions exist.

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[7] http://energyperformancecontracting.org/
[8] http://www.seai.ie/Your_Business/Public_Sector/Energy_Performance_Contacts_and_Guarantees.pdf
[9] http://www.enhr2011.com/sites/default/files/paper-nieboer-ws11.pdf

2.3 Concept of conventional vs. real performance

Conventional performance is the theoretical performance of a construction work, based on the technical characteristics of the construction, under standard conditions of use (set of usage rules and maintenance requirements made by the designer).

It has to be opposed to the real effective performance of the building, expressed by the real energy consumption or production of the building. This performance is achieved according to the behaviour of the user, which depends on its own definition of what is normal, for instance in terms of perceived comfortable temperature or aeration of the rooms.

While the design and construction of the building is based on a conventional performance, the achieved performance is partly based on outstanding variables, behaviour of the user and effective climate conditions for example.

The Conventional Performance requirements are met if certain materials are used and follow a set of implementation rules. Therefore the effective real performance is not a requirement and can hardly be a factual objective in construction works where performance depends on the user's behaviour.

2.4 Measuring the energy performance

The 2010/31/EU[10] directive which aims to increase building energy performance requires from the state members to develop a calculation method in order to assess energy performance regarding the "energy performance of a building"[11].

By definition these theoretical tools rely on a very simplified appraisal of the real energy performance of a building not taking into account some important components of energy consumption (such as appliances).

Therefore they give results that can be quite far from real life results, even though they are absolutely consistent with material and mechanical laws.

The existence of various tools increases even more the gap between theoretical design rules used to build and the effective consumption.

The question therefore becomes: what type of energy performance can be insured? Is it possible to insure the gap between expected performance and observed performance?

If achieved, real performance can be simply measured by real energy consumption; it is not a desirable insurance product, since it does not cover inherent performance of the construction work.

On its side, conventional performance still needs a standard framework that could assess material, design and workmanship of the construction work.

Duration of the warranty

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[10] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

[11] "energy performance of a building" means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, inter alia, energy used for heating, cooling, ventilation, hot water and lighting

Considering the link between the energy performance and the equipment of the construction (notably HVAC) or the maintenance of the envelope of the building, the duration of the warranty has to be adjusted consistently with the lifespan of these elements.

2.5 Existing financial energy performance guarantees

We can already infer that existing non insurance protection is mainly aimed to office buildings, where the final use (or behaviour) can be defined independently from personal perception.

Secondly, these protections are the result of implementation by contractors of quality systems inside an integrated group of actors functioning as a whole. The different compounds of the final performance of the construction work, i.e. materials (products), design and workmanship must be assessed by the different responsible actors on common grounds. It has to be an integrated approach. The drawback of this approach is that it is specific to each set of actors, considering their habits and objectives (requirements).

In order to bypass the lack of guarantees from the private sector, some governments decided to encourage energy performance improvements through public financing, thus doing ESI and taking the risk of failure of the investment:

Germany:	KFW Bankengruppe[12]
United Kingdom:	The UK Green Investment Bank plc[13]
Belgium:	Fedesco[14] (for public buildings)

At a municipal level, Berlin City also carried out an Initiative through its Environmental Improvement Programme (EIP)[15]

2.6 Specific hurdles to insure innovation

Two major parallel hurdles can explain why it is so hard to insure innovation:

- The lack of historical claim:

  Without any claim history the insurer cannot rely on any statistical evaluation of the risk. As expressed otherwise, innovative products can only be assessed through a specific forecast of failure.

- The lack of risk assessment tool:

  Due to its novelty, the insurer has no clear technical view on the risk of failure of an innovative product. Hence, the insurer has no underwriting mean to evaluate the price of the cover.

2.7 An example of historical assessment of innovation by insurance

In order to better understand how eco-technologies could be assessed by the insurance industry, it is interesting to see how it has been done for another innovative technology in the past.
If we consider cladding technologies, the development of Structural Sealant Glazing (SSG) technology was one of the most striking innovations of the 80's.

12 https://www.kfw.de/kfw.de-2.html
13 http://www.greeninvestmentbank.com/
14 http://www.fedesco.be/
15 http://edz.bib.uni-mannheim.de/daten/edz-ma/esl/00/ef0013en.pdf

Looking back to construction insurance in the countries where water tightness was insured, we can outline two important lessons:

- Even for an innovative technology, it took quite a long time for the insurance industry to assess the risks of failure of this technology and find some risk criteria in order to make an appropriate pricing. In fact it appears that the definitive solution was to wait for a sufficient time to get a valuable return of experience on failure. The statistical approach was in fine applied.

- In order to assess the risk and find an insurance solution, the industry had to "create" a specific tool, i.e. find a relevant quality sign. The same occurred more recently in France for photovoltaic panels with the appearance of the pass innovation (emitted by the CSTB), with its green / red indicator.

Appendix 3.3: Deliverable 3.3 : Information needs about construction insurance

The following paragraph is only intended to draw a sketch of the future final content of the deliverable. This third study will present the construction insurance underwriting process in general, highlighting its specific information needs. Notably, it will try to clarify the risk assessment principles and the role of the Technical Inspection Service in this process.

3.1 "Sustainable development" works

In order to describe the process of underwriting and its information needs we first have to define the purpose of this process, i.e. the insured "sustainable development" works, object of the insurance.
A definition of a typology of construction works concerned by sustainable development, hereafter named "eco technologies" is already presented in WP2.

3.2 Construction Insurance Underwriting Process

The general underwriting process can be detailed through the following steps:

1 Global check if the insurance request complies with underwriting guidelines of the insurance company
2 Check if the insurance request fits in the level of interest of the insurance company
3 Detailed risk assessment by the insurer if necessary
4 Check if the risk falls within the treaties between insurer and reinsurer or needs facultative reinsurance (case by case approach)
5 In case of facultative reinsurance technical assessment, terms and conditions of the reinsurer
6 Establishment of terms and conditions by the insurance company

Therefore the insurance companies define their insurance guidelines and interest in regard of their global strategies and experience of the field. As free players in the market, the insurance companies are in their own right to use any technical criteria, independently from regulations.

3.3 Risk assessment principles

Based on the knowledge of the technical inspector, the insurer and the reinsurer in construction risk assessment:

- Description of the main risk analysis principles in construction insurance;
- Identification of the main technical information needs in the construction risk underwriting process for the different Construction Works categories.

3.3.1 Risk notion

a) Common terminology in insurance risk assessment

Risk:	1) Uncertainty arising from the possible occurrence of given events.
	2) The insured or the property to which an insurance policy relates. For example, a building is called a risk.
Uncertainty:	State, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequences, or likelihood.
Exposure:	Extent to which the construction work is subject to loss because of some hazard or contingency.

Level of risk:	Level of risk: Importance of the consequence of an event, otherwise noted: Level of risk = Exposure x Likelihood of occurrence.
MPL:	The Maximum Possible Loss is the worst loss that could possibly occur because of a single event.
Aggravation:	A circumstance which increases the risk of failure.

b) Definition of the notion of catastrophic risk

The frequency risk comes back on a regular basis while the catastrophic risk is the risk of occasional unusually high losses.
Without a long history, innovative technologies clearly belong to the catastrophic risk type.

Since there is not enough pathology feedback to be able to extract a statistical law regarding its failure, risk evaluation of innovation has to be made upon specific technical inherent risk assessment.

The analyst will have to focus on a predictive failure analysis based on his knowledge of the technology, through a qualitative approach.
On specific technologies the insurer can also get assistance from an external specialist.
This definition is supporting the uselessness of a statistical approach in risk assessment of innovation.

c) Concept of "systemic risk"

A systemic risk is a widespread damage caused by a unique default on a product widely used. It is still a catastrophic risk but with a widespread damage.
It is the risk that insurers fear the most, because a small cause has a great impact in terms of damage and amount of loss.

d) Different types of covers

Depending on the type of activity carried out by the contractor, the following different types of insurance covers is usually provided:

Type of cover	Conditions basis	Insurance object / insured activity
Single covers	conditions made on a project by project basis	occasional construction projects
Open covers	conditions agreed initially, declarative basis	heterogeneous projects
Annual covers	conditions made on a turnover basis	numerous / uniform projects

e) Concept of Not Current Technique

A Not Current Technique (NCT) is a technique without any accepted technical sign as relevant to assess the risk by the insurers.
For example in France, an innovative product that is outside national codes or framework, and that has no ATEC or recognized quality sign will be considered a NCT.
Those techniques need a specific insurance assessment to be covered since they are out of the "normal" insured works spectrum.

3.3.2 Stakeholders

Identification of the different stakeholders in the construction process that may be impacted by insurance:

- The project owner / The developers
- The manufacturer
- Designers including:

  - ✓ Architect;
  - ✓ Geologist, geotechnical engineer, hydrogeology and environmental engineering firms;
  - ✓ Engineering firms: structural engineering, ventilation engineering, heating engineering, acoustic engineering, electrical engineering;
- ➢ The contractors

3.3.3 Technical Inspection Service role

In order to assess the risks the insurers usually need the assistance of an independent supervisor or so-called Technical Inspection Service (TIS) or Technical Controller.
Our investigations show that insurers use a very narrow range of quality signs in their risk assessment.
If we consider quality signs as means to indicate a level of risk for the insurer, then the TIS assessment itself can be viewed as a quality sign.

a) Context of the Technical Inspection Service intervention

In order to assess the risks, the insurers usually need the assistance of an independent third party or so-called « building technical controller » who assesses the technical risks linked to the construction work to be built, so that the incidence of the damages guaranteed by the builders insurance is reduced.
These private control organizations, originally established on a voluntary basis, extended their activities to the regulatory building control scheme.
In recent years, the general trend is to enlist the services of an independent private technical control, which may be done in a different way according to the countries:

1- Delegation of building control activities from administrative authorities
In a number of countries, design and technical details control as well as on-site inspection during construction phase are partly delegated from administrative authorities to an independent third party for lack of means. These controls are meant to ascertain the compliance of the project with the regulatory requirements, mainly regarding the soundness of the construction work.

2- Technical requirements of the building regulations
The mandatory missions mainly apply to the soundness of the construction works and sometimes to fire safety, which are two requirements among the seven to be fulfilled (see appendix 1, Construction Product Regulation – prime requirements applicable to construction works). In France, other missions are compulsory such as anti-earthquake building practices and accessibility for disabled people.

3- Incentive from the insurer
The insurer may require a technical control when the works exceed a certain amount. This control mainly deals with the soundness of the construction work and is usually ordered by the contractor or the architect .
When it deals with building renovation or construction close to a neighbour, the insurer imposes the same mission for the existing or surroundings works that may be impacted.

4- Voluntary approach
To make sure the prime requirements such as noise pollution, thermal insulation and energy savings (CPR – appendix 1) are taken into account, the project owner may voluntarily order a mission to the technical Inspection.

TIS can hence be considered as 'quality signs' by insurance companies regarding their risk assessment procedures. Previous works nevertheless pointed out that different building control systems exist in Europe, althought their overall scheme do not differ from each other as much as could have been expected (see for example *Building Control Systems in Europe,* CEBC, 2006).

It therefore seemed relevant to proceed to in-depth analysis of TIS assessment processes across the EU. We hence developped a questionnaire (see appendix) and submitted it to different actors across the European Union.

The aim of the questionnaire is to gather information about the different Technical Inspection Service frameworks in the EU, focusing on following questions:

- in which cases do TIS proceed to conformity assessment or to technical risk assessment?
- are TIS required by the authorities (on a mandatory basis), by the project owner (on a voluntary basis) or by the insurance companies?
- are all basic requirements as defined by UE regulation n°305/2011 concerned by TIS assessments?
- at which stage of a construction project are TIS carried out?
- which kind of quality signs are used as criteria for TIS conformity or risk assessments?

As regulations and end-user warranties differ from one country (or even region within a country) to another, we use the EU regulation n°305/2011 as general framework, and supposed that conformity or technical risk assessment could be considered as carried out with respect tofollowing basic requirements:

0. construction work being fit for intended use,
1. mechanical resistance and stability,
2. safety in case of fire,
3. hygiene, health and the environment,
4. safety and accessibility in use,
5. protection against noise,
6. energy economy and heat retention,
7. sustainable use of natural resources.

We moreover keep in mind that ELIOS 2 deals with eco-technologies. It is therefore useful to remind our working hypothese: Eco-technologies for construction works can provide direct or indirect benefits for the building's environmental performance.

> *example 1 - **Wood fiber insulation** might be considered as an eco-technology as far as its energy payback time and use of natural resource show better environmental performances as e.g. rockwool insulation. In this case, this technology provides indirect benefits for the building's environmental performance as it replaces an existing current technique.*
>
> *example 2 - **Building Integrated Photovoltaics** might be considered as eco-technologies as far as these systems implement a new function (production of electricity) in the building. In this case, this technology provides direct benefits for the building's environmental performance, especially regarding basic requirements number 6 and 7.*

Furthermore, we use following building typology in the questionnaire, in order to be able to evaluate whether typical TIS interventions match with the cases where technical risks (with respect to the building itself or with respect to the end-user warranties) are considered the highest:

1. individual housing,
2. collective housing,
3. building with public access,
4. office buildings
5. industrial buidings,
6. building having extrinsic technical risks (e.g. earthquake),
7. building having intrinsic technicla risks (e.g. high-rise buildings).

Hence we distinguish between following building functions:

- 1&2 → housing,
- 3 → public access (any kind of function),
- 4&5 → working environment
- 6&7 → any function but possibly building- or environment-specific technical risk.

b) Different types of Technical Inspection Services role

The research and investigations conducted, mainly based on questionnaires and interviews, have resulted in a more precise definition of the role of the private technical inspector in the construction process. Several factors are involved:

- ✓ The construction defect protection model
- ✓ The liability regime (legislative, contractual, etc.)
- ✓ Liability coverage (insurance, bank guarantee, etc.)

Even though no official classification of liability regimes exists, four types can be distinguished at present time, whose characteristics can be used to define the technical inspector's role. In this part the corresponding operating modes are identified and one or two examples are given to illustrate each particular case.

Type 1:
Countries in which liability is essentially legislative-based and constructors are required by law to take out insurance to cover the said liability.

