BENCHMARK OF BIOENERGY PERMITTING PROCEDURES IN THE EUROPEAN UNION

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Abstract

This report describes the results of the efforts of the consortium performed in frame of the *Benchmarking and guidelines for streamlined authorisation processes for bioenergy installations* study. The major goal of this report is to reveal detailed quantitative information about the various bio-energy permitting procedures in the European Union, in particular the lead time and the costs. The bioenergy categories considered are Biofuels, Biogas, Combustion, Cofiring and Boilers including all possible kinds of feedstock as well as the organic fraction of waste. In total, over 130 real cases were considered.

Our major finding is that the permitting process is controlled by factors that can be linked to the **procedure** rather than to the process or the content. The main results for the **criteria** are:

- The average **lead time** of the total bio-energy permit procedure is ca. 23 months and the deviation is ca. 21 months. These values are more or less the same for each region in the Union.
- For procedures including an Environmental Impact Assessment (EIA), the average lead time increases to almost 34 months. Inclusion of both an EIA and a legal case even stretches the duration to almost 59 months.
- The average lead time of a single **procedure step** is ~8 months and its deviation is ~8 months also. Once more, these values are weakly dependent on the type of technology, or the geographical region.
- A permitting procedure on average consists of slightly over **three serial procedural steps**.
- Over **30% of the applications fails** (i.e. their characteristics exceed the benchmark). The technology categories **Codigestion** and stand-alone **Combustion** plants inhibit the lowest success ratios.
- The major steps leading to delay are the spatial planning procedure, the Environmental Impact Assessment, the (integrated) environmental permit, the grid access and the legal case (if applicable).
- Of all technologies, the Biofuels include on average the longest durations and the Boilers the shortest.
- The major driver for the costs is the **Environmental Impact Assessment**. The presence of the EIA increases the median value of the total costs from 49 k€ to 400 k€.

In approximately one third of all analyzed cases, permits were appealed or objected to. After the final decision of the responsible authorities, still ~13% of the cases were appealed to higher authorities. The technology category which faces the most resistance is Cofiring, followed by Combustion, Biogas and Biofuels. The most frequent reasons for appeal are the expected emissions, followed by traffic movements, land use and sustainability aspects. In case of higher appeal, emissions are again the main reason for objection, followed by sustainability issues. In case of emissions, the most common named by the appellants are noise, smell, NO_x and fine dust. In most of the appealed cases, the projects were objected to by the residents, followed by NGO's and other stakeholders. It appears that the resistance is limited to Northwest Europe only. In the South and the East, formal opposition is virtually absent. The Central and Scandinavian regions are in between.

The major **bottlenecks** controlling the length of the environmental procedure are the following:

- Land use approval is denied for biomass facilities;
- Bureaucratic inefficiencies like cross-authorisation or lack of mandatory time limits for authorities;
- An ineffective multitude of permits and licenses issued by separate authorities;
- Permits are subject to a huge amount of legislative acts (>30);
- Bio-energy particular legislation is deficient;
- Well-defined administrative structures are absent;
- Conditions in single-type permits issued may conflict with each other;
- Procedural errors which result in an incorrect issuance of the permit;
- Official authorities lacking the knowledge, capacity and expertise to fully adjudicate innovative bio-energy production plants;
- Applicants lack the experience to prepare proficiently complex bio-energy permit applications;
- Both local and national public resistance to bio-energy may lead to objections and higher appeal;
- There is no clear and transparent procedure for the grid access;
- Legal conditions in the issued permit are too costly to implement or unmanageable otherwise.

Actions toward streamlining the permitting process should focus on streamlining the procedure (One-stop-shop principle) and improving the efficiency of the communication process among the various stakeholders to prevent ineffective higher appeals.

Content

Part 1: Introduction and Literature overview

1 Introduction

This report describes the results of the efforts of the consortium performed in frame of the *Benchmarking and guidelines for streamlined authorisation processes for bioenergy installations* study. The major goal of this report is to reveal detailed quantitative information about the various bio-energy permitting procedures in the European Union, in particular the lead time and the costs. This information in combination with the bottlenecks revealed from literature, our expert inquiries and the stakeholder workshops, will guide us to establish the various actions required to streamline the bio-energy permitting procedures.

The time period of this report stretches from December 2007 to January 2009. The work consists of five work packages, which are described below.

1.1 Tasks of the various work packages

Tasks for work package 1 - Literature survey, methodology and category identification)

- **Literature** study to research existing expert studies on the subject to reveal the (formal) permitting procedures in the various countries and possible bottlenecks;
- A **data base** of bio-energy permitting procedures is created with basic information about each project (longlist). Projects are selected from various European countries distributed across various technologies;
- A **selection** is proposed to restrict the data set to (at least) 60 permits to be analysed in detail in WP 2 (shortlist);
- A methodology and a draft **Quality Management Schedule** (QMS) is developed for analysing the shortlist;
- A **questionnaire** for input for the QMS is created.

Tasks for work package 2 - Inquiry and documentation of real licensing cases

- A final **shortlist** is prepared with interesting bio-energy projects across Europe taking into account a certain spread over the various biomass technology combinations;
- An **inquiry form** is arranged consisting of a Word document and an Excel form. These forms were distributed among stakeholders;

- The data collected from the positive responses are entered in a single Excel sheet for further analysis in WP 3. This common data base is used to analyze the various permitting processes in the various European countries quantitatively.

Tasks for work package 3 - Analysis of results

- The real data collected in WP 2 is **analyzed** to reveal in particular the lead times and the costs per selected technology;
- The data retrieved from WP 1 about the formal procedures in a Member State are analyzed in the same way.

Tasks for work package 4 - Establishing best practices, workshops and recommendations

- Relevant **stakeholders** are invited to participate in one day workshops prepared for 4 separate technology groups;
- The workshops take place in Brussels in June 2008.

Tasks for work package 5 - Dissemination and knowledge transfer

- Dissemination material has been prepared in the form of **flyers**;
- Presentation of the results at various European biomass conferences and on the website of DG TREN.

1.2 Boundaries and definitions

In this work the consortium has considered 'permits', i.e. the written authorization to perform some activity. This is distinguished from a 'contract', i.e. the obligation to perform an activity (to exchange services or goods). A permit or license is applied for by the applicant (a commercial legal entity; most often the project developer or plant operator) and issued or approved by a competent governmental agency, referred to as the regulatory authority.

For example, the approval to use the land to erect a biomass facility is included in this study, but the actual land purchase or rent contract is not. Possibly, such a contract is required to obtain such an approval. The authorisation to access the electricity grid is included, but the contractual negotiations with the grid operator are not. Greenhouse Gas (GHG) emission rights are excluded as well; although they are issued by governmental institutions they are traded on the market freely. Besides, the applicant can start operating the plant without these rights (unless they are mandatory; in that case they are included). Accreditation, metering, monitoring and registration being routine requirements are excluded as well.