- ✓ The technical inspector assesses the <u>construction risks</u>. This helps to determine the construction insurance coverage required and prevent any further defects.
  The technical inspector is also delegated by the administrative authorities to inspect drawings and technical details and conduct on-site inspections in order to <u>ensure that the project meets the regulations</u>.
- ✓ Building contractors and constructors are required to provide ten-year and two-year warranties.

Case of France:
The technical inspection of constructions can be compulsory or optional but when it is not compulsory, it is often required of the Owner by the insurance company. It is compulsory when stipulated by the legislation, particularly in the case of certain public assembly buildings, very high buildings and exceptional structures (span, depth, cantilever). Solidity, safety of persons, respect of earthquake construction regulations and regulations pertaining to accessibility for the disabled are the main concerns. The technical inspector must take out ten-year warranty insurance. Like the constructor, the inspector has a public liability insurance obligation for 10 years after acceptance of the construction.

Type 2:
Countries in which liability is essentially legislative-based but in which there is no legal insurance obligation for construction defects even though such insurance is widely practised.

- ✓ Technical inspectors are delegated by the administrative authorities to inspect drawings and technical details and conduct on-site inspections in order to <u>ensure that the project meets the regulations</u>.
- ✓ When an Owner chooses to take out ten-year and two-year warranty cover, the technical inspector is called upon by the insurers but contracts with the Owner in order <u>to assess the construction risks</u>.
- ✓ The technical inspector's role is therefore very similar to that of type 1 described above.

Case of Luxembourg
The Owner takes out optional ten-year and two-year liability insurance for the project concerned. All defects are covered without having to determine liability.
The technical inspector contracts with the Owner or sometimes with the building contractors at the Owner's request. The inspector's risk assessment is mainly based on the solidity of the main structures (frame/roof) but sometimes includes smaller structures defined under the terms and conditions of the agreement. The guidelines used to carry out the assessment are mainly German and Belgian standards.

Compliance with the regulations is determined by an approved organisation which performs acceptance of the completed work required by the operating authorisation. Technical inspectors are also approved organisations.

Type 3:
Countries in which liability is essentially legislative-based but where constructor's insurance is neither compulsory nor frequently used.

Case of Czech Republic

- ✓ Technical inspectors are very rarely called upon. Construction projects are inspected at the beginning and end of the project by the Building Inspection Department, which is a local authority, in order to grant planning permission and operating authorisation and during construction by government officials and approved engineering consultancies.

Type 4:
Countries in which liability and the corresponding insurance cover are completely or mainly contractual.

- ✓ The role of independent technical inspectors varies considerably according to the country. When called upon, the inspector may contract with the Owner, the architect or the building contractor.
- ✓ The technical inspector is more concerned with verifying conformity than with analysing risks.

Case of Great Britain
Technical inspection is very common due to both legal obligations and insurance practices. The law stipulates that all constructions must be inspected to ensure compliance with building regulations, starting with the planning permission phase. On-site inspections are then carried out during construction and a completion certificate is issued at the end of construction. The certificate guarantees that the building is fit for use. The Owner decides whether inspection will be carried out by the local authorities or by an approved inspector such as the NHBC Building Control Service, a subsidiary of the NHBC insurance company. Inspections are often outsourced to avoid complaints in the case of defects.

In particular, insurers are often involved in the technical monitoring of housing construction. An insurer such as the NHBC thus has the necessary skills and human resources to carry out technical appraisal of construction projects (even before construction begins) and to inspect the work site even having remedial work carried when necessary at the expense of the building contractor who has taken out the insurance. The specific role of the Building Control Service is therefore to check compliance with rules established by the insurers (conformity) but it also means that construction risks are addressed.

Case of the Netherlands
The local council is responsible, both operationally and legally, for technical inspection which is carried out during both the design and construction phases (verification of compliance with project documents).
Technical inspection is based on detailed design documents supplied by the Owner to the service in charge of inspection of construction and housing.
Inspection concerns not only compliance with town planning regulations but also with the rules, technical standards and instructions in force including insulation, respect of environmental regulations, fire protection, etc. The documents required now systematically include the design of the building foundations and a ground survey whose validity is checked by the service concerned. Inspection of the stability and solidity of the structures is usually outsourced to certified engineering consultancies.

The present approach helps us to understand the responsibility of technical inspection services in the field of construction and to determine their role in risk assessment. The party responsible for the risk and how it is insured must first be identified in each country. We could then study the tools and guidelines used by technical inspection services to analyse risks and identify the quality markers which enable them to insure a construction product or method.

c) How can technical control contribute to construction quality?

Construction quality depends on a few factors either before the construction to avoid defects, or after the completion of the work in order to make the best repair of these defects.
Technical control is a sequence of three actions: PREVENTION, CONTROL, INSPECTION, meant to assess risks and avoid defects during both the design and construction stages. Technical control makes sure that regulatory requirements are respected and does a technical assessment of the buildings which design or implementation may lead to a risk of damages or accident prejudicial to the quality of the construction.
In the context of eco-technologies where new materials or energy and resources-efficient methods appear on the European market, independent third parties technical assessment is the way forward to manage and control the risks linked to innovation.
What does indeed make the difference between the new Product (process or technique) and the well-known traditional Product? The answer is the lack of technical rules or experience feedback.

The technical Controller knows how to adapt to those new situations through his specific expertise:

KNOWLEDGE: knowledge in construction technologies, regulations and standards, role of the various stakeholders in construction and building pathology.

KNOW-HOW: implement investigative and control techniques (notion of proof, assessment), risks analysis (identify, rank), write an advice, explain it and argue about it, inform, capitalize.

KNOW-TO-BE: ability to integrate the context and to adapt with precision and efficiency.

Economically, the prevention of risks allows the best conditions for the market development and thereby reduces construction costs.

d) Risk assessment and management process in the technical Controller's mission

The technical inspection service adopts, within the same mission, an approach of risk assessment together with another approach of inspection according to specific methods based on technical standards, which may vary depending on the country (construction regulatory framework, technical regulations, etc...). With respect to the project progress these approaches will result in:

- risk assessment during the design phase,
- supervision of the companies self-monitoring during the construction phase,
- regulatory inspection during the completion stage ahead to receipt of the work.

Different frameworks apply at different stages of a construction work's project (and depending on national contexts); for the survey, we developed following broad outlines for a project:

	Applies to
- local development plan, urbanistic regulation, etc.	the Project Owner
- design requirements (from PO) and technical standards / regulation	the Designer
- Construction-oriented standards and regulations	the Contractors
- Product-oriented standards and regulations	the Manufacturers
- maintenance and use requirements	the Owner

Conformity assessment and technical risk assessment are carried out by TIS with respect to the above frameworks. The value-added for insurance companies also depends on these, as the typology of TIS (private expert, local authorities, architects, etc.) does. At this stage, we do not have enough answers to the questionnaire to draw general conclusions.

Based on available information, the technical Controller evaluates deviations toward technical standards (building regulations, state of the art, etc.), analyses the risks of occurrence of feared events (according to operation, pathology, conditions of quality control by companies) and submit its expert opinion on the construction work.

On the basis of this opinion, the insurer identifies hazardous construction works and is able to decide the quotation of its insurance plan.

Some quality signs are necessary information, in particular to assess the CE marking or labels which declaration of performance helps to ensure the suitability of the product to the construction work.
However, confidence in quality signs level may vary according to products or construction works.

The survey already points out that different quality signs are considered relevant by TIS:

- regarding the product itself: CE marking, product certificate,
- regarding professional skills: certification of quality management system,
- regarding suitability for intended use: supplementary information is required by TIS, such as test reports, contractor's self verification procedures, TAB assessments, etc.

e) Role of the Technical Inspection service in claim risk management.

The quality of construction may also be attained if possible defects are properly repaired within a reasonable period of time and at lower cost for the Customer. Quality is often measured by the number of claimed accidental damages.

Regular technical inspections on site are often organized after completion of works by the operator or the project owner at periodicities which may be defined by the insurance company providing the coverage.

In United Kingdom, the NHBC system integrates within its organization technical inspectors and involves several functions:

- Prevention : prior work with the builders to prevent the constructional problems,
- On-site inspection during the building process,
- Insurance: decennial liability insurance for housing construction,
- Standardization: writing of technical standards, periodically revised and reflecting feedback on surveyed substandard work when on-site inspecting.

3.3.4 Risk assessment methodology

As previously stated, for innovative technologies, the risk assessment is made through a qualitative approach.
Based on his experience, the analyst must qualify the risk according to various criteria, focusing on known pathology, and on failure cost and probability of occurrence.
The result of an assessment is to define a level of insurability, or "aggravating factor" of the risk. A risk can be considered as "uninsurable".

3.3.5 Risk assessment criteria

Regarding single covers, the risk assessment made by the (re)insurer will globally deal with the different topics described hereafter:

a) Construction scheme

- Type of construction. Some risks are specific to technologies used in certain type of constructions. For example HVAC systems are critical for hospitals, where nosocomial disease is a risk.
- Nature of the work (new works / rehabilitation / turnkey project). The adaptation to an existing context is source of interface risks.
- Intended use of the construction (to be sold / operated by the developer). The implication of the owner as a great impact on the care taken on the design phase, thus on the operating risks.
- Adequacy of planned maintenance
- Owner / developer experience and know how on this type of project
- Expected use of the construction by the owner (quality level requirements / opportunity of claiming the guarantees)
- Level of complexity / innovation. By definition the insurer hates prototypes, for which he lacks vision
- Surroundings. For the Third Party Liability assessment.
    - Cost of construction. Cost breakdown is an important tool to appraise the level of standard / quality expected.
- Involvement of a Technical Inspection Service

b) Natural event context (to be analysed even if not covered)

- External loads taken into account:
    - Weather exposure (wind / snow / rain)
    - Water intake (groundwater uprising / flood)
    - Earthquake
- Design in regard of natural events :
    - Level of design loads in regard of specific national standards (national annex to Eurocodes)
    - Necessity of further studies (ex: modelling) made by external engineering firm (cross check)
    - Type of stress assessed in the design in the light of the risks to cover (thermal gradient, fatigue)

c) Materials

- Conformity of materials with standards (to be checked during construction)
- Quality of work depending on the origin of materials (problems of quality regularity depending on producer)
- Welding control (on-site vs. workshop welding / control of welding by trusted institute)

d) Design

- Intrinsic risks associated with the type of work (structural complexity, choice of technology / materials)
- Known pathology for this type of work, based on insurer's experience or expertise of the technology
- Level of loads in regard of national standards
- Adaptation to the context
- Interaction with other construction elements (ex: effect of humidity on wood framework caused by high level of airtightness imposed in new constructions)
- Scale of design studies
- Use of non-traditional techniques
- Qualification / specialization of designers
- Quality of the reports

e) Technical Inspection Service

- Qualification / trust in the TIS

- Quality / specific knowledge of the person in charge of the control with this specific type of work
- Extent of the mission (mission / number of visits / nature of the reports)
- Adequacy of fees (evaluation of time allocated to the project)

f) Execution / methodology
- Type of contract. Structure of contractual relations between contractors has an impact on recourses possibilities hence extent of the cover.
- Qualifications / experience of contractors on this specific type of work
- Construction / installation methods
- Quality plan / self-check

g) Surroundings / neighbouring
- Risks of impact of a defect on construction works with different owner (general liability risk). Ex: distance of neighbours (risk of fire spread)
- Exposure / amounts at stakes

h) Existing works
- Standards to be applied
- Level of connection with existing parts / compatibility risk
- Adequacy of new work in regard of the existing one / analysis from a global point of view
- Importance of the modifications on existing bearing structure
- Specific risks of covered existing parts

i) Construction work inherent risk
- Geometry:
  - Geometry of building (height, asymmetric geometry, non-alignment of bearing elements, "transparency" in lower levels)
  - Geometry of bearing parts (spans of simple or cantilever beams and floors, slenderness of columns / walls)
  - Depth of excavations
- Materials used for construction (innovation)
- Structure
  - Materials
  - Bearing elements
  - Bracing
- Roof / Façade
  - Glass roof
  - Point fixed structural glazing

j) Other specific technical risks criteria

As we've seen risk assessment is mainly dependant on the person making the analysis, is knowledge and experience on the type of construction, without any very specific criteria. However regarding inherent risks, insurers developed some specific technical risk criteria for some widespread eco-technologies such as Photovoltaic panels or Heating pumps.

3.3.6 Definition of relevant technical criteria

In relation to WP1, identification of relevant technical criteria, i.e. signs, used to assess "eco technology" risks in construction insurance.

As previously stated, risk assessment is essentially qualitative, based on the analyst own experience, whether the risk is a project or the activity of a contractor. It appraises the adaptation of the "product" to the construction work and its environment in general.

The insurer does not have the technical means to assess directly the risk of an innovative product at large. Therefore he also has to rely on quality signs.

The sign will define the required technical specifications of the product itself, in what environment it can be used (its purpose), and how to install it. Its aim and use are completely distinct from the insurer's risk assessment.

For the insurer, more than an appraisal tool, signs are usually a simple prerequisite to the insurability of a risk. As for standards and norms compliance, quality marks are seen as a requirement, a prior condition to be insured. They are mandatory; it is the absence of default of marking that prevents insurability. They are usually not a positive assessment tool of valuation but a negative, essential "must have" label to access insurance.

Nonetheless a few signs seem to be discriminatory and give some information on the risk level. In order to retrieve this information, we decided to use a top down approach in accordance with WP1, and already got a few answers.

Examples of national quality signs used by insurers in their risk assessment of eco-technologies:

Country	Name of the sign	Certifying body
France	Avis Technique (ATEC)	CSTB
Germany	TUVdotCOM	TÜV Rheinland
Italy	Certificato di conformità (of TIS)	ACCREDIA (ex SINCERT)
Spain	Documentos de Idoneidad Técnica (DIT)	Instituto Eduardo Torroja
United Kingdom	MCS Certificate	Microgeneration Certification Scheme

Those quality signs are presented more extensively in the WP1.
Nonetheless first findings show that quality signs used by insurers for their risk assessment are very scarce. Therefore it will be difficult to assess various technical criteria (used in the risk assessment) in regard of each corresponding type of "eco technology". The study will essentially focus on the identification of the widest different used criteria across Europe rather than on hypothetic technical reasons for their use.