A permit usually is a concrete document. It may include several forms or attachments. The **permitting procedure** is defined as a series of activities required to obtain the approval of the permit. Activities are also referred to as process steps, procedural elements or phases, which are undertaken by either the project owner or the authority.

A **project** or initiative considered by this study includes the process to collect all the permits required for the biomass facility. The project starts with the application by the project developer of the first permit and ends with the irrevocable approval of the last permit required to operate the biomass facility. The three most important criteria of a project are the duration, the costs (from the perspective of the applicant) and the outcome (success or failure).
In some cases the real permit considered reflects an extension or adaptation of an existing production facility only (extension permit). Obviously, the process for the issuance of an extension permit differs from that of starting an entirely new facility.

The applicants and the regulatory authorities are the only two stakeholders that can be responsible for the execution of a specific activity in the permitting process. Other stakeholders (public, mayor, commissions, utilities, etc.) may be involved but can only contribute to the process indirectly.

The most important criterion of the permitting procedure is its **lead time**, i.e. the time between the application of the first permit and the irrevocable issuance of the last permit. Not always may such a definition be applicable; some Cofiring facilities, for instance, need a revision permit only to be authorized to combust biomass. In this case, a more pragmatic definition is useful: i.e. the time span of the start of the Environmental Impact Assessment and the irrevocable issuance of the revision permit.

Furthermore, the permitting procedure for some stand-alone power facilities includes the grid access, while for others it doesn't since the electricity is distributed to a nearby industrial complex, for instance. These examples show that no unique definition exists, but is to some extent context dependent. Informal negotiations between the applicant and the authorities prior to the application are not included in the lead time.

The project with regard to this work is a **success** in case its time period matches the benchmark and the eventual construction of the facility is not cancelled by permitting issues. A **failure** arises in case:

- The procedure lasts longer than the benchmark;
- The permit expenditures exceed the benchmark;
- A permit application is rejected by the authorities;
- The permit issued is revoked by the Supreme Court;
- The conditions of the (irrevocable) permit are not feasible for the applicant.

1.3 Glossary

ANOVA	Analysis of variance
Biomass	Biomass in the sense of the definition for biomass in EU Directive 2001/77/EC
Biofuel plant	Production of sustainable fuels (gas and/or liquids) for the transport sector
Biogas plant	Biological conversion of biomass to biogas, not for transport purposes
Boiler	Thermal conversion of biomass or biomass and fossils without electricity production
BAT	Best Available Technology
BREF	BAT Reference Document (used for the preparation for the IPPC Permit)
BTC	Biomass Technology Combination
BTRC	Biomass Technology Region Combination
CHP	Combined heat and power production
Cofiring	Thermal conversion of biomass and fossil fuels for electricity production
Combustion	Thermal conversion of biomass for electricity production
DSO	Distribution System Operator
EIA	Environmental Impact Assessment
GHG	Greenhouse Gas emissions
EP / IEP	Environmental Permit / Integrated Environmental Permit
IPPC	Integrated Pollution Prevention and Control Directive
LCP	EU Directive for Large Combustion Plants
• / <•>	Duration of the whole permitting procedure / average duration of the whole procedure
$\bullet_n$ / $<\bullet_n>$	Duration of a procedure step / average duration of a procedure step
n	Number of serial process steps (or activities) for the permitting procedure
N	Sample population
NIMBY	Not in my backyard (possible position residents)
NGO	Non Governmental Organization
PPC	Pollution Prevention and Control
•(x,y)	Correlation between the variables x and y
• / $\bullet^2$	Deviation of a parameter from its average / variance of a parameter
TSO	Transmission System Operator
TINA	There is no alternative (possible position applicants)
Union	The European community including all the 27 member states (status 2008)
WI	EU Directive for Waste Incineration
Waste	Biomass waste in the sense of the EU Waste Incineration (WI) directive
QMS	Quality Management Schedule
Void	Time period between the rejection of an application and the resubmission

2 Literature study

2.1 Summary

In sum, from literature and expert interviews, the following generic types of bottlenecks in the permit issuing process were identified:

- Land use approval is denied for biomass facilities;
- Bureaucratic inefficiencies like cross-authorisation or lack of mandatory time limits for authorities;
- An ineffective multitude of permits and licenses issued by separate authorities;
- Permits are subject to a huge amount of legislative acts (>30);
- Bio-energy particular legislation is deficient;
- Well-defined administrative structures are absent;
- Conditions in single-type permits issued may conflict with each other;
- Procedural errors which result in an incorrect issuance of the permit;
- Official authorities lacking the knowledge, capacity and expertise to fully adjudicate innovative bio-energy production plants;
- Applicants (project developers, environmental consulting agencies or operators) lack the experience to prepare proficiently complex bio-energy permit applications;
- Both local and national public resistance to bio-energy may lead to objections and higher appeal;
- Legal conditions in the issued permit are too costly to implement or unmanageable otherwise.

2.2 Relevant literature

The literature review found that there is a lack of public information on environmental permitting procedures, in particular for bio-energy. Most literature is directed toward the content of the permit; for example emission limit values and standards, best available techniques (BAT), implementation of IPPC directive[1], flue gas cleaning, safety measures, toxicity of elements, etc. while the present study focuses on the procedure itself and the formal interactions among the various stakeholders. Other literature focuses on guiding principles for effective environmental permitting procedures[2].

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[1] Integrated Pollution Prevention and Control (EU Directive 96/61/EC on integrated permitting, recently replaced by EU Directive 2008/1/CE of 15 January 2008).

[2] Guiding principles of effective environmental permitting systems (OECD, 2007).

Only three relevant generic expert studies were found focusing on procedural elements such as the duration, the outcome, regulatory authorities, voids in the applicable legislation, etc. Koeslag[3] describes in detail the experiences with on shore wind energy construction permits in the Netherlands. The author concluded that although the official term is frequently exceeded, many legal options for delay for the authorities are covered. It was even suggested that the duration of the construction permit is longer than that of the environmental permit; however, in the Netherlands the construction permit cannot be granted prior to the environmental permit.

Daey Ouwens[4] reports on various bio-energy permits for the Netherlands as well. The author revealed that the length of the environmental permitting procedure is related to the number of stakeholder protests - to some extent a proportional relationship exists since the authorities have to handle each and every protest on its own. Another factor adding up to the duration of the environmental permitting procedure is the requirement for an Environmental Impact Assessment. It was also concluded that some technologies, in particular co-firing, face much more public resistance than others. Furthermore, it was concluded that almost no bio-energy permits were refused and that ~13% was revoked at the highest administrative court. This monitoring study is repeated by the Dutch government every year.

These two Dutch studies are the only ones perceived as including **quantitative** information.

Finally, the consortium reviewed a broad **qualitative** study performed considering non-technical barriers for various renewable energy technologies in frame of the ADMIRE REBUS project[5]. Their major conclusion from analyzing expert enquiries was that the permitting procedure is essentially a local one and determined by local authorities who are very sensitive to site-specific circumstances and pressure. It has never been proven, however, that decentralized planning systems are less efficient than more centralized institutional arrangements.

In the following paragraphs, this information in concert with the consortium's expertise is used to describe in brief the permitting procedure in the various European countries and to reveal per phase some bottlenecks in the process.

[3] J. Koeslag: Permitting trajectory wind energy (CEA, 2002).
[4] J. Daey Ouwens: Monitoring bio-energy permits (Novem, 2004).
[5] K. Skytte *et al*.: Challenges for investment in renewable electricity in the European Union (ECN, 2003).

2.2.1 General description of the permitting procedure

In this section, the various activities in the permitting procedure are described in general from the perspective of the project developer. These steps are more or less the same and occur in the same order for every European region and for any biomass feedstock technology combination (BTC) thus offering a good framework for further analysis.

The procedure starts with an unofficial pre-permit application discussion. It is up to the responsible officials to choose what means of interaction are most appropriate. A number of issues may be clarified during this phase (boundaries of the installation and activities to be covered by the permit; the types of information that should be contained in the application, linkages to other licenses and permits, etc.). Interestingly, in some countries an informal pre-discussion for some permit types is mandatory[6].

Spatial planning coherence

Initially, the developer has to establish in conjunction with the local authorities, usually the municipality and/or other regional authorities, to what extent the proposed biomass facility fits in the current land use plan[7,8]. Sometimes, if the present use is industrial this may suffice, but it may appear that energy production as an activity should be included in the land use plan specifically. In case of discrepancy, the developer has to apply for a **land use plan change**. This procedure can be quite time consuming and may last several years, even in case all stakeholders meet the formal time periods[9] and abstain from any legal process. Even more important, the outcome is uncertain.

The legislation of some countries contains explicit exemption clauses[10] to include the biomass initiative in the present land use plan without changing it. However, also in this case the result may be sensitive to objections and (higher) appeal. In Germany and Poland, public participation in the spatial planning establishment is limited or even absent[11,12,13].

In case of definitive failure, the developer is left with no other option than to find another location. In case of locally restricted feedstock availability, the project unfortunately has to be discarded definitely.

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[6] F. Meijer *et al*: Building regulations in Europe (TU Delft 2002), for example.
[7] Also known as zoning plan, regional plan, local development plan or spatial planning.
[8] Land use plans may include several hierarchical levels: provincial, regional and municipal (urban planning).
[9] In case there are any periods set up by law – this is not the case in Italy, e.g., where land use plan change may take between one month and one year, and in theory (i.e. in case of political pressures) even longer
[10] E.g., in the Netherlands referred to as an Article 19 procedure.
[11] Windturbines and parks (Dutch German commission for spatial planning; 2004).
[12] R. Schmidt: Full in the Wind (TU Delft, 2003).
[13] J. Jendroska *et al*: Legal framework for public participation and existing legal practices at the start of 1995 (REC).

For the overall procedure, the land law appears to be the most important; much more important than the environmental law. It was concluded by Koeslag[3] that the outcome of the project (success versus failure from the permitting perspective) depends on the land use approval only. The reason for a project failure is that the initiative does not fit in the land use plan and the responsible authorities refuse to cooperate in changing the plan[14].

In other words, appeal or higher appeal to the various other permits or licenses may delay the procedure or change the content of a permit, but will not change the initiative's outcome.
This conclusion is limited to Dutch wind energy projects only. The consortium's preliminary work suggests that for European bio-energy projects also other reasons exist for the observed failures.

Good examples of spatial inconsistency are biogas plants, since they are often planned in agricultural areas thus contradicting their actual purpose; i.e. energy production. Other examples are biomass-fed power production facilities in the neighbourhood of populated areas.

This bottleneck could be absent in case there are government-controlled designated areas for bio-energy facilities. Although they exist to some extent in many countries (e.g. Spain, Germany, Belgium and Denmark) for wind energy[5,12], both on shore and off shore, to the consortium's knowledge they do not exist for bio-energy yet.

Planning permit

In some countries a planning permit is required[15] by the regional authorities. This document generally states all the permits that are obligatory before operating the production plant; the applicable authorities; the crucial technical documentation; a basic planning of the various steps of the project; a time line of the activities, etc.

In the UK, the planning permit integrates the construction permit and the land use approval. It is the dominant permit in the sense that it determines the lead time, and, if stakeholders appeal, it usually is to the planning permit.

Environmental permit

The environmental permit controls the emissions to the environment, primarily to the atmosphere. It is considered in most countries to be the most important permit since in case of appeal, most appellants protest against the environmental permit, probably related to the concern that if the environmental permit granted is too soft, and the facility will impact the health and safety of local residents. Moreover, the duration of this permit usually is much longer than that of other types of permits.

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[14] A reason can be a conflict of the initiative with regional nature protection laws (e.g. bird migration, protected natural parks, etc.) or overlap with shipping lanes or airline routes.
[15] In Spain known as the Implementation Project Schedule, for instance.

In some countries[16], for some types of installations, usually very small plants, no environmental permit but only a construction permit is required. Some (small) types of installations are exempted from permitting by national regulations (decrees).

Depending on the size of the project, usually denoted in MW boiler capacity, the authority is the municipality or the region in case of small and medium sized installations and the region, the province or even the Ministry of Environment (e.g. Italy, for power plants exceeding 300 MW) in case of larger plants.

The first step includes the submission of the applicants' documentation. Within a few weeks, the authorities review and either consider the application complete (in a legal sense) or call for additional information. Following a valid application, a **draft permit** is prepared for informing and consulting various public and institutional stakeholders to gather facts and opinions (public consultation, consultation phase). Following international guidelines, the length of the consultation period typically is 30-45 days. An essential feature of this phase is whether the public is consulted actively or passively. Within a few weeks, the authorities include the consultation comments and objections in a final version of the permit. The preparation of the permit typically consumes a few months in case of integrated permits and a few days or weeks otherwise.

The final permit most frequently is sensitive to (higher) appeal. A higher administrative court (at least a different regulatory authority) may validate or revoke the permit. This step may be lengthy; it usually takes a year but can easily consume a few years. Some countries impose a mandatory timeframe for legal procedures but not all of them. In case of a positive decision of the court, the permit becomes irrevocable[17].

Official protests may force the authorities to temporarily put the procedure on hold. In the Netherlands, this only holds for the higher appeal case; in other countries, protests in an earlier phase will do.

In case of eventual revocation by the highest administrative court, the developer has to repeat (parts of) the application procedure or dispose of the application entirely.

In most countries, higher appeal for a stakeholder is only allowed in case of former objections. In Finland, the higher appeal procedure can be followed by a subsequent procedure at another hierarchical level[18].