Appendix 3.4 : Deliverable 3.4 : State of the art insurances schemes and transition paths

4.1 Innovation models

As part of the ELIOS project WP3 on construction and insurance regimes, a literature survey has to be conducted, highlighting different innovation models that can be used to qualify the discussion of how (if possible) new insurance schemes can stimulate innovation and the use of sustainable solutions in construction. We focus three ways in this survey, highlighting models that operate on different scales, i.e. macro (sector perspective), meso (company perspective) and micro (learning perspective). We start, however, by highlighting different types of innovation in order to put the subsequent models into context.

4.1.1 Types of innovation

Slaughter (1998) distinguishes between five different types of innovation in construction. The focus here is to guide selection and implementation strategies by construction companies; however the framework can also be used in the planning and carrying out of strategies to identify, acquire, develop and implement construction innovations (Slaughter, 1998: 226). Hence this framework can be used as a starting point for understanding the successful development of insurance schemes that could support cross border services and the cover of building sustainability performances

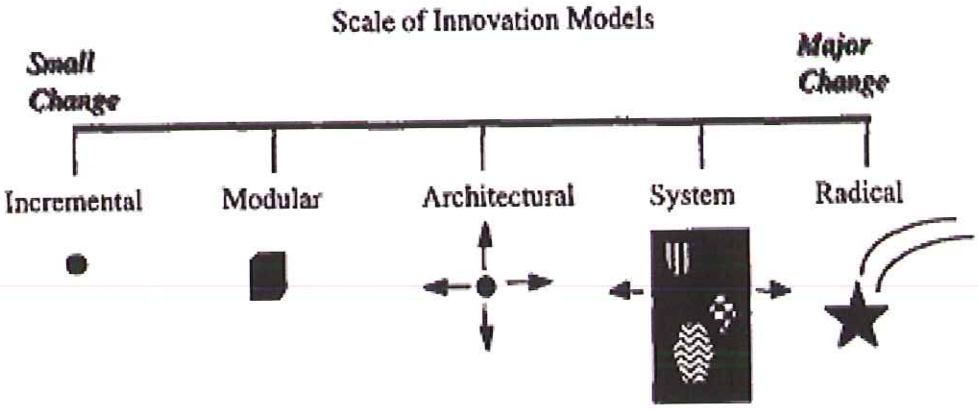

Figure 4.1: Innovation models for construction (Slaughter, 1998: 229)

According to Slaughter (1998) a wide range of different benefits arise from construction innovations, including economic growth, market growth, social benefits, increased technical feasibility and a series of intangible benefits such as e.g. improved reputation.

The benefits from construction innovation differ from those in the manufacturing sectors of national economies that hitherto have received the greatest attention. Here it is often assumed that innovations are generated by an internal R&D organization that according to Nelson and Winter (1982 in Slaughter, 1998) chooses from among a set of promising research pathways, and that innovation can be exploited through large scale mass production (Slaughter, 1998: 227). In contrast, construction innovations rely on markedly different dynamics in that the nature of the construction industry differs from the nature of the manufacturing industries in important ways (cf. Slaughter, 1998; Winch, 1998; Gann and Salter, 2000; Engwall, 2003). This has e.g. to do with the temporary nature of projects, the difficulties in coupling business and project processes, and issues arising from systems integration.

4.1.2 Models of construction innovation

The different types of innovation models proposed by Slaughter (1998) take the starting point in this idiosyncratic nature of construction activities. Thus, the organizing principles for the models are (i) the magnitude of change from current state-of-the-art associated with the innovation; and (ii) the expected linkage of the innovation to other components and systems.

An *incremental innovation* is defined as "*.a small change, based upon current knowledge and experience.*" (Slaughter, 1998: 227). In contrast, or rather at the other end of the innovation spectrum, is the *radical innovation*, which can be seen as a breakthrough in science or technology that according to slaughter often changes the nature and character of an industry. Making this distinction, Slaughter also pointed to the deduced fact that radical innovation occur very seldom, whereas incremental innovation occur constantly.

In addition, Slaughter also identified *modular, architectural* and *system* innovations. A modular innovation "*...entails a significant change in concept within a component, but leaves the links to other components and systems unchanged*" (Ibid., 1998: 228). An architectural innovation reverses the logic. It is an innovation that involves a small change within a component but a major change in the links to other components and systems.

Finally, Slaughter identified system innovations. These types of innovations can be "*...identified through their integration of multiple independent innovations that must work together to perform new functions or improve the facility performance as a whole*" (Ibid., 1998: 228).

Slaughter further argued that the five innovation models can provide the basis for a strategy to incorporate innovations into specific projects. As it is argued: "*Using the attributes of the magnitude of change and the linkages to other components and systems, companies can predict and plan for different types of activities depending upon the type of innovation involved.*" (Ibid., 1998: 228). These types of activities are presented in summarised form in the below table.

Types of innovation	Timing of commitment	Coordination with project team	Special resources	Supervision organizational level	Supervision type	Supervision competency
Incremental	At any time	None	None	At locus of improvement	Notification	Specific product or process
Modular	At design / selection	None	For concept change	At design level	Notification, review	Technical competency
Architectural	At design-to-implementation stage	Among affected parties	For complementary changes	At affected system level	Notification, agreement, review	System competency
System	At conceptual design stage	With all project team members	For integration of set of innovations	To top engineering management level	Project scope, agreement, review	Technical and system competency
Radical	At technical feasibility stage	With top management from all involved organizations	For breakthrough	At top management level	Project objectives and scope	Specialized technical competency

Table 4.1: Specific activities for implementation by type of innovation (Slaughter, 1998: 230).

Whilst it is plausible that the five innovation models can provide the basis for a strategy to incorporate innovations into specific projects, the conceptualisation has several shortcomings in relation to the specific purpose of the ELIOS 2 project.

First of all, while the ELIOS 2 project indeed deals with construction innovation, in the form of eco-technologies, the focus is not on implementation on specific projects, nor on innovation *per se*. Rather, emphasis is placed on the governance of innovation processes and technology uptake across different European countries.

This gives rise to two further points that should be addressed in a theoretical framework that are able to handle the question of how new insurance schemes can be used to stimulate innovation and the use of sustainable solutions in European construction, namely: (i) the nature of innovation *processes*; and (ii) the notion of context and systemic innovation.

4.1.3 Innovation processes

Slaughter's (1998) study deals first and foremost with the nature of different types of innovation. As illustrated in Table 1, while Slaughter does address some issues relating to the implementation of innovations, she does not present an explanatory model of the processes of innovation, i.e. how a new technology is diffused and anchored in existing practices.

Traditionally, the innovation process literature has made a distinction between two basic models for technological innovation being (i) technology push; and (ii) market pull mechanisms.

Distinction between rational and emergent understandings of the innovation process:

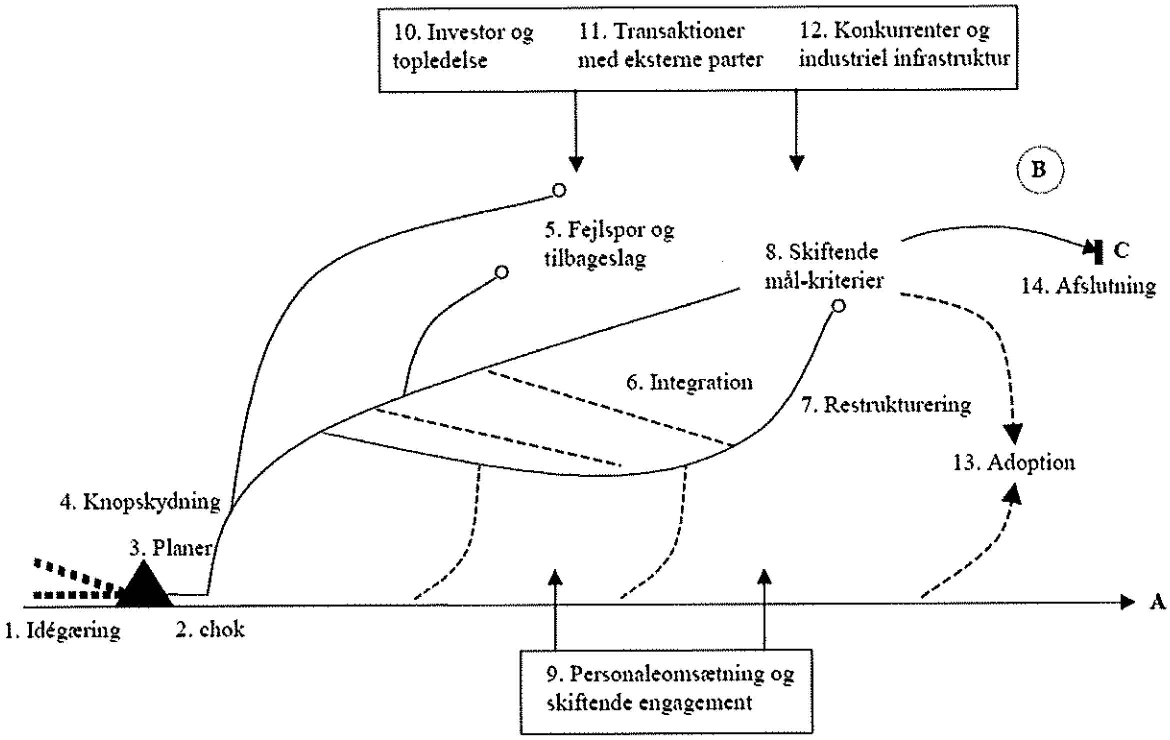

Figure 4.2: The innovation Journey (Van de Ven et al., 1999)

4.1.4 Context and systemic innovation

To be developed.
Implementation of new eco-technologies as a matter of transition dynamics according to Geels et al. Furthermore some of the MLP and SNM models will be used and elaborated on later in the report.

4.2 Construction and insurance regimes

An overall objective of the project is to achieve concerted change on construction insurance regimes and sustainable innovation in Europe. A transition towards increased levels of sustainable innovation in construction is, however, not only a question of aligning national interests, but also a question of aligning highly discrete and durable systems of construction, sustainability and insurance within the individual member states.

Applying a socio-technical approach, combining contributions from transition theory and institutional theory, the analysis will be conducted as two distinct yet interrelated analyses; a horizontal respectively vertical analysis of regimes development and transformation as illustrated in figure 1 below.

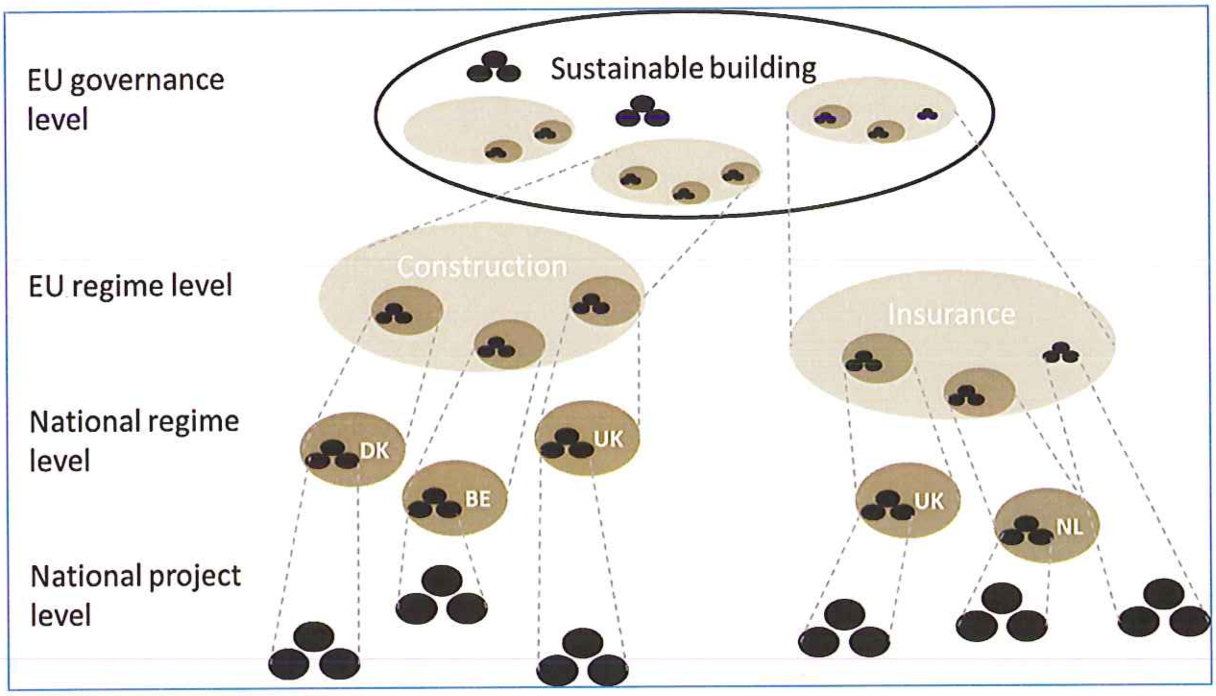

Figure 4.3: Levels of analysis (adapted after Seyfang and Longhurst, 2012).

The vertical analysis aims at providing an understanding of the interplay and co-development of national regimes of insurance, sustainability and construction within the individual national context. The analysis will result in a typology of various national construction regimes based on their technological, historical, social, political, cultural and economic characteristics. The analysis will be conducted in order to identify main similarities and differences between the various national construction regimes that may function as drivers or barriers towards a common European insurance policy implementation, which is the focus of the horizontal analysis. The horizontal analysis, thus, will focus on the interplay between national and supra-national regulation and on the dynamics of adaption and circulation of insurance schemes in Europe.

4.2.1 From Construction Business Systems to Regimes

The preliminary findings indicate that national regimes of construction vary markedly from country to country in the EU. Winch (2000, 90) has distinguished between three types of systems / regimes:

- The Anglo-Saxon system is characterised by "a greater reliance upon liberal market values, relatively low levels of state regulations...."