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[16] In Austria and Belgium the threshold for power plants is 300 kW, for example. In Germany, it is for biogas plants smaller than 350 kW.

[17] The validity usually is finite; in particular if waste is included the permit has to be renewed every 3 to 10 years.

An environmental permit may include an Environmental Impact Assessment (EIA) or an Integrated Pollution Prevention and Control (IPPC) procedure, or some other country specific procedure. Since these activities occur serially, the environmental permit in case of an EIA may easily require a few years.

Environmental Impact Assessment (EIA)

Following European regulations, an EIA is required in case the project is supposed to have significant impact on the environment. The value for this limit and its type (size, feedstock, technology or other) vary throughout Europe[5]. In some countries, the thresholds are determined by law. In others, a specific part of the procedure, referred to as EIA screening (EIA scoping), is included to establish if an EIA should be conducted or not (and how). Usually, this task is mandated by the regulatory authorities to a dedicated commission or task force (EIA commission).

In case an EIA is required, the duration of the procedure is extended vastly. The reason is that a series of activities must be performed serially rather than in parallel and the applicant has to await the guidelines of the EIA commission prior to further steps such as performing the actual assessment. In some countries the EIA procedure includes active public participation; in most countries it includes at least passive public participation. However, (higher) appeal is only possible to the successive environmental permit.

Finland probably is one of the countries with the most complex EIA procedure[18]. It consists of two separate phases, the EIA programme phase and the report phase, and involves active public participation including several audit groups, public events and meeting of various authorities. This stakeholder participation phase alone may already last 12 to 18 months.

IPPC procedure

According to European Directive 96/61/CE of 24 September 1996 on the integrated pollution prevention and control or IPPC (recently replaced by Directive 2008/1/CE of 15 January 2008), installations exceeding given thresholds, belonging to specific categories, are required to have an integrated environmental permit (“IEP”). In case of energy-related facilities, there is a threshold of 50 MW thermal power capacity (category 1.1), above which the IPPC applies.

The purpose of the outdated and of the current directives is to avoid or at least minimise the emissions to air, water and soil, and regulate waste management operations, of the activities presenting the highest potential for multi-media environmental impacts.

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[18] M. Pohjonen: Finnish environmental licensing procedure (OPET Report 10, 2002).

For new installations, the directive requires that an IEP application be submitted to the competent authority, accompanied by technical documents (detailed description of the installation, the process, and its expected releases to the environment) and a non-technical summary. Once the competent authority (which can be at national or regional level) receives the application, it has a period of time to examine the documentation, make it available to public consultation, request any additional information from the applicant, and finally issue an IEP which will establish the maximum concentrations for airborne and waterborne emissions, as well as for other aspects of the installation which may be of environmental significance.

The IEP is an operation permit, which allows the operation of an installation provided the permit's conditions are met. As regards the emissions to air and water, thresholds are based on the comparison of the installation against the so-called 'best available techniques' (BAT) rather than against national standards. Such thresholds are therefore likely to be site-specific.

Each Member State has approved national acts implementing the old directive, and they will also implement the new directive accordingly. The experience with the application of the old directive (and of the corresponding implementing national acts) to the bio-energy sector is relatively limited, as many installations have a thermal capacity below the 50 MW threshold.

If the threshold is exceeded, then the permitting procedure can vary from country to country: the process to obtain the IEP can be independent or correlated to other steps of the overall procedure, such as in Italy, where (according to the old directive) the granting of the IEP was subjected to the completion of the EIA or, alternatively, of the EIA screening[19].

In some countries obtaining an IEP is a relatively simple process, where even the public consultation step is not problematic, while the same process may be more complex in other countries, especially where the technical background of some stakeholders is more limited, and the guidelines to support the preparation of IEP application documents are not available.

The major **bottlenecks** controlling the length of the environmental procedure are threefold: socio-administrative, thus the complex interactions of the various authorities involved; gaps in the (national) environmental legislation and public resistance.

[19] On 16 January 2008 the Italian government approved a new act, Legislative Decree No. 4, which enters into force on 13 February 2008 and significantly modifies the EIA and IEP procedures; understandably, there are no practical experiences in this respect so far.

Bureaucracy

Although the duration of the permitting procedure is often established by national law, the duration may be lengthened significantly amongst others by bureaucratic inefficiencies. Several authorities and different levels within the authority may be involved. Authorities may linger some procedures while others are pending.

The authorities may request additional information. Usually, they are allowed to extend the length of the procedure with the duration of the applicants' response as well as in case of appeal. In principle, requests for additional information can be unlimited. These requests may be linked to insufficient knowledge and expertise of the authorities and/or the applicants[20]. This problem is primarily apparent in Eastern European countries and for projects under the jurisdiction of local entities (municipalities in rural land areas).

Major permits may require minor permits or licenses; minor permits may require additional documents, forms and attachments, ad infinitum.

Authorities are also legally allowed to increase the duration of the procedure in case of complex or very large projects; for example in case an EIA has been conducted[21]. Applicants regularly have few options to force a decision of the authorities. Mandatory terms may be unclear for some permits or lacking at all.

Inadequate Legislation

This issue is one of the major obstacles since it may lead to an impasse resulting in the authorities passing the case to higher administrative levels or even formally rejecting the application. Alternatively, procedural errors may occur thus ending later on in a revocation of the permit at the court. Some aspects of the applicable law may be absent, ambiguous or contradictory to other connected legislations (either European and/or other national laws). A number of issues frequently mentioned are:

- Deviations or inconsistencies may occur as member states include European directives, in particular the IPPC and BAT, in their national legislation. In general, if legislation is under construction, coordination difficulties may arise.

[20] See e.g. the web site of the BioProm network: www.bioprom.net.

[21] In the Netherlands authorities are allowed to consume five weeks more for the environmental permit in case of an EIA. In Belgium this timeframe is two weeks.

- Feedstock classification: although there is a clear European definition for biomass, European directives and various national legislations apply different definitions for what is considered biomass and what is considered waste[22]. This distinction is important since the nature of the feedstock determines the appropriate directive (e.g. the waste incineration (WI) directive or the directive for large combustion plants (LCP)) and also determines if the feedstock can be combusted anyway (i.e. recycling may be preferred or mandatory).

- Category classification: depending on the nature of the feedstock, the size of the plant and the applied technology, the applicable legislative articles should be established. For innovative technologies or feedstock (e.g. gasification, biogas, co-firing and pyrolysis), legislation may not have matured fully or may even be absent. For example, authorities may apply articles dedicated to fossil combustion plants to biomass gasification projects.

- A technical guidance for BAT is missing implicating widely varying judgements among institutional stakeholders from region to region.

- Environmental legislative standards for small power production facilities may be missing[23].

- Inappropriate jurisdiction: in case some of the above is not clear, an erroneous authority - for example the municipality instead of the province - may award the permit which results in a procedural error.

- Regulatory immission levels can be exceeded by present initiatives thus leaving no room for the new proposal. For example, exceeded sound levels or immissions of fine dust. A present initiative may also be another new project in procedure.

Public Resistance

Renewable energy projects, in particular wind and bio-energy projects may face strong public resistance. Protests are directed against emissions of contaminants to the atmosphere reducing local air quality (primarily nitrogen oxides and fine dust), disturbing smell (e.g. manure, waste), annoying noise (ventilators, generators and traffic), additional transport movements, vibrations, visual aspects, etc.

Furthermore, not all stakeholders agree that all type of biomass should be considered **sustainable**. By appealing to the environmental procedure, they can advertise this view, although it is not sure this argument will stay at the court.

[22] Regulation of energy from solid biomass plants (AEA, 2006).
[23] See for example the EU Bionet project: www. eubionet.net.

To what extent these factors influence the process quantitatively cannot be established yet but will be scrutinized by the consortium in later work packages. It has been suggested that public resistance is more related to the level of acceptance of renewable energy options than to the population density[12].

Procedural errors

These types of errors are the most severe. A procedural error arises in case the relevant law is applied incorrectly or unauthorized entities issue formal documents. Practical examples are an unsigned application or approval; unpaid administrative fees; an illegitimate exemption from the EIA obligation; lack of the IPPC benchmark; inadequate public participation; obstruction to information access or omitted announcements of an EIA or (draft) permit in public media.

Construction permit

The environmental permit is followed by the construction (building) permit, granting the right to build the facility. This permit can be part of the environmental permit in case of an integrated permit. Alternatively, one can apply for it at the same moment as for the environmental permit although the construction permit cannot be approved without an environmental permit and vice versa. In practice, however, exceptions are often applied. The authority for the construction permit (if required) is the municipality (for very large facilities it is the province).

It has been concluded that (higher) appeal against the construction permit is rare[24]. In case a blockage arises, it is related to the land use plan and unfortunately has remained unnoticed in earlier stages. For instance, it suddenly turns out that that the developer is not allowed to build outside a specific part of the cadastre or above some height or has neglected visual impacts; issues that should have been considered earlier.

The low appeal rate of the construction permit demonstrates that, generally speaking, the further one proceeds with the permitting process, the lower the opposition becomes. Note that in case the construction permit is part of another permit (planning permit or other type of integrated permit), this conclusion may be fallacious.

Operational permit

After construction, in some countries an operational permit[25] is required to license the project developer to exploit the facility. It is awarded most often quite fast without too many problems. Exemptions are e.g. Spain and Greece, for which this permit is considered to be cumbersome.

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[24] J. Lindeman *et al.* : Monitoring bio-energy permits 2006 (SenterNovem, 2008).

[25] Also referred to as activity permit, start-up permit or exploitation permit.

Production permit

In several countries, a production permit in order to license electricity and/or heat production is required. The duration of the procedure to obtain this permit is relatively short as well and major problems are not reported. The authority usually is the energy regulatory office. With the production permit may come a distribution permit; i.e. the license to distribute electricity or heat to end-consumers.

Grid access

In case of non-private use, a permit or license to access the grid may be required, in particular in case the grid is owned by the government. Nowadays, grid access is one of the most important non-technical barriers hindering the development of renewable energy, in particular in rural areas[46]. The authority may be the local grid operator (DSO[26] or TSO).

Other permits

Depending on project type and geographical location, many additional permits may be required.

One can think of a separate water (effluent) discharge permit or groundwater license in case of water abstraction or abduction for biogas plants, particular safety permits, fire prevention documents and waste management plans, etc.

In Poland, a permit for greenhouse gas (GHG) emissions is obligatory for all investments with a heat demand higher than a few MW. For biogas projects, specific permission is required to distribute the digestate as a fertilizer.

In Spain, a declaration stating that the initiative is for the benefit of the public is required as well as a start-up certificate; in Bulgaria design visa; in Belgium a specific safety report is included in some environmental permit procedures[27] and in Romania a permit to distribute electricity to end-consumers is imperative. In Greece, one has to obtain the so-called installation permit.

These permits and licenses usually are minor and have little influence on the overall permitting procedure.

A concluding bottleneck is that all permits needed are approved within time limits but may contain legally binding requirements, in particular emission limit values (ELV), that are not manageable or simply too costly for the project developer to implement. Authorities have to include best available techniques (BAT) as described in the IPPC BREF documents.

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[26] DSO is Distribution System Operator - TSO is Transmission System Operator.
[27] Manual for environmental permit applications (VlaO, 2006).

Single-type permits may conflict. The construction permit may restrict the height of the chimney, while the environmental permit requires a greater height to allow the diffusion of emissions across larger areas.

2.2.2 Expenditures

The costs of the project consist of the opportunity costs for the project developer (determined by the project duration), the administrative fees and the costs to contract a consulting agency to prepare the documents and apply for the permit (or opportunity costs in case of in-house services). Only one report was found[4] indicating the permitting costs in terms of a percentage of the total development costs; it was established by means of a stakeholder inquiry to be about 14%. Scarpini reported between 5% and 10% of the investment costs[30].

2.2.3 Process flow per selected count ry

Common quoted obstacles in permitting procedures have been described, as well as insight is given to the various permitting procedures. The types of permits that are issued in the EU have been listed and comparisons have been made among EU countries, showing an extensive variation in complexity.

Besides the differences in necessary permits and the complexity of obtaining these, also differences exist between countries that concern with the order or permit procedures, interdependency and complexity of successfully obtaining all required permits within a reasonable timeframe. A 'flowchart' of the entire permitting cycle provides direct insights into these differences.

For this purpose, a comparison has been made between three typical 'flowcharts' that are representative for the major differences within the EU. Examples are taken from The Netherlands (typically representing the procedures in Belgium and Scandinavian countries)[28] , United Kingdom (representing all British Isles) and Italy (representing Germany, France). Flowcharts of procedures in Eastern Europe are highly diffuse, for which no common process flow can be determined.

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[28] Flowcharts of permit procedures are never identical in countries, but these typical cases have more or less the same structure

Figure 1: Flow charts of typical procedures in the EU.