- The corporatist system depends more on "...negotiated coordination between the 'social partners', greater willingness to intervene in the market to protect social values... "
- "The 'étatique' system has more extensive coordination of the economy by the state relatively high level of worker protection ... and a desire to promote national champions in various industrial sectors"

To this, a fourth regime typology may be relevant for the Eastern European countries, where the development of new state/market relations has been under development since the early1990s. Not only do these national regimes of construction and insurance differ on some dimensions, they might also be contradictory and even detrimental in terms of their functioning. In addition, the preliminary findings also indicate that the distinctiveness or idiosyncrasies of the different national construction regimes have impact on the actual uptake of new technologies and policies. In essence, this entails that policy and technology implementation follow different transition pathways dependent on the regime level characteristics.

Winch's (2000) typology of Construction Business Systems (CBS) constitutes, however, quite a broad framing and conceptualisation for understanding different cultural and systemic factors that are important to understand when discussing issues of how actors and structures are interrelated and not least, how change can be brought about in highly institutionalised organisation fields. Thus, for the purpose of the following analysis, we intend to describe the Danish corporatist construction business system drawing on concepts from institutional and transition theory to enable a richer understanding of these issues.

Thus, the following section constitutes a heavily comprised description of the Danish construction and insurance regime based on Gottlieb (2010), Jensen et al. (2011), Thuesen (2011) and Brahe et al. (2013). The objective is to describe the characteristics and modus operandi of the Danish construction and insurance regime as a starting point for the further analysis of differences of regimes in the EU and hence the challenges of harmonizing insurance and liability schemes across member states.

4.2.2 The Danish construction and insurance regime

In a historical analysis on the constitution of the Danish construction sector, Gottlieb (2010) argued for the need to understand the current practices and systemic configuration of the sector in a historical perspective, i.e. as a result of a development process that have taken place over generations. This type of historical awareness is crucial in understanding the conditions for how new technologies or practices can gain prominence, including the role of existing systemic factors in promoting or resisting institutional change. In essence, Gottlieb (2010) argued that the current Danish construction regime can be seen as the result of a development process taking place in the intersection between three highly institutionalised regimes or systems of interaction (see also Gottlieb and Haugbølle, 2013) and that the introduction of new technologies or practices depends on the ability to understand and manage contradictions in and between these regimes. The three regimes comprise:

- Building customs and practices
- Rationalisation
- Negotiation

In the following analysis, the three regimes will briefly be described (based on Gottlieb (2010) and Jensen et al. (2011)) followed by a summary of their central characteristics using the nomenclature from the MLP framework.

4.2.3 Building customs and practices

Gottlieb's (2010) analysis of the Danish construction sector started by exploring the notion of the 'building sector' in the medieval and pre-industrial eras, using the figure of 'building customs and practices' as the diagrammatical point-of-entry. He discussed the guild and crafts-based roots of the building sector with special emphasis on the management and organisation of work. In doing so, it was shown that apprenticeship, and the close relation to a specific type of building material within a craft, was instrumental in ensuring *coherence* as the governing principle in a sociality predicated on a variety of different practical rationalities and performative practices.

Moreover, it was demonstrated that guilds as an institution represented a form of organised community in relation to a specific craft, and that they were formal associations of specialised artisans whose authority was backed by superior political sanction.

A cornerstone in the guild system was the so-called guild statutes, which represent the earliest form of (state-)centralised regulations in Danish construction. The guild statutes can be said to comprise a constitution of the sociality of craftsmen, i.e. guidelines for the conduct, norms, and practices of belonging to a community and being a craftsman. The statutes played a very important role, as they regulated both the workmanship, the formal festivities, and the social intercourse. Much traditional building is thus carried out in absence of any formal methods of quality control. And in the absence of formalities there must be something else that ensures sound building – methods that are internal to the craft system itself, being:

- Control of entry to the trade
- Sanctions for poor work
- A recognised training system

These three elements together can be seen as constituting the first insurance system in Danish construction. Thus, entry to trade was a prominent mechanism in the traditional feudal or city state society. In cities it was only possible to work as craftsman if you were a journeyman employed at a master artisan or a master artisan yourself. The master artisan had to be a member of a guild, which in turn required him to be part of the bourgeoisie and carry a trade license. The guild was a professional community, which had a primary protectionist role to play in ensuring that only members of the guild could perform their trade in the cities. This entry control was vigorously enforced with severe precautions in case of violations. Upon admission into the guild, the master artisan accepted to serve the king, the city and the guild according to the commands of the guild master. At the same time he however also accepted, the first competition provisions of the trade.

Despite their seemingly monopolistic position, the guilds (and also the magistrate and the city council) kept strict control with both the price and the quality of work. In paragraph 4 in the coppersmiths' guild statutes it is thus stated that if the master artisan is found to be un-cheap or negligent, he has to pay a penalty to the guild as well as to the poor (cf. Kieser, 1989: 553).

Yeomans (2001: 3) gives an example from Britain in which the guilds were under an obligation to seek out and destroy any materials or work that was defective. He argues that this quality control function, which originally was carried out in exchange for having entry to the craft restricted, eventually broke down making it necessary for clients to control their own people to supervise work on their own buildings. This is to some extent also the case in Denmark; however it is also worth noting that the fixed schedule of wages, i.e. the price lists composed by the guilds (and today by the different trade organisations) constituting the most central element of the piece rate system, still contains the clause that the stipulated prices only apply to well-performed work and that the craftsmen bear full responsibility and risk being sanctioned in the form of deductions in their piece rate if they deliver inferior work, which has to be redone.

In Seligman (1887: 64-67, 71) we find a similar line of reasoning for the function filled by the guilds. He suggests that the control of entry was the condition *sine qua non* of exercising any supervision over craftsmen for the purposes of avoiding any mischievous practice as well as to prevent fraud and public deception. This view is further supported and substantiated by Kieser (1989: 549-552) who argues that guilds were initiated by offices created by the town magistracies for two reasons: 1) to ascertain that the taxes were paid to the town and church, and 2) to protect the poor from any exploitation and manipulation by the craftsmen and merchants.

From the 1850s onwards, as a part of the increasing urbanisation, a series of laws were passed to ensure i.a. the quality and structural safety of the many new dwelling, however, as early as in 1731 a semi-public fire fund (d'assurance contre l'incendie) to prevent a recurrence of the economic problems associated with the Great Fire of Copenhagen in 1728. In 1761 membership of the state fire insurance scheme became mandatory. According to Engelmark (1983) the urban development of Copenhagen was subjected to three building laws from respectively 1856, 1871, and 1889, which were further supplemented with a series of supporting provisions. With the law of 1856, the City of Copenhagen was subjugated to the first collective set of building regulative requirements. This law was much stricter than the previous, scattered building regulations – and it was furthermore accompanied with a reorganisation of the building authorities to ensure a more effective implementation.

Prior to the passing of the law of 1856 for the City of Copenhagen the building legislation consisted on a variety of different statutes, considerations and standards spread out on many different local authorities. Engelmark argues that the 1856 building law was considered quite restrictive at that time even though it only contained few considerations, which had not previously been covered by existing regulations. One of the most important innovations introduced with the law was the requirement of compulsory construction permit application regardless of size or type of construction activity.

Engelmark (1983: 42-43) highlights three conditions in his discussion of the great impact of this law for the built environment of Copenhagen and not least its quality. First, that all significant provisions relating to building activities were collected in one law, thus making the procurement process transparent. Secondly, the provisions relating to structures and materials, formulated on the basis of the state-of-the-art theoretical-technical knowledge, were sufficiently precisely formulated to be appropriate and adequate to be in use for the particular type of buildings for more than 100 years. Engelmark thus argues that the Copenhagen building code of 1939 contains the almost exact same provisions on the design of outer walls, beams, and roofs as the law of 1856. The reason for this continuity Engelmark attributes to the fact that no major changes occurred within the typically used building techniques. The third and last condition for the success of the 1856 building law was that the law was followed by a re-structuring of the organisational set-up of the building authority and the establishment of an effective administrative practice focusing on the supervision of ongoing projects (Engelmark, 1983: 43).

Dimension	Characteristics
Technology	Wood (1100), Bricks (1500-1600)
Industry	Craft-based traditions based on a certain relationship to materials.
Market	Cathedral Crusade: Cathedrals as driver for the development of new practices and technologies.
Insurance	Guild supervised. Quality through well-proven technologies. Sanctions for poor work.
Policy	Very weak public regulation.
Culture	Guild as organised community. Strong culture pertaining to the different crafts. Professionalization through apprenticeship.
Techno-scientific knowledge	Tacit, embodied knowledge, rules of thumbs, limited planning and use of drawings.

Table 4.2: Defining elements in building customs and practices. Thuesen et al. 2011 (Based on Gottlieb, 2010)

4.2.4 Rationalization

Based on this understanding, Gottlieb (2010) illustrated how the gradual emergence of 'a building sector' form the 1940s onwards instigated a process of unification by functional differentiation. The leitmotif in these efforts was the scientification of the art of building; a process which to a great extent was driven through by the state in its newfound role of *public construction client.*

Thus, as also argued by Jensen et al. (2011), in the years after the Second World War the Danish construction industry was for the first time problematized as a sector in the sense that it is known today. The background for this sector-oriented problematization was the post-war housing shortage. The housing shortage was estimated by the Ministry of Internal Affairs in 1946 to be 48 000–53 000 housing units, which positioned the shortage as an irrefutable and imperative policy problem. In order to cope with this societal challenge, the Ministry of Housing was established in 1947 (Bertelsen, 1997; Boligministeriet, 1997) and the Danish Building Research Institute was established in the same year to provide the necessary scientific underpinnings for the development activities to the ministry.

With the establishment of these institutions, the industry became institutionalized as an independent regulatory entity, and on behalf of the societal interest the state was accorded the right to intervene in the affairs of the industry (Møller, 1954), as it was both de facto and de jure in a position to encode the activities of the industry with a new set of sectorally defined opportunities and necessities in order to initiate a fundamental reorganization of the existing identities, interests and rationalities.

The strategic imperative acting as the matrix for a new dispositive of building was that of rationalisation and would, as Villadsen (2004) phrases it, take the form of the schematic "correspondence/divergence" – a schematic that at one and the same time *shapes* and *is shaped by* the practices of building (*Ibid.*, 2004). It was shaped by the practices of building in that the rationalisation efforts first and foremost took as its starting point the early notion of building customs and practices. It accepted every *individual* element of the existing complex of building; however only to subject these to an all-encompassing or omnipresent gaze of stratification, normation and correspondence. In this process of strategic codification elements were emptied; were stripped of content bar their 'name' in order to be prepared for this schematisation – a schematisation that can be observed in its most diagrammatic form in the phase model.

The schematic also shaped the practices of building. Bricks, bits and pieces were standardised and modularised and different actors were continuously shaped and reformed for them to be able to claim a specific place in the sociality of the sector. The client's demands for fixed price and time prompted the architects and engineers to safeguard their work, transforming the architect from shop steward to adversary. The technical development coupled with this functional differentiation deprived the building sector the skilled craftsman, and *uni-directional coordination and control* emerged as the nexus between the different parts of the apparatus. Thus, the main assumption in the debate concerning the rationalization of construction sector was that the housing shortage could never be met if traditional configurations of technologies, methods, practices and regulations were not transcended. Only by replicating the rationalization of the manufacturing industries on a sectoral scale could the housing shortage be solved. Observed in the light of the production methods of the manufacturing industries, the existing organization and operation of the sector was accordingly seen as a highly irrational assemblage of bricks, bits and pieces that were only held together by the age-old traditions of the crafts (Dansk Ingeniørforening, 1951, p. 14). And such a system could not be optimized sufficiently to deal with the societal housing shortage.

Instead, based on three core principles of rationalization, listed below, a broad series of coordinated interventions were initiated to develop the tools, processes, materials, professional and identities of the industry:

- the establishment of a centralized point of planning and control capable of integrating the entire construction process
- a new division of work which separated planning from execution
- calculative optimization

These interventions can be observed most notably in the manner in which sector rationalization was promoted in the 1950s through development schemes focusing on the furtherance of so-called non-traditional construction (Indenrigs- og Boligministeriet, 1953; Kjeldsen, 1954). Here the aim was: (1) to decrease the level of skilled labour employed on housing projects; and (2) to introduce new planning methods. In the 1960s this scheme was followed by the so-called 'assembly quota' prescribing increases in the use of prefabricated and factory-produced building elements, along with continuous development of planning tools and methods (Gottlieb, 2010). These schemes were implemented through large-scale public demand in social housing and were furthermore backed up by a series of regulatory interventions and developments, ranging from the harmonization of local building regulations to the introduction of a 'Modular Agreement for the Building Industry' (Komiteen for Byggestandardisering (KBS), 1958) laying down the principles for a national system for the coordination of measurements in buildings in order to ensure compatibility between prefabricated components (Munch-Petersen 1980, p. 15).

Dimension	Characteristics
Technology	Concrete (in-situ and pre-fab.), standardized products, phase models, tolerances, mechanisation of work, plans.
Industry	Unskilled labour, planning engineers, general contractors, concrete factories.
Market	Large housing market
Insurance	?
Policy	Strong governmental regulation (Ministry of Housing). Circulars, contracts.
Culture	Separation of design and construction.
Techno-scientific knowledge	Scientific management, Establishment of the Danish Building and Urban Research Institute, CERT/PERT.

Table 4.3: Defining elements in rationalization. Thuesen et al. 2011 (Based on Gottlieb, 2010)

4.2.5 Negotiation

Gottlieb (2010) then discusses the development in the 1990s onwards. A development that saw the rise of a re-activation of the sociality of the sector; a re-activation that, based on the problematisation of the phase model, was mediated by a different regulatory governance strategy than in the 1940s onwards – being a governance strategy founded on governmental development programmes and active experimentation rather than on legislation and direct decrees. Retrospectively observed it can be argued that the sectoral stratification efforts of the 1950s onwards had been so successful that it had resulted in a de facto lock-in situation in which the uni-directional and unequivocal circumscription of space had deprived the individual actors any room for maneuver for agency. Thus many of the efforts associated with the development period in the 1990s could in this respect be seen as strategic attempts to 'repair' on a series of the inexpediences of the highly rationalized construction process; an attempt to break-down functional differentiation and its derivative – the focus on central control and coordination.