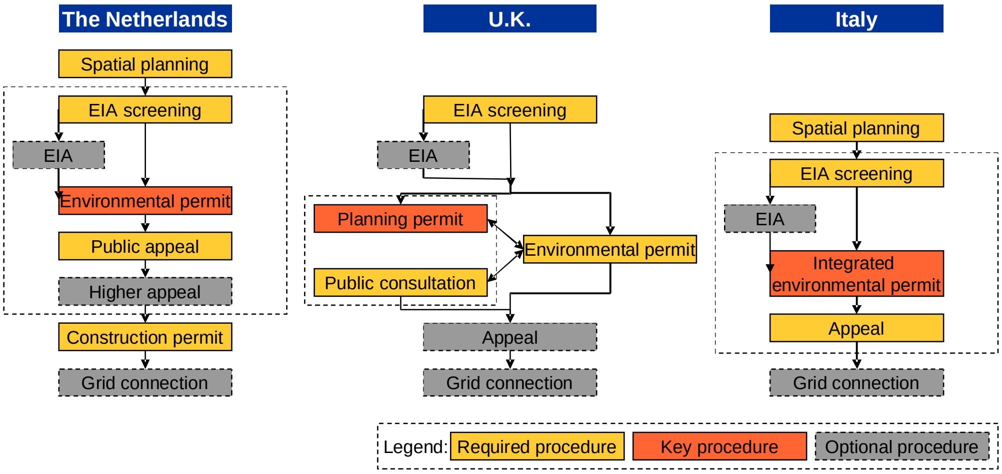


Figure 1 shows the simplified flow charts of permitting bioenergy installations in three different regions. In general, the procedure for an Environmental Impact Assessment is similar throughout the EU. The EIA Directive outlines which project categories are subject to an EIA, which procedure has to be followed and the content of the assessment, which lead to a streamlined approached throughout the EU.

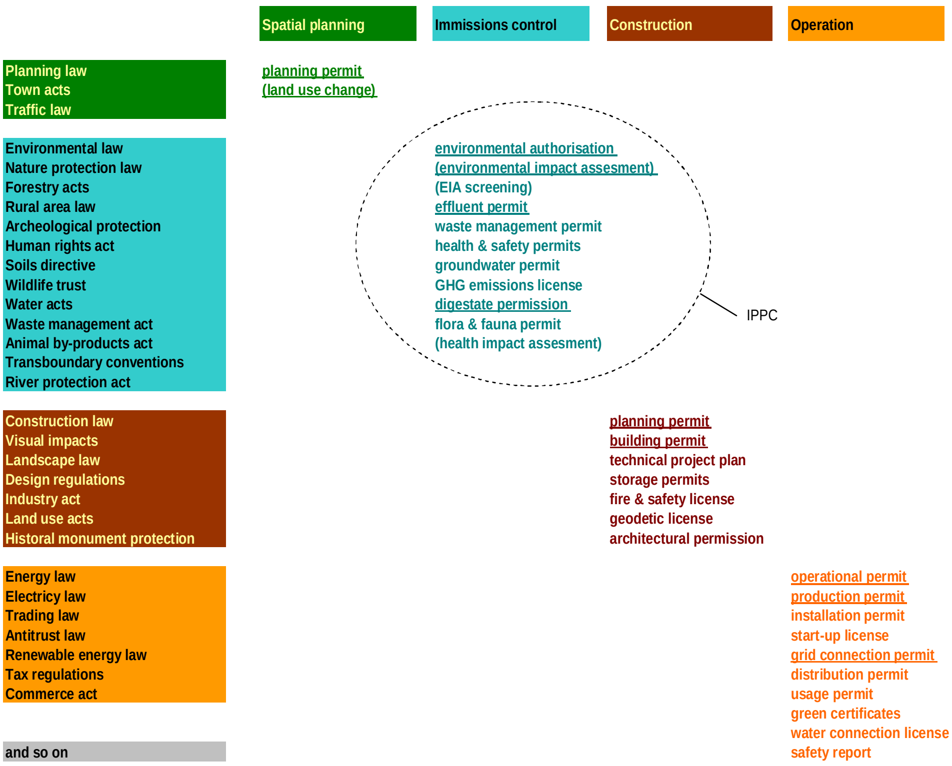
Since in The Netherlands most permits need to be obtained subsequently, little saving of time is possible by parallel actions. Especially, spatial planning needs to be started before applying for an environmental permit or starting the EIA screening phase. Furthermore, a construction permit can only be issued when the environmental permit is granted. In practice, the construction permit can be readily prepared earlier, but administratively it can once be issued after the environmental permit. The Italian procedure is roughly a simpler version of the Dutch procedure. In an Integrated Environmental Permit, procedures are adjusted to one another and actions can be carried out in parallel which would streamline the entire procedure.

The British procedure differs most compared to other regions. The planning permit is to most crucial procedure, whereas the (integrated) environmental permit in other regions is most important. The appeal procedure in the UK differs as well, since specific committees are explicitly asked for objections against the permit applied for ('active appeal'), whereas in the Netherlands and Italy appeal is 'passive', i.e. stakeholders are not approached but need to appeal from own initiative.

2.2.4 Interaction permitting process with legislation

After the application, the authorities have to examine the request in accordance with the various national, district and local acts, decrees and legislations. It is likely that the more acts, the more the permitting process is elongated, therefore a reduction of the number of acts relating to permitting is to be preferred; several authors reported their application was subject to over ~30 acts[29,30]. The next chart shows the phases in the process and what kinds of acts are feasible:

Figure 2: Possible feasible legislative acts per permitting process phase. The major permits are underlined (activities in brackets).



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29 E.g. L. Balogh: Contradicitons in the Hungarian regulation system of licensing small biomass power plants; F. Kirchmeyr: Problems getting the permission for biogas plants and future needs; S. Nagy Adrienn: Authorization process of a new biogas plant in Hungary (all workshops in frame of this project, Brussels 2008).

30 A. Scarpini: Administrative barriers to Renewable Energy (AEBIOM, Brussels 2007).

2.3 Level of integration

One of the basic questions of this study is to evaluate the efficiency of **integrated permits**. Integrated permitting prevents focus on an emission reduction to a particular environmental medium; it may, however, also streamline procedures because of a reduction of the number of contact windows for the applicant.

Indicators for the level of integration can be derived from the constitutional process in a country or region. Relevant indicators are the number of permits, licenses and documents required; the number of appeal opportunities, the number of authorities involved and the number of steps in the procedure, obviously correlated to the former. The time period, at least from an abstract point of view, can be derived from a critical path analysis (next paragraph).

Indicators were collected for various countries and procedural types (Table 1). The analysis of the formal procedure represents a benchmark for further analysis of experimental data in WP 3. For example, the environmental permit (excluding an EIA) was estimated to take 1-2 months in Bulgaria and Poland; ~3 in Spain; 3-6 months in Belgium, Italy and Germany and more than 6 months in Finland and the Netherlands. In contrast, the construction permit lasts much shorter - at most 12 to 13 weeks - and its lead time is quite constant throughout Europe.

In Bulgaria, more than 18 activities have to be performed including over 17 different legislations and almost 20 stakeholders participate[31]. Bulgaria is not full IPPC proof yet[32]. In Romania, over 14 different primary and secondary legislations have to be applied. In Spain, typically eight major permits[33] have to be collected requiring over 18 activities. In contrast, permits in Germany and Italy are relatively integrated (*Autorizzazione Unica*). In Germany, the environmental permit includes the construction permit. In Italy, it includes the construction and the water discharge permit as well as the operation permit.

In the Netherlands a full integrated permit process exists in principle but is seldom applied[34].

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[31] Project developer, mayor, services authorities (electricity, sewerage, heat), municipal authorities, municipal expert commission, commissions to the regional directorates (agriculture,forests), regional environmental and water inspectorate, Ministry of environment and water, public media, chief municipal architect, designers, transmission & distribution companies, State energy and water regulatory commission, National building control Department and the independent technical supervisor.

[32] Review of environmental permitting systems in Eastern Europe, Caucasus and Central Asia (OECD, 2003). By the end of 2009, BAT will be adopted in main industrial sectors. All integrated permits will be issued by 2012.

[33] Adjudication of the land, activity license, administrative authorisation, construction permit, public benefit declaration, environmental authorisation, project schedule and start-up certificate.

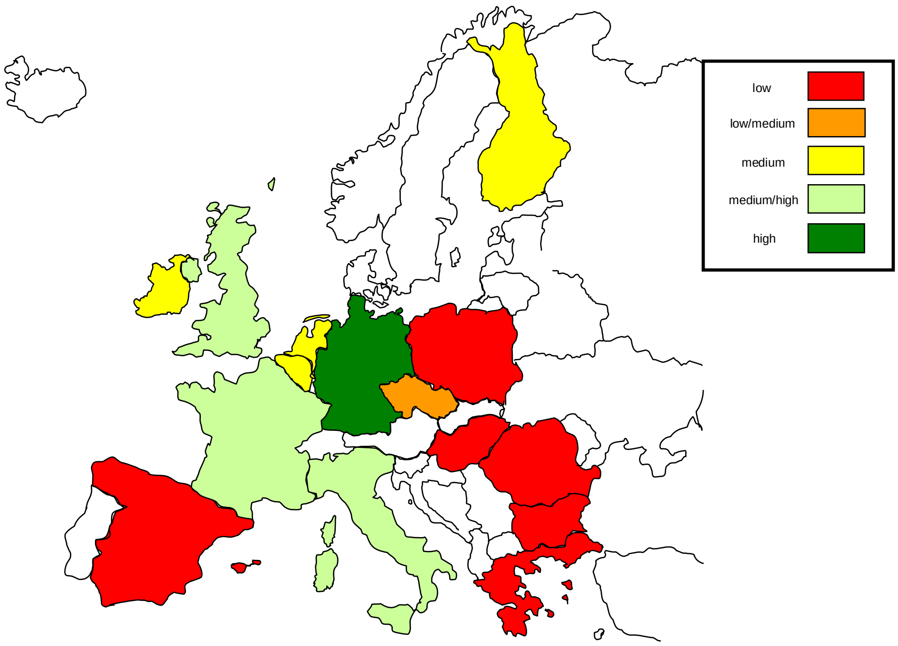
[34] Rijks Projecten Procedure (RPP: authorized by Ministry).

It can be concluded that the total number of permits and their terms strongly vary from country to country and even from region to region (Spain, France). In Finland and the Netherlands procedural phases last particularly long, in Bulgaria, the Czech Republic and Poland relatively short; Belgium is in between. In general, the less integrated is the procedure, the shorter its constituting activities - demonstrating that integration is only possible to some extent. Further research in WP 3 has to reveal if integrated permits have shorter lead times and face less appeal than diffused ones.

Hitherto, the reasons for the in homogeneities in the procedural terms are not clear but are most likely related to the historic development of the legislative framework in a country. Key elements are the sovereignty of its constituting regions, the distribution of the decision power among the various institutional actors, the inclusion level of the opinion of the public and regulatory stakeholders and the diverse options for objections and higher appeal.

The estimated level of integration in the Union is visualized below:

Figure 3: Level of integration in the Union



Several countries are starting up the integrated permitting procedures and applying the "one-stop shopping" principles[35]. Although the project duration varies strongly from region to region, the variations from case to case are even larger.

[35] See www.iea.org, for instance.

Table 1: Selected estimated projects parameters for the constitutional process per country (vast biomass projects only).

	# permits required[36]	# project activities[37]	# legislations involved	# institutional stakeholders	Length of dominant[38] permit (weeks)	Average formal duration of single permits (weeks)	Level of integration
Bulgaria	8-10	~18	~17	~20	~13	5	Low
Belgium	3-4	~5		~6	~22	14	Medium
Czech Republic	6-7	~10			~30	13	Low/Medium
Finland	3-4	~9	~5		~52	29	Medium
France	3-4	~7			~18	18	Medium/High
Germany	1-2	~6		~8	~26	16	High
Greece	6-7				~20	8	Low
Italy	1-2	~6	~14	10-12	~34	19	Medium/High
Ireland	4-5						Medium
Netherlands	3-4	~7	~4	~6	~26	25	Medium
Poland	6-7	~9		~6	~10	11	Low
Romania	7-9		~14				Low
Spain	8-10	~19	~9		~13	11	Low
UK	2-3	~7		~6	~16	16	Medium/High
EU average	5	9	11	9	23	15	

[36] Major permits and licenses only.
[37] Excluding a legal process (higher appeal).
[38] Most often the (integrated) environmental permit, operational permit or planning permit. Including public consultation.

	Land use approval[39]	EIA screening	Public consultation	Technical project plan	Environmental permit[40]	Construction permit	Integrated permit	Effluent permit	Production permit	Connection license	Installation permit	Operational permit	Higher appeal	Final approval	Average duration
Bulgaria	5	4-5		4	4	1-2			13	~13		1		1	short
Belgium			4		14-29	11-15			13				~32		medium
Czech Rep.	4-9	8			21-39	4-8									short
Finland	26-52		4		~52	13-26		~26					56-108		long
France	~22		7		~17	~18									medium
Germany	~13[12]	8			n.a.[41]	n.a.	16-36								medium
Greece	6				4	~13			~20		2	2			short
Italy	12-13	9	4		n.a.	n.a.	~34						~52		medium
Netherlands	30-57	8	4-6		26-31	13-26		~26					~52		long
Poland	4-36	4	2-3		~10	12-13		4		13					short
Spain	4-13			9	~13	8-9			4-5	17-26	13	13		9	short
UK	9-18		23		~18	n.a.									medium
EU average	**17**	**7**			**20**	**10**	**30**		**13**	**16**			**60**		

Table 2: Formal lead time (in weeks) per process step for the permitting procedures per selected EU country.

39 Planning permission in the UK (including construction permit).
40 In case no environmental impact assesment is required; including consultation (appeal) period but excluding higher appeal.
41 n.a. is not applicable; n.t.f. is no time frame.