Gottlieb (2010), however also demonstrated that even though a series of attempts were made to introduce new technologies, materials and working practices throughout the 1990s, in the form of e.g. (i) a flexible wooden building system for multi-story housing projects; (ii) an industrialised steel and plaster cast building system; and (iii) a building technical development centered on installations and wet rooms, ambitions were not realized – most notably due to the insufficient demand and the fact, that new the new technologies did not have the strength to penetrate the market and provide a robust and low risk alternative to existing institutionalized building systems and practices.

An important development that, however, did take place in the transition from the predominantly rationalized construction regime in the late 1980s and 1990s was the implementation of a national Quality Assurance and Liability Reform. According to Bonke and Levring (1996: 11), during the 1980s extensive studies revealed both basic technical faults as well as severe managerial malfunctions in the industrialized building process. This coupled with a strongly rising number of defects in buildings of only 15 - 25 years of age led to an increased focus on the measures being taken to assure a sufficient level of quality in construction – the process of the Quality Assurance and Liability Reform, which was put into operation by the Ministry of Housing in 1986. The philosophy of the reform, as described by Bonke and Levring (1996: 11), was: *"...to urge the actors of the building process to identify the optimal balance between the total cost for the project, the management cost and the cost of correcting defects. It is widely accepted that the construction process during the previous period had developed into a position far from this point of cost optimisation."* The reform, which has later been included in the 1992-version of the general conditions for building works consisted of a wide spectrum of instruments, e.g. (Bonke and Levring, 1996: 11):

- Formal procedures for the documentation of quality in design and execution,
- Unification of periods of liability for all parties involved in the project,
- The establishment of the Building Defects Fund (da. Byggeskadefonden),
- Manuals for care and maintenance,
- 5-years inspection.

Especially the establishment of the Building Defects Fund in 1986 has had a profound impact on the quality in the Danish construction industry. The Fund comprises approximately 210.000 publicly subsidised housing estates, youth housing, and housing for the elderly, privately owned co-operative housing associations, and co-operative house shares. In 2011 the Fund had a holding of 220 million Danish kroner. The Fund covers all building defects claims for the first twenty years and, as such, the oldest buildings comprised by the Fund are no longer covered by the Fund. The buildings, which are covered by The Building Defects Fund, comprise some 40% of all construction of residential housing schemes since 1987.

Dimension	Characteristics
Technology	Many new different materials. Competing system products, however oncrete as dominant technology.
Industry	Unskilled labour, planning engineers, general contractors, concrete factories.
Market	Individualised market, however a consumer lock-in to traditional concrete and brick technologies.
Insurance	Unification of periods of liability for all parties involved in social housing projects projects
Policy	Deregulation through the abolishment of a Ministry of Housing. Construction as a resource area
Culture	Separation of design and construction.
Techno-scientific knowledge	Partnering, LEAN, BIM, etc. as alternative visions for the future sociality of construction.

Table 4.4: Defining elements in negotiation. Thuesen et al. 2011 (Based on Gottlieb, 2010)

4.2.6 Summarising findings on the Danish construction regime

Thus, despite recent developments we would argue that the current Danish construction regime to great extent is moulded in the image of the rationalised construction industry that was formed the 1940s onwards. Thus, observed in the light of the MLP model and Geels' typology of transition pathways we get the following picture of the different transition pathways and the dynamics of change between these three epochs or systems of construction.

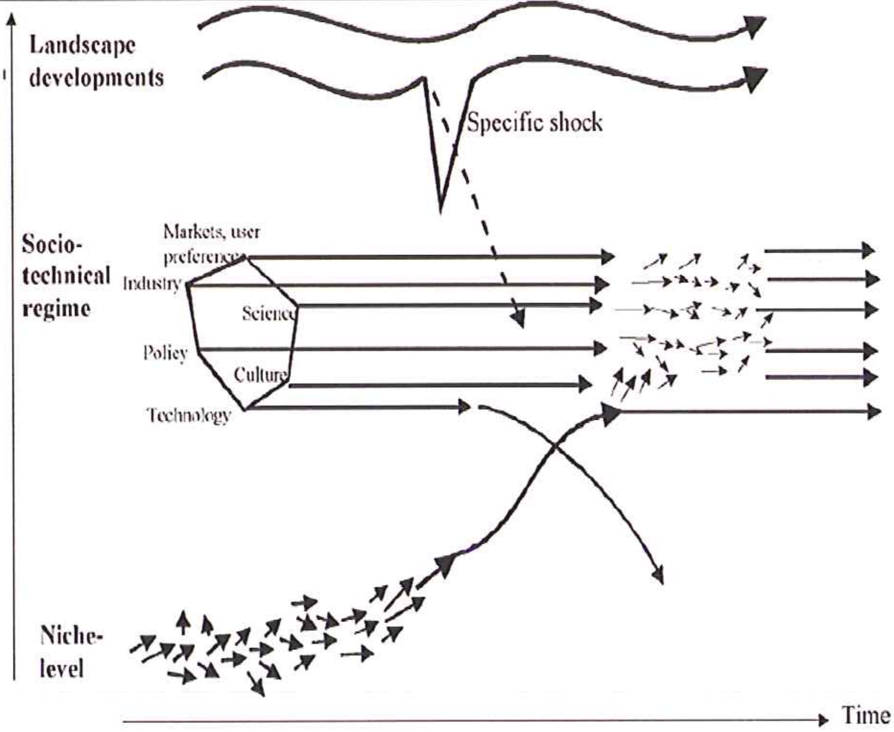

Figure 4.4: Technological substitution

Reiterating, Geels and Schot (2007: 409) claimed that: *"If there is much landscape pressure [...] at a moment when niche innovations have developed sufficiently, the latter will break through and replace the existing regime. This pathway assumes that radical innovations have developed in niches, but remain stuck because the regime is stable and entrenched."* Further: *"Without landscape pressure, this remains a reproduction process. It becomes a technological substitution path when a 'specific shock' 'avalanche change' or 'disruptive change' exerts much landscape pressure on the regime. This pressure leads to major regime tensions, and windows of opportunity for niche-innovations. Niche-innovations can use these windows, because they have stabilised and gathered internal momentum"* (Ibid. 2007: 409-410).

An example of this, we would suggest, is the developments that took place around WWII leading to the emergence of a rationalized, industrialized construction regime. Here the acute housing problems coupled with the wartime shortages in skilled labour and traditional construction materials constituted a specific landscape shock that rendered the regime open for the uptake of a new developed niche-technology (reinforced concrete elements) that had been used for decades in road and bridge building. As, demonstrated, the uptake of this new technology also gave rise to a series of additional changes in the Danish construction regime, as new policies, production technologies, roles and scientific knowledge emerged to support and further strengthen the use of reinforced concrete in house building.

In contrast, the developments that took place from the 1990s onwards can much better be seen as following a so-called transformation pathway, in which a moderate landscape pressure, not least prompted by the abolishment of the Ministry of Housing, lead to a continuous process of *modifying the direction* of development paths and innovation activities in the sector. This is illustrated e.g. by Jensen et al. (2011: 671) who argued that *"From the early 1990s the industry was once again problematized from a sectoral point of view. This sectoral problematization was [however] radically different from the sector problematization of the immediate post-Second World War years and it generated a set of very different theorization dynamics."*

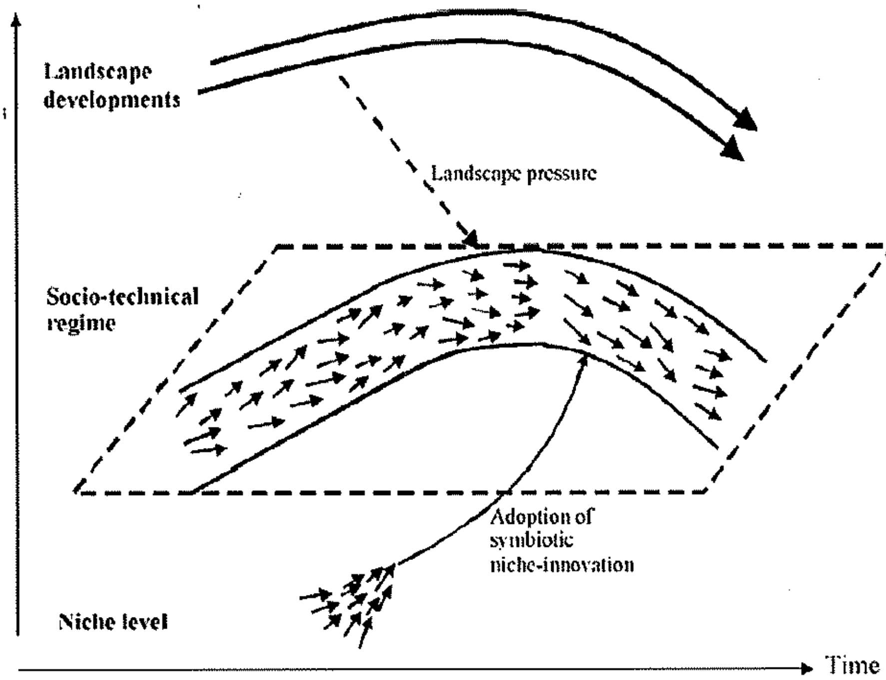

Figure 4.5: Transformation pathway

Most notably, Jensen et al. (2011) demonstrated that in the 1990s, the sector was no longer framed as the means to cope with a critical societal need but rather as an inefficient economic entity with an unsatisfactory high consumption of societal resources due to a series of interconnected weaknesses such as low productivity, poor innovation, poor collaboration and organizational fragmentation.

Jensen et al. (2011) further show that this new sectoral problematization generated a series of representations each claiming to identify the underlying root cause, which could explain the various symptoms. In contrast to the sector development agenda of the post-Second World War period that was monopolized by the logic of rationalization, multiple-sector representations were theorized as a response to the sector problematization of the 1990s, however none of these has radically replaced existing practices in the socio-technical regime.

Rather, we have seen that the most radical of the proposed niches (e.g. system deliveries) have had the most difficulties in gaining wide support and uptake in the industry, whereas the more "symbiotic niche-innovations" that do not offer a whole new conceptualisation of what it means to do construction but rather offer to supplement and existing practices and sort out the worst of the current inexpediences (such as e.g. partnering and the local Danish version of LEAN (LPS)) have been able to gain industry-wide accept. Therefore, it is much more difficult to observe the direct or deduced effects of these niche-innovations on a sectoral scale.

4.2.7 Insurance as a regime internal response

What is interesting in the above description of the historical constitution and development of the Danish construction industry is that insurance, more than representing a vehicle or mechanism of change emerges as a consequence of regime internal dynamics. Thus at a niche level it is the proliferation of new production technologies breaking into the regime level that propels the need for insurance schemes to evolve and adapt to newfound needs. This is also argued by Bunni (2003: 7) who suggests that *"Insurance developed and spread as a result of society's needs and demands"*.

4.3 International comparisons

Based on the above description of the Danish construction regime and the co-development of construction and insurance, we will highlight some of the main characteristics of the French and UK regimes in order to contrast the findings and point to some general observations and issues that have to be taken into account in the development of recommendations for policy convergence of insurance schemes in the EU.

4.3.1 France

Whereas we could claim the hegemony of a rationalised concrete regime in Denmark, the situation in France is somewhat different. In a comparative analysis of the diffusion and institutionalization of prefabricated concrete elements, in France and Denmark during the post-war construction period, Boxenbaum and Daudigeos (2010) demonstrate two things in particular. First, that "*...the relative pace of diffusion was determinant for institutionalization*" (Ibid., 2010: 1) of prefabricated concrete elements as a new dominant technology rather than other competing technologies at that time. In the foregoing analysis of the Danish construction regime, we have demonstrated how the diffusion was supported by various legislative and market changes. Second, Boxenbaum and Daudigoes (2010) demonstrate that there is a marked difference in the diffusion of prefabrication between Denmark and France, where prefabrication, in the period between 1958 and 1967, gained prevalence in Denmark while it first stabilized and then lost prevalence in France. This is illustrated in the figure below.

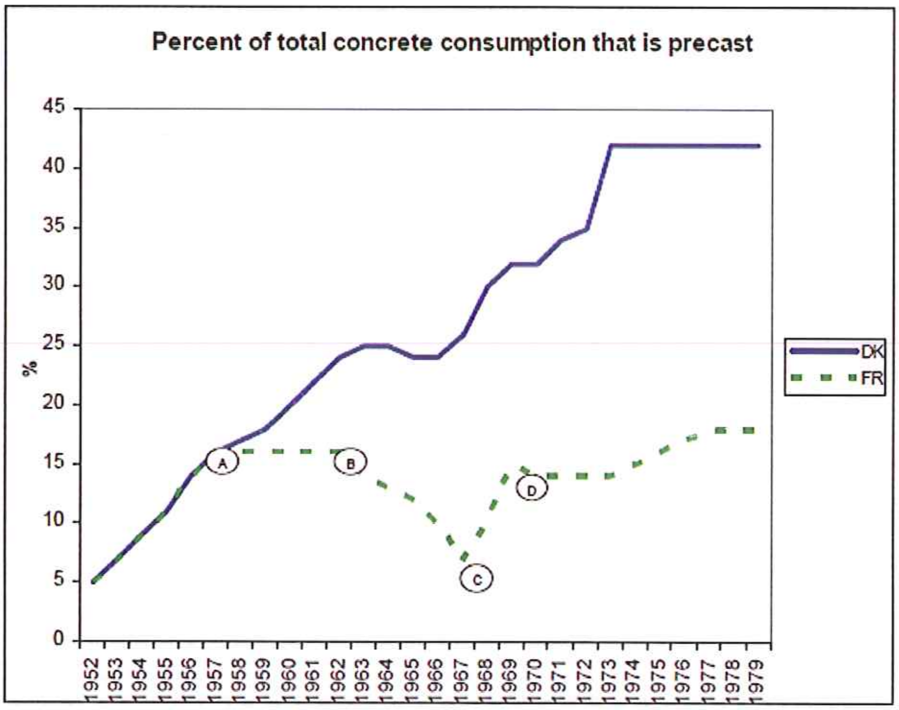

Figure 4.6: The prevalence of prefabrication in Denmark and France, 1952-1979 (Boxenbaum and Daudigeos, 2010: 8)

Boxenbaum and Daudigeos (2010. 8-9) advance the following theoretical suggestions or explanatory factors for the differences in the diffusion in Denmark and France: "*The most obvious theoretical explanation is that of the rational actor. This explanation would have it that the first experiences with prefabrication in the early 1950s produced objectively better results in Denmark than in France. [...] For instance, construction professionals in France might have selected cast-in-place techniques for their next construction project after having encountered poorer results with prefabrication than their colleagues did* *with cast-in-place techniques. Meanwhile, their equally rational colleagues in Denmark, having encountered better results with prefabrication than with cast-in-place techniques, might have made the opposite choice."* This rational agent explanation is however deemed unlikely and unsorted by empirical evidence. Other explanations are therefore propounded, ranging from landscape pressures (the decolonization in France leading to the Fifth Republic), to regime internal support in the form of legislative sanctioning, subsidy schemes, techno-scientific mobilization and much more. What we however in conclusion can learn from this short comparative analysis is that even though the same new technology is introduced and initially diffuses in a similar fashion in two different countries, the cultural socio-technical context of the diffusion environment plays a crucial role in determining the relative success (i.e. institutionalization) of said innovation.

4.3.2 United Kingdom

In a thorough historical account, Gann (1993) have analysed UK attempts to modernize the construction industry and the production of buildings. Gann used this historical account to illustrate different distinct trajectories of development in the industry, which each operates with its own systemic rationale and entails different and distinct modes of technology diffusion and innovation dynamics.

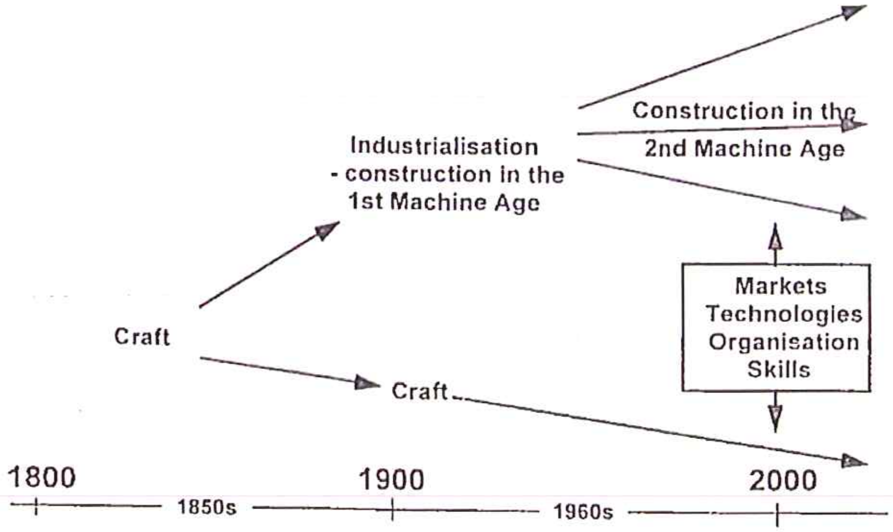

Figure 4.7: Industrial divides in construction (Gann, 1993: 76)

Gann operated with two stages in the industrialization of construction, the so-called first and second machine age. The first was concerned mainly with the development of new technologies for structural element, for facades and for the fabric of buildings.

In the second era, the trajectory of industrialization divided into several paths, due to the circumstance that construction was influenced by alternative approaches to raising productivity and expanding markets adopted by firms in other sector. According to Gann (1993: 76) each path of development is characterised by differences in markets, technologies, organisation of production and skills, such that the industries operating within the craft trajectory are distinct from those in the industrialised trajectory. These two technological divides are illustrated in the figure above. The characteristics of these different technological trajectories are illustrated below:

	Craft	Old Industrial	New Industrial
Process	Handicraft	Assembly	Adaptable assembly

Markets	Small scale traditional markets: residential and repair and maintenance	Large scale projects – new markets: construction of infrastructures, mass-housing, schools, hospitals, slum clearance	Mainly large projects: new sophisticated buildings
Product	Bespoke, made from basic materials	Standardised, made from factory produced components	Complex, made from components sourced internationally
Type of firm	Small, local, with directly employed labour	Large, national or international, using specialist low-skilled sub-contractors	National and international coordinating very specialised firms
Competition	From other local firms	From national and international construction firms	From international construction firms and firms form other sectors
Skills	Craft trades demarcated by skills associated with the use of particular materials, some shift towards multiskilling	Specialised, narrow technical skills – fragmentation of old craft skills, growth of new skills associated with new materials and techniques	Specialist and general
Learning	Cumulative	Application of scientific knowledge, short formal training	Interactive
Innovation	Unstructured, informal	Structured, formal R&D	Large-scale R&D, flexible solutions
Technological change	Incremental changes, adaptation of 'tried and tested' techniques based on the use of traditional materials	Major changes such as prefabrication and the use of new material, construction plant and equipment	ICT
Organisational change	Minor adaptations to traditional craft forms	Adoption and adaptation of forms used in manufacturing sectors, standard contracts	Experimentation with different forms of contract and new relationships

Table 4.5: Paths of development, 1850s to 1960s and 1970s onwards (Gann, 1993: 62, 75)

Thus, according to Gann (1993) today we have in the UK at least three different forms of organising work: those based on traditional craft practices, those associated with the industrial techniques used in the first machine age, and those emerging after the latest boom in construction activity.

4.3.3 Insurance in UK and the role of NHBC

An important player in the industrialised paths of development in the UK, has been NHBC, the National House Builders Registration Council, which was incorporated on 17 November 1936 and *"...created to combat unsatisfactory building practices prevalent in UK housebuilding in the aftermath of inter-war government slum clearances"* (Howard, 2011: 25).

Beyond its role as Latent Defect insurer, NHBC also plays an important role as certifier. Historically, NHBC was created to increase quality in the construction through the establishment of a set of "requirements" in order to get their certification, which is needed of course to be insured. Of course those requirements focus on "workmanship" and "installation" problems, but also filled some gaps in design codes.

According to Howard (2011) NHBC represented an important voluntary venture into self-regulation and consumer protection by the industry. Thus, as well as inspecting and certifying new homes as being fit for purpose, the council also operated a register of approved house-builders prepared to build in accordance with a model specification. In terms of consumer protection, registration with NHBC included a warranty: *"...for buyers of certified homes that required builders to rectify defects arising from non-compliance with specifications during a two year period from date of purchase."* (Ibid. 2011: 25). In 1965, this evolved into the ten year concept of the Buildmark warranty, which covers over 80 % of new UK houses, giving home owners assurance and redress if things go wrong (Howard, 2011: 26).

4.4 Summary

This brief description of the evolution and configuration of the Danish, French and UK construction industries has two important lessons to convey. First, that transitions from one regime or 'machine age' to another is prompted by different precipitating jolts (Greenwood et al., 2002) and vehicles of transformation. Thus, the transition from craft to industrialisation in the first machine age was prompted by more or less the same overall landscape changes and processes as in Denmark, whereas the transition to industrialisation in the second machine age in the UK according to Gann (1993: 63-70) was marked especially by a construction boom in the start of the 1970s and the Ronan Point collapse, which prompted designers and architects to criticise the use of standardised heavy concrete systems and search for alternative paths for industrialised construction.

Second, the cases also illustrate that it is difficult to talk about regimes in the singular form even within individual member states. A regime is thus not a homogenous entity, as the preliminary analysis of the Danish and UK construction industries. It has been shown that even though we can speak about evolutionary dynamics and technological trajectories, there are still competing sector socio-technical configurations present, and that in order to implement new policies or technologies, these competing representations have to be taken into account. This is essentially a question of governance and strategic niche management that will be addressed in the following work in WP3.

In the end, this description of the organization of the different existing consumer protection systems, through incentives toward quality of the construction, has highlighted the importance of differences, and most important, that those differences are market/culture specific, and the result of an evolution. It is shown that some systems are based on a legal framework others on a market driven trend, some systems offer very few protections while others are extensive. Insurance can be viewed only as an element (systemic approach), maybe the final one, in the consumer protection framework. It is closely linked to the other elements involved in the construction quality chain and cannot be considered alone.

Overview of construction and insurance regimes in three European countries:

Level	Denmark	France	UK
EU Landscape	Policy convergence or harmonized insurance regimes?		
National construction regime	Corporatist system	Étatique system	Anglo-Saxon system
Techno-scientific knowledge	Strong administrative and technical continuity surrounding concrete technologies in DK. The adoption of standard measures, modules, planning techniques and specialized engineering education have played an important role in institutionalizing concrete as the de facto standard building technology in Denmark	TBC	Mixed. Comprising application of scientific knowledge as well as of short formal training. Specialised, narrow technical skills. Fragmentation of old craft skills, growth of new skills associated with new materials and techniques
Industry/Infrastructure	Complete existing infrastructure for the use of concrete in construction comprised of quarries, cement plants, concrete elements factories, transport and on-site production facilities.	TBC	TBC
Policy and regulation	The national construction policy conducted in DK favours extent concrete construction principles, through a strict legislation pertaining requirements for acoustics, climate, fire and structural safety.	TBC	A great reliance upon liberal market values, relatively low levels of state regulations.
Insurance	TBC	TBC	TBC

Technology	Well-anchored network of proven roles and technologies to support and sustain pre-fabricated concrete as the dominant construction principle, including: norms, standards, element fitters, masons concrete production engineers, factory workers, etc.	TBC	Mainly pre-cast as dominant technology, however an increasing move towards the use of complex products made from internationally sourced components.
Culture and markets	Strong cultural-cognitive legitimacy surrounding the use of concrete technologies among both professionals and end-users. More than 70 years of continued development have constituted concrete as the dominant construction principle in Denmark. Eco-technologies such as e.g. wood is almost non-existent in multi-story buildings and there is a marked reluctance among home owners to reside in a wooden detached house.	TBC	Three types of markets: 1. Small scale traditional markets: residential and repair and maintenance 2. Large scale projects – new markets: construction of infrastructures, mass-housing, schools, hospitals, slum clearance 3. Mainly large projects: new sophisticated buildings
Niche level	Sustainable eco-technologies		

Appendix 3.5: Deliverable 3.5 : Conditions for greater mutual recognition of construction insurances regimes

The following paragraph is only intended to draw a sketch of the future final content of the deliverable.

This task will constitute an analysis of the conditions for a greater mutual recognition of construction insurance regimes, and possible convergence paths, basis for the development of a set of guidelines for a policy formulation.

Following previous deliverables, we will first extend the analysis on recognition paths toward its "vertical", regime integration, point of view.

We will then briefly see how mutual recognition may concern a wide range of stakeholders and how regulation, and more specifically "freedom to provide service" regulation impacts the organization of the insurance market.

Finally, we will see how "policy convergence" literature could clarify possible pathways toward better market practices.

5.1 Impacts of national strategies on construction insurance

A preliminary finding from the first part of the analysis of construction and insurance regimes show that the envisioned analysis, as illustrated below, has to be adjusted.

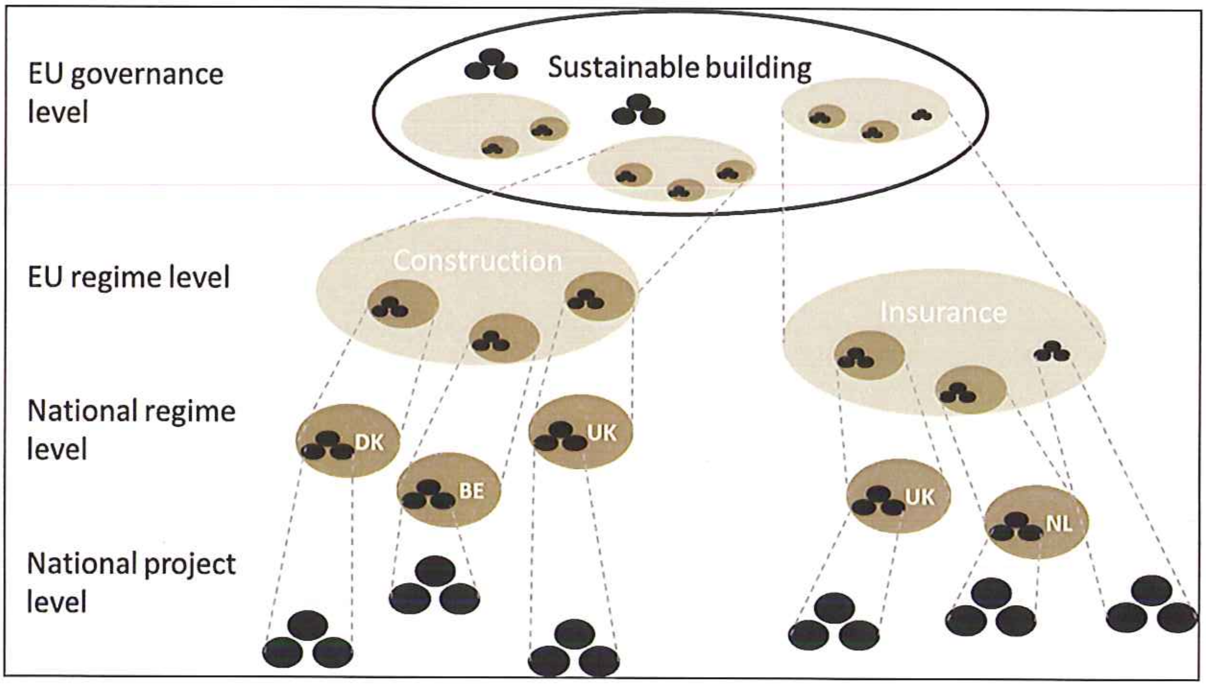

Figure 5.1: Levels of analysis (adapted after Seyfang and Longhurst, 2012)

We still intend to conduct two distinct yet interrelated analyses; a horizontal respectively vertical analysis of regimes development and transformation where (i) the vertical analysis aims at providing an understanding of the interplay and co-development of national regimes of insurance and construction within the individual national context; and (ii) the horizontal analysis will focus on the interplay between national and supra-national regulation and on the dynamics of adaption and circulation of insurance schemes in Europe.

The preliminary findings, however, also illustrate that it is not conducive to talk about an insurance regime respectively a construction regime, as these elements to wide extent are intertwined and have co-developed over the decades. Furthermore, we have also seen that national regimes are not homogenous entities. Rather, findings indicate that it may be more useful to understand and analyse the emergence of a new technological trajectory from the point of sensitivity towards local multiplicity. What this entails is a shift of focus from the individual technological niche to multiple localised projects that exist simultaneously and build on each other over time in such a way that sequences of local projects gradually add up to a technological trajectory at a global level as illustrated below.

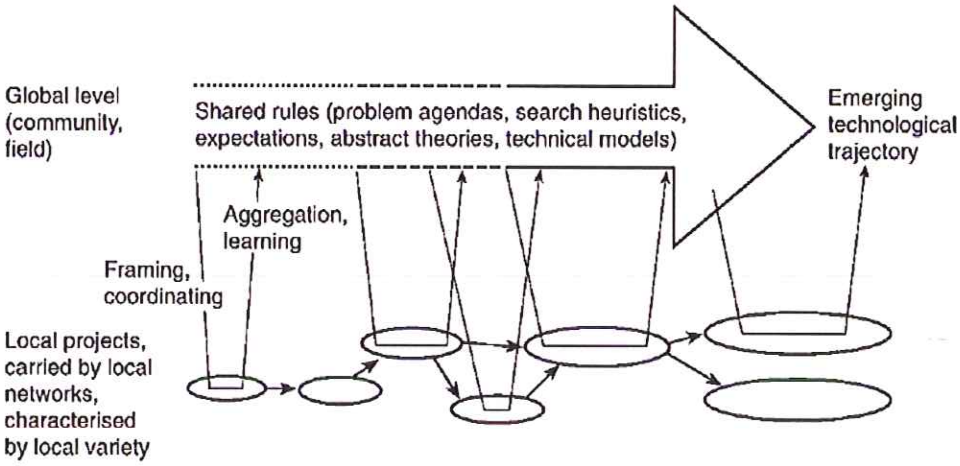

Figure 5.2: Technological trajectory carried by local projects

This further means that we will have to direct our attention towards understanding processes of systemic configuration and reconfiguration. So in the next part of work in WP3 we will go down on the local level and through a number of case analyses of the use and implementation of specific eco-technologies in the three countries that have been selected for this work. Focus will be placed on examining how new elements are introduced in a socio-technical context and what changes in linkages between elements take place and are required – and on how insurance can be seen as a vehicle in these types of processes, as illustrated below:

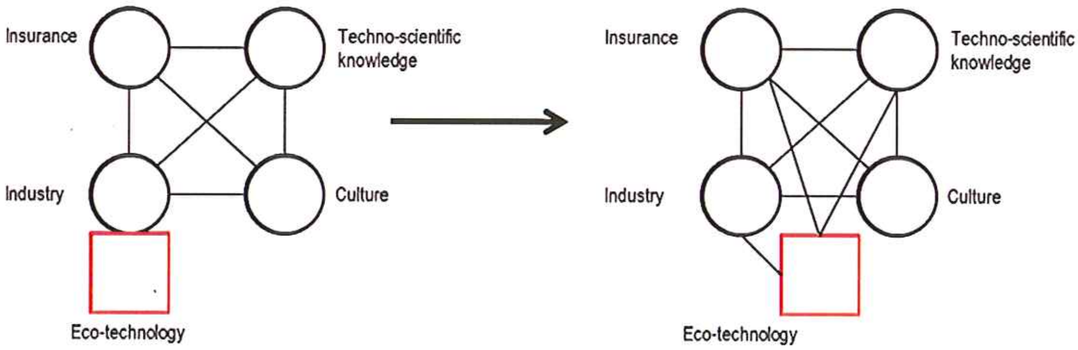

Figure 4.10: Socio-technical configuring and reconfiguring

Therefore, the governance of policy implementation, e.g. new in relation to EU legislation on the topic of sustainable building, is constituted as a prime unit of analysis in the further project progress. The reason for this being that it under such varying and even contradictory circumstances is not possible to implement and enforce a single solution or governance scheme across all nations. Instead, new policy (insurance) schemes have to be designed and applied differently in different nations acknowledging that a single, uniform solution might not be possible to implement.

5.2 General financial protection requirements and regulatory framework influence

Formulation of general financial protection requirements and regulatory framework influence in order to support the sustainable development.
Depending on the type of stakeholder the answer to the question "what are the expectations or fears that are implied or understood behind the idea of recognition?" may be regarded very differently.
Considering answers to the "mapping update" questionnaire, intended for insurers, we will see how FPS raises questions about the cross-border activities.

5.2.1 Financial protection requirements

We previously noted that the necessity of information on financial protection touches all the actors of the market:

- The insured, regarding the risk of default of his insurer, notably the owner, who must ask for information on his insurer. Note that this category also includes contractors, and designers in general.
- The insurance broker who bears a "duty to advise" and is liable according to European Directive 2002/92 on insurance mediation[16].
- The insurer regarding its own "financial exposure". This is notably the case for an insurer which is used to work on an unfunded / pay as you go basis and wants to deliver guarantees on a funded / capitalized basis like decennial covers.
- The reinsurer, also regarding its own exposure. This is the case for example if it participates to the cover on a quota-share basis. The asymmetry of information between the parties may also lead to an inadequate use of the treaties (for example use of a general liability treaty instead of specific decennial treaty).
- The financial public authorities which deliver the FPS authorizations, which may not have the knowledge on the financial exposure of foreign guarantees (such as decennial covers). In order to verify and validate the financial security of an insurance activity, the authority must have a thorough knowledge on the insurance product structure.

Once again it appears that access to information is a key element in the global financial protection requirements hence in insurance underwriting.

5.2.2 Regulatory framework influence

Among insurers interviewed, cross-border activity of insurance seems to raise a concern of equal treatment for all European actors in terms of application of the regulatory framework.
In other words, what are the applicable rules in terms of financial protection in case of cross border insurance and who is supposed to verify their compliance?

5.2.2.1 Regarding general insurance financial regulations, the main existing European framework is the Solvency 2 directive.

Article 30 of the Solvency II Framework Directive[17], provides:
"1. The financial supervision of insurance and reinsurance undertakings, including that of the business they pursue either through branches or under the freedom to provide services, shall be the sole responsibility of the home Member State.

[16] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0092:EN:HTML
[17] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:335:0001:0155:EN:PDF

*2. Financial supervision pursuant to paragraph 1 shall include verification, with respect to the entire business of the insurance and reinsurance undertaking, of its state of solvency, of the establishment of technical provisions, of its assets and of the eligible own funds, **in accordance with the rules laid down or practices followed in the home Member State under provisions adopted at Community level**".*

Nonetheless, there are specific cross border insurance regulations.

5.2.2.2 Regarding insurers activity, the main tool available in order to offer guarantees to their home clients across Europe is the "Freedom to Provide Services" (FPS) European law.
We understand that your question is essentially about home/host competences of national authorities regarding insurance undertakings passporting into another Member State under the freedom to provide services.

Regarding insurance undertakings, the European Commission's Interpretative **Communication** on freedom to provide services and the general good in the insurance sector[18] states:

*"The Third Council Directives 92/49/EEC and 92/96/EEC(1) completed the establishment of the single market in the insurance sector. They introduced a single system for the authorisation and financial supervision of insurance undertakings by the Member State in which they have their head office (the home Member State). Such authorisation issued by the home Member State enables an insurance undertaking to carry on its insurance business anywhere in the European Community, either on the rules on establishment, i.e. by opening agencies or branches in all the Member States, or under the rules on the freedom to provide services. Where it carries on business in another Member State, the insurance undertaking must comply with the conditions in which, **for reasons of the general good, such business must be conducted in the host Member State**. Under the system set up by the Directives, the financial supervision of the business carried on by the insurance undertaking, including business carried on under the rules on establishment or on the freedom to provide services, is always a matter only for that insurance undertaking's home Member State".*

Where the concept of the general good is expressed as:
*"The concept of the general good is based in the Court's case law. [...] However, the Court has never given a definition of "the general good", preferring to maintain its evolving nature. [...]**The Court requires that a national provision must satisfy the following requirements if it is validly to obstruct or limit exercise of the right of establishment and the freedom to provide services:***

- *it must come within a field which has not been harmonised,*
- *it must pursue an objective of the general good,*
- *it must be non-discriminatory,*
- *it must by objectively necessary,*
- *it must be proportionate to the objective pursued,*
- *it is also necessary for the general-good objective not to be safeguarded by rules to which the provider of services is already subject in the Member State where he is established.*

These conditions are cumulative. A national measure which is claimed to be compatible with the principle of the freedom of movement must satisfy all the conditions. If a national measure does not meet one or other condition, it is not compatible with Community law.
[...]
*The harmonisation directives define the minimum level of the general good within the Community. Measures relating, for example, to the calculation of technical provisions and the solvency margin, **the conditions for taking up insurance business, and financial and prudential supervision may no longer be covered by the general good of a Member State.***

18 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000Y0216(01):EN:HTML

[...]
The Court has so far acknowledged that, in the absence of harmonisation, the following areas could fall within the scope of the interest of the general good: the professional rules designed to protect the recipient of services, protection of workers, consumer protection, etc."

In other words, since harmonized minimum provision rules exist at European level, and that financial and prudential supervision do not fall under "the general good" concept, a Member State that decides to impose on its own insurance undertakings stricter enforcement rules than those laid down in the Directives, cannot impose those standards to a foreign State.
In other words the directive establishes a framework for a race to the bottom of consumer protection in terms of construction insurance.

As a consequence, insurers are apparently taking competitive advantage from providing insurance from Member States with less restrictive prudential rules.
This situation seems to be especially the case for Inherent Defect Insurance, which implies financial protection up to construction costs, for periods of up to 14 years according to prudential regulations of the countries where the risks are located.

5.3 Conditions for handling incompatibility of national insurance regimes

Considering the previously exposed inter-connection of elements that makes up the construction regime systems and the variability of situations, we will further develop the possible theoretical paths toward "policy convergence" at a European level.

While various and numerous literature explore the topic of policy convergence, the following discussion will be essentially based on the framework presented by Christoph Knill in his synthetic, nonetheless very complete, comparative articles[19]. The overview made in this article encompasses all policy convergence mechanisms we could find in literature.

5.3.1 What causes policy convergence

Even though causal factors of policy convergence vary among authors, Knill identifies five main categories of causes. As summarized in the following table, each mechanism combines a stimulus and a corresponding response, i.e. the behaviour leading to convergence.

Table 5.3.1 - Mechanisms of policy convergence

Mechanism	Stimulus	Response
Imposition	Political demand or pressure	Submission
International harmonization	Legal obligation through international law	Compliance
Regulatory competition	Competitive pressure	Mutual adjustment
Transnational communication		
- Lesson-drawing	Problem pressure	Transfer of model found elsewhere

19 "Causes and conditions of cross-national policy convergence" by Katharina Holzinger and Christoph Knill, Journal of European Public Policy, vol. 12:5 October 2005: 775-796
"Introduction: Cross-national policy convergence: concepts, approaches and explanatory factors" by Christoph Knill, Journal of European Public Policy, vol. 12:5 2005

- Transnational problem-solving	Parallel problem pressure	Adoption of commonly developed model
- Emulation	Desire for conformity	Copying of widely used model
- International policy promotion	Legitimacy pressure	Adoption of recommended model
Independent problem-solving	Parallel problem pressure	Independent similar response

- Imposition
  "Convergence through imposition occurs whenever an external political actor forces a government to adopt a certain policy".
  We can regard this coercive mechanism as not desirable considering the variety and complexity of the systems and situations described in the previous discussion. It also faces two major critic: legal systems differ from one country to another, and insurers are free actors on the insurance market.
  Firstly, common imposed legislation as to suit both common law and civil code legal systems.
  Secondly, if legal requirements are to be imposed, it cannot be on insurance legislation but only on liabilities, leaving the adequacy of the insurance and financial associated protections unclear.

- International harmonization
  International harmonization occurs when the different countries involved in the process comply with uniform legal obligations defined in supranational law. It is a voluntary co-operative process.
  We can in our case categorize it as a "negociated" imposition. It therefore faces the same hurdles.

- Regulatory competition
  In this mechanism, "countries facing competitive pressure, mutually adjust their policies, [...] they redesign their market regulations in order to avoid regulatory burdens restricting the competitiveness of domestic industries".
  In summary it is a race to bottom mechanism that is not desirable in our case, considering once again the importance of level of protection existing in the different countries.

- Transnational communication
  This category includes different related mechanisms: lesson drawing, transnational problem solving, emulation and transnational promotion of policy models.
  "In contrast to other mechanisms, they are are purely based on communication among countries." In summary:
  - Lesson drawing utilize available experience elsewhere, it is an experience-based policy learning.
  - Transnational problem learning is a rational joint development of common solutions to similar domestic problems.
  - Emulation of policies is driven by a desire of conformity with other countries. It is function of the number of countries that already adopted a certain policy, trying to increase social legitimacy, and not being left behind. Its adoption also depends on the perception of its urgency. Considering the increasing number of countries carrying out IDI covers and the general sustainable development trend this mechanism seems to fit greatly to our problematic.
  - International policy promotion is a comparable rational learning mechanism but driven by the active role of international institutions promoting the spread of distinctive policy approaches they consider particularly promising. It is here again a definition that corresponds to our situation, the European Commission being the promoting institution.

- Independent problem solving
  In this mechanism, the convergence of policies between several countries arise as a result of similar but independent responses to parallel problem pressures. Actors do not behave in response to each other's actions. Therefore, this mechanism is out of the scope of our means.

A preliminary conclusion of the description of those mechanisms is that "transnational communication" seems to be the preferable path to follow as they allow convergence by pulling upwards the standards without interfering in national regulations and construction systems' balance.

5.3.2 When does policy convergence occur

For each casual mechanism Knill further develop theoretical framework of conditions of their operation. As summarized in the following table he shows that "the conditions and effects of convergence vary strongly across the different convergence mechanisms".
He also states that "it is hardly surprising that empirical findings on policy convergence and on races to the top or bottom are rather ambiguous."

Table 5.3.2 - Theoretical expectations on scope, degree and direction of convergence

Mechanism	Factors affecting convergence scope	Factors affecting convergence degree	Expected convergence direction
Imposition	Reach of the imposing actor (individual country vs. international institution)	(by definition full convergence to imposed model)	No prediction possible
International harmonization	Number of member countries	Degree of legal specification	Upward shift for minimum harmonization
		Capacity to enforce compliance	Persistence for total harmonization
Regulatory competition	Market economy Trade-related policies	Trade dependence	Upward or downward shift for product standards
			Downward shift for process standards
Transnational communication	Apart from information about policy choices of other countries no particular restrictions apply	Degree of existing similarity (number of adopters)	Upward shift in case of policy promotion For other mechanisms no prediction possible
		Cultural linkages	
		Degree of model specification	
		Similarity of policy legacies	
		Degree of inter-linkage into transnational networks	
Independent problem-solving	Number of countries that recognize similar problem	Degree of existing similarity across countries	No prediction possible

Consequently, if the theoretical framework may clarify the mechanisms of convergence, it doesn't give any simple answer to the efficiency of those mechanisms.
Nonetheless, we can conclude from our previous discussion, that policy convergence of construction insurance regimes seems preferable through "transnational communication" mechanisms, in order to improve voluntary dissemination of the insurance offer, adapted to each specific sociologic, economic, technic, cultural and regulatory context of the construction systems.

Appendix 3.6: Deliverable 3.6 : Recommendations for policy formulation

The following paragraph is only intended to draw a sketch of the future final content of the deliverable. This analysis will provide recommendations for policy formulation stimulating good practices and insurance solutions.

As already indicated in Elios 1, and developed in previous paragraphs, considering firstly states' legal sovereignty and secondly freedom of activity of private construction insurance players, legal and insurance frameworks throughout Europe can only be changed by the stakeholders being part of the national markets themselves. Among others, those frameworks are the result of local culture regarding construction methods and techniques, legal history, insurance role in the construction quality chain, and financial realities.
Therefore, improvements in both constructions market accessibility and protection of consumer through easier access to insurance and better coverage can, above all, be achieved through "transnational communication" mechanisms.

In consequence, our main lever to promote insurance is information. Whether it be through incentives in order to stimulate the market of through sharing out the knowledge to the different actors involved.

In order to support the propositions of incentives, a valuable tool could be the creation by the Commission of an Elios internet site that would centralize information regarding construction insurance of eco-technologies. We'll see in the following paragraphs how this tool could support different goals.

6.1 Improve failure forecast

One efficient incentive to improve insurance availability would be to give some help to the insurers in their risk assessment.
Being able to make a reliable forecast of failure is the key element in order to do the pricing of a cover and propose guarantees. And as previously indicated, without claim history and statistical data this forecast can only be done through a specific qualitative analysis of the risk.

Preliminary results of discussions indicate that:

- The technical classification of claims is a problem: it has to be done by experienced staff that can classify the claims, and it is unlikely that most insurers have the computational systems to differentiate "eco-technological" claims.
- Insurers are not interested in participating to a pure statistical database, which would report the spread of claims, since it touches their internal pricing secrets. They seem to be more interested by an exchange on technical information on systems' failures.
- One form of exchange could be the creation of a "Pathology Forum" where insurers:
  - Decide together the systems to be assessed, corresponding to shared topical subjects
  - Create together a simple typology of claims regarding eco-technologies that each insurer could implement in its own computational system. That way, the staff could technically categorize and manage the claims in order to select and report them.
  - Send information on technical claims on those systems, without giving any information on the number of claims or number of contracts underwritten in order to get rid of any strategic statistical data disclosure. The only information given is that the topic is of interest for the insurer.
  - Get the information processing and risk analysis done on those claims by the "Pathology Forum" itself, relieving every insurer to do it on its side. Pooling the outsourcing of the analysis would constitute a substantial economy for the insurers.

6.2 Hazard Notification Procedure

With the involvement of insurers, another form of exchange of information about pathology could be the creation of a "hazard notification procedure" for eco-technologies.

6.3 Quality signs

6.3.1 Quality signs as an insurance underwriting tool

One way of helping the insurers who want to cover a foreign company is to give them the means to appraise the quality of this company through a better knowledge and understanding of its quality signs. Note that the given information must be sufficiently relevant and discriminatory in terms of risk assessment to have an added value for the insurer.

Therefore, information gathered through Work Package 1 on quality signs used locally by insurers should be provided through the internet in a simple and straightforward manner to all actors.

Reminder: the technical information that will be provided by the information system has to be sufficiently valuable for the insurer in order to help them assess the risks and consequently set up new insurance products to seize new market opportunities.

6.3.2 Quality signs at the European level

As mentioned in previous paragraphs, in order to be useful assessment criteria, quality signs have to be relevant in terms of risk characterization. In conjunction with Work Package 1, we tried to identify those signs in regard of their use by insurers in their risk assessment process.
One of the conclusions of this work is that few pan European signs are recognized as valuable by insurers. In order to improve this situation, we feel that some interesting developments could be pursued specifically on European Technical Approvals (ETA).

Suggested improvements for ETA:
- Take into account in the ETA of local climatic conditions in accordance with Eurocode 1 national annex. It is especially necessary for all envelope elements (roofs, joinery, insulation) with regard to bad weather or temperature loads (e.g. possible material fatigue under thaw-freeze cycles in some locations), but also for "sustainable" materials with regard to humidity, insects attacks, mildew or fungi.
- take into account in the ETA of implementation and installation problematic.

6.3.3 Quality signs as a promotion tool

On the other hand the companies should know what signs are used locally by the insurers on their homeland to appraise their risks, notably it they want to set up business or engage in a long term activity. Those signs are the ones overviewed in the "Risk assessment criteria" (Chapter III, 3.1.2) and in the "Definition of relevant technical criteria" section (Chapter III, section 3.3.2.7) in conjunction with WP1.

6.4 Construction techniques and normative framework knowledge

In order to help a company operating in a foreign country we could give information about the local construction techniques and normative framework.

Companies should get a better knowledge of:
- Local design codes and general normative framework, including local climatic or live loads.

- Local construction techniques for different type of construction elements. For example type of roofs and terrace sealants for a company installing photovoltaic panels.

This information should help the companies demonstrate that they comply with local design codes, and are taking into consideration the local environmental construction context and therefore should help them find insurance.

6.5 Legal and insurance requirements knowledge

6.5.1 Existing regimes

One of the important set of information that could be shared on the Elios internet site should be the Mapping of Insurance Regimes for each country. Therefore, it would be possible to assess the insurance requirements and/or legal risks for each country.

Beyond the pure description on the Legal framework / requirements or insurance possibilities / obligations, as expressed in the mapping, the site should point out the associated risks for the "builder". In addition, considering the presumed incompetence of the users in legal terminology (SME), the text should also be edited in order to be accessible by non-legal speaking audiences.

As a result, the reader should be able to know easily what are the risks incurred in a selected country, notably financial, and consequently what insurance protection is needed.

6.5.2 "Single points of contact"

As indicated in §.1.3, "single points of contact" should be provided by governments as requested by the Service directive. The centralized European internet site that gives access to the national information sites is apparently not widely used and should be promoted, notably on the Elios site. Nonetheless, the information provided on insurance matters through this mean seems at the moment very difficult to be used.

In order to improve its usefulness, we first recommend a systematic English translation of the sites. Language barrier is still the main difficulty in cross border activity and shouldn't exist in cross border activity information matter at European level.

Regarding the content of the sites on insurance matters, we recommend clear access to "insurance access guides" such as the one written by the French insurance federation (FFSA) in an attempt to help foreign companies understand the French legal framework and how to comply with it. This guide notably gives:

- Description of how insurance works locally[20]
- Description of the administrative documents needed to be insured[21]

Should notably be indicated in these guides, the means to get insurance, including: who to contact, what information is needed, etc.

6.6 Existing insurance covers

Another way of clarifying the subscribing process could be to improve the transparency of the existing insurance products and existing financial offer.
Considering the difficulty of sharing insurance companies' contracts, the information could be given through examples of usual covers included in those contracts.

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[20] http://www.ffsa.fr/sites/jcms/c_51299/how-decennial-liability-insurance-works?cc=fp_7202
[21] http://www.ffsa.fr/sites/jcms/p1_663116/decennial-liability-insurancea-guide-designed-for-european-builders

Beyond covers, the single point of contact should also give information about the usual insurers' information requirements regarding innovative risk. These requirements could be:

- Experience feedback on comparable projects
- Specific opinion of a TIS or expert

6.7 Technical Inspection Services (TIS)

Share information on existing national TIS "certification" procedures:

- The companies should be able to know the role of the TIS in the selected country, notably in regard of insurance requirements.
- The insurers should be informed on the local legal or private accreditations of the TIS in order to help them follow their insured companies on foreign markets.

Promote systematic inspections of construction works and on contractors like what is done by NHBC in order to diminish insurance costs.
These inspections should notably be carried out in absence of mandatory Technical Control.

6.8 Energy performance guarantees

As we've seen, coverage of performance guarantees faces many challenges.

6.8.1 First, even if it is not pure performance coverage, existing covers can quite easily be extended to malfunctioning, within the existing inherent defect covers.

6.8.2 On its side, "Consumption performance" coverage, i.e. the level of energy consumed by the user or produced in order to suit the consumer demand, faces huge hurdles. Its dependency on the consumers' behaviour makes it hard to assess, particularly if the users are individuals. On the contrary, some energy saving guarantees are appearing on office buildings, for which on the one hand consuming framework is better foreseen, and therefore construction more adapted at the design level, and on the other hand maintenance is carried out flawlessly.

These guarantees are usually directly delivered by ESCo in case of rehabilitation or by developers for new constructions, without implication of insurers. The risk is directly borne by the builder or investor.
It is not clear yet if collective buildings' risk could be assessed in the same way, hence performance guarantees proposed for this specific situation.

In order to avoid these insurance difficulties, and develop the offer of coverage, various countries decided to support funding of projects through public financing. In those cases while the governments substitute for the insurers, the covers are widen to a broader range of buildings and situations. If it's conclusive, the acquired experience will maybe allow the insurers to take over.

6.8.3 Finally, regarding its decennial IDI cover, French authorities are in the process of excluding the "consumption performance" guarantees from insurance obligation, in an attempt to restrict the extent of the cover to Inherent Energy Performance Guarantees[22]. The implementation of this cut down guarantee is not yet carried out, and still has notably to define what would represent a claim.

Actually, this "Inherent performance" coverage, i.e. theoretical performance of the construction work in place, hence consisting of material / design / workmanship coverage still confronts the performance measurement problems. It will therefore need standardized measures of "inherent performance".

[22] GPEI - Garantie de Performance Énergétique Intrinsèque in « Premières propositions dévoilées pour booster la garantie de performance énergétique » - Le Moniteur, 23/04/2013

6.9 Promotion of other guarantees

6.9.1 Completion Guarantees

Promote the "completion guarantees" during the "making good period" (also called perfect fulfilment), in order to get the remediation measures directly handled by the contractor without involvement of the insurer. The completion guarantee is a one-year or two-year guarantee under which the builder agrees to carry out the required work and assume related risks during the years following completion.

Find other direct repair schemes without involvement of insurance and extra cost arising from the "recourse" process.

6.9.2 Proper Functioning Guarantees

Promote the "proper functioning" covers, of a two years duration, which guarantee that equipment are operational and in good working order. These guarantees perfectly fit eco-technologies coverage requirements and can be carried out independently from inherent defect long term guarantees (IDI).

6.9.3 Professional Indemnity Guarantees

Promote the Professional Indemnity (PI) guarantees, across all Europe. Beyond general Third Party Liability (TPL) this second level of protection of the consumer can be quite easily taken out. As it touches the design process it suits well innovation coverage difficulties and therefore "eco-technologies".

6.10 Regulatory framework

6.9.1 Enforce responsibilities through General Liability

The goal of this recommendation is to find ways for manufacturers and contractors to be more responsible of their work. This could be done through minimum obligations of protection on the General Liability and ensuring that those guarantees can be easily activated by the insured. Therefore failures would be attributable to the actor who's responsible, at least up to a minimum level.

As we've seen in the analyses, the principle of levelling up the requirements, departing from lowest common denominator could be the only possible convergence path through harmonization. Nonetheless, once again this solution faces a problem of complexity. Actually, the TPL cover encompasses a very very wide diversity of different guarantees and types of risks, and not only construction. Insurers combine different underlying types of insurance coverage, without detailed distinction, in order to spread out the risks.

This aggregation principle is the main reason why construction TPL premium values are never available, they cannot be distinguished from other types of TPL.

Consequently, modifying regulations on construction TPL cannot be done alone, independently from other domains covered, that would be impacted by any modification.

6.9.2 Freedom to Provide Service

Based on the application of Home Member State's provisions, the Freedom to Provide Service regulation appears to lead to unfair competition.

Communication by EIOPA to National Authorities of existing local rules associated to specific guarantees, and notably IDI, could be a first step in order increase their awareness of possible financial risks

Actually, the lack of knowledge about the covers delivered may impair the national financial protection mechanisms that underlie the FPS. Being informed of the risks, the local authorities cannot deny their responsibility of protecting the consumer from a possible failure of a domestic insurer.

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Appendix 3.8: Definitions

Risk-attaching basis: A basis under which insurance is provided for claims arising from policies commencing during the period to which the insurance relates.
All claims from insured incepting during the period of the insurance contract are covered even if they occur after the expiration date of the insurance contract. Any claims from insured incepting outside the period of the insurance contract are not covered even if they occur during the period of the insurance contract.

Underwriting Year: The effective date of the original policy, rather than the date of loss, determines the basis of attachment. Any losses occurring on policies written or renewed with inception or renewal dates during the term of the given reinsurance agreement will be covered by that reinsurance agreement irrespective when the loss actually occurred.

Claims-made basis: A policy which covers all claims reported to an insurer within the policy period irrespective of when they occurred.

Claims Made Basis Insurance Agreements: The provision in a policy of insurance that affords coverage only for claims that are made during the term of the policy for losses that occur on or after the retroactive date specified in the policy. A claims made policy is said to "cut-off the tail" on liability business by not covering claims reported after the term of the insurance policy unless extended by special agreement.

Accident Year: The date of the loss under the original policy rather than the effective date of the original policy that determines the basis of attachment. Any losses occurring during the reinsurance agreement period on policies in force (if any), written or renewed will be covered irrespective of the inception or the renewal date of the original policy. This mechanism is often used with "the losses occurring during" the contract period methodology.