Most types of permits and licenses across Europe take relatively short to obtain (a few weeks). Hence, the lengthiness of the whole process is caused by the serial nature of the various permits (i.e. an environmental permit application cannot be started before the EIA is finished; the assessment cannot start prior to media publication of the initiative and so on) and cross-authorisation (i.e. a permit cannot be granted before another is applied for or obtained).

In general the land use permit (in case of land use change), the environmental permit in case it includes an EIA, the operational permit (in the South) and the legal process in case of higher appeal last the longest and dominate the duration of the project.

Part 2: Real permitting cases

3 Data collection and methodology

3.1 Data collection and selection

The consortium's experts have filled a data base with relevant real projects. This list includes biomass initiatives from various European countries across various technologies (including waste). Some permits were issued rather short and others unusually long. The draft longlist included over 250 projects; for over 130 of them the consortium was able to retrieve detailed information with the aid of the questionnaires. The others failed because of confidentiality of data and/or unwillingness of the applicants and/or authorities to provide the information.

Biomass Technology Combinations (BTC or simply T) vary from region to region. The incineration of (municipal) waste, for example, is quite common in the North but rare in the South. The reverse holds for biogas from landfill or waste water; biofuel (for transport) plants can be found almost anywhere (although the type of feedstock has some geographical dependence).

The following technologies (T) have been selected for further analysis:

- Biofuel plants
  -Biodiesel
  -Bioethanol (sugar beet, wheat and/or agricultural residues)
  -Biomethanol
  -Biogas for transport
- Biogas
  -Anaerobic digestion (monoculture (manure and/or crops)), codigestion, effluent)
  -Landfill gas
- Combustion (biomass and/or waste, vegetable oils[42])
- Cofiring[43] (biomass and/or waste, vegetable oils)
- Boilers[44] (biomass and/or waste).

[42] In diesel engines.
[43] Cofiring implies the combustion or gasification of biomass and fossil fuels at the same location for electricity production using a steam cycle. Heat production only (for example district heating) is included in Boilers.
[44] Heat production only (either from biomass or biomass and fossils).

The division of the technology cases over the various countries is listed below:

	Biofuels	Biogas	Combustion	Cofiring	Boilers
Austria		1	3		
Belgium	2		4	3	
Bulgaria	2				2
Denmark	1	1			
Finland		2		4	4
France			1		
Germany		4	3		1
Hungary	1	2		1	
Ireland		2	2		
Italy			12	2	
Netherlands	3	8	14	3	2
Poland		1			2
Portugal		18	4		
Spain	1	5	7		8
Sweden	3				
UK	2	2	10	1	1

Table 3: Total number of selected projects per EU country and technology.

For some figures, the data are averaged per geographical region (R); the following six European regions have been defined:

- Scandinavia: Sweden, Finland and Denmark;
- British Isles: Great Britain and Ireland;
- Northwest Europe: Netherlands and Belgium;
- Central Europe: France, Germany, Italy, Czech Republic and Austria;
- Southwest Europe: Spain and Portugal;
- Eastern Europe: Hungary, Bulgaria and Poland.

A combination of a technology and a region is referred to as BTRC.

3.2 Methodology and Quality Management Schedule

As mentioned earlier, the three most important **criteria** of a permitting project are the duration, the costs and the outcome. Eventually, all three can be connected to the costs for the applicant, either opportunity costs or out-of-pocket costs.

The results of the literature study combined with our expertise suggest that there are four **factors** (bureaucracy, public resistance, legislation and expertise) determining these criteria. A factor implies a set of regulations, concerted practices or stakeholder actions. It can not be measured unambiguously, but rather reflects a qualitative component strongly influencing the project.

Indicators (parameters) are attached to the various factors. These figures are quantitative (numbers, dichotomous values, scale levels, etc.) and will be measured per project by means of a questionnaire (a draft questionnaire with relevant questions is attached to this report). A specific parameter can tell something about one or more factors.

Examples of indicators are:

- type of feedstock;
- type of process and technology;
- innovativeness;
- number of stakeholders;
- number of permits;
- number of process steps;
- type of output (whether energy or matter);
- number of protests (public resistance);
- number of legislative acts;
- frequency of communication;
- size of the project; and
- (geographic) location of the project.

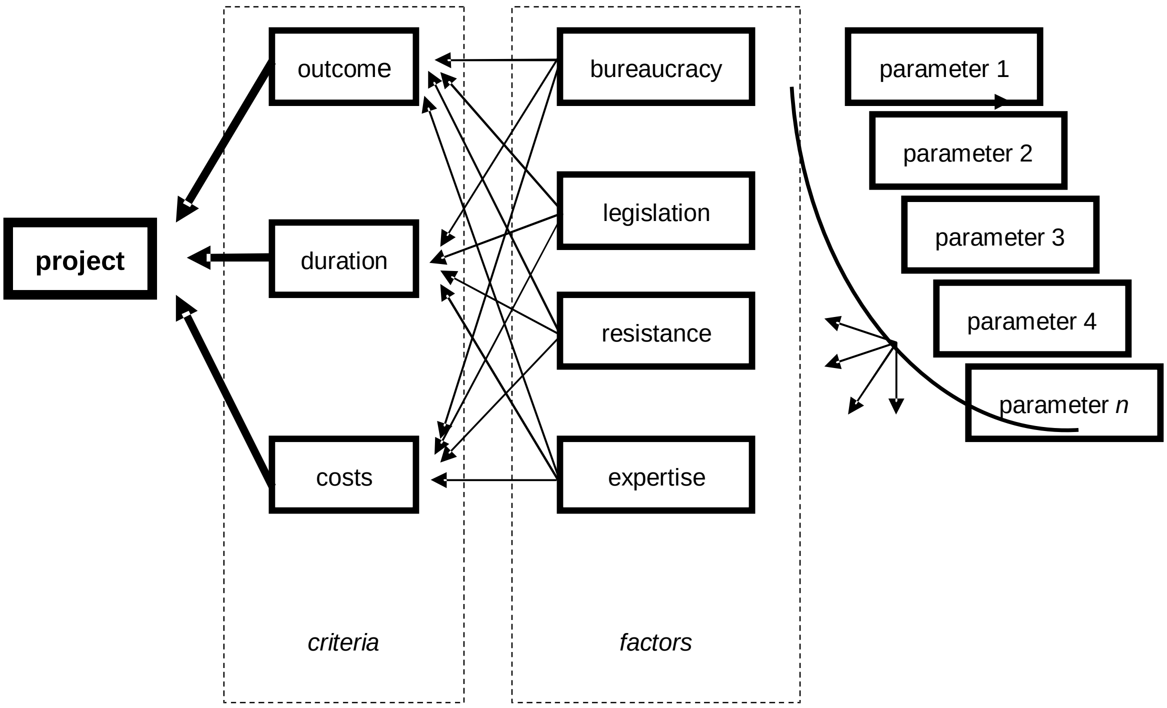
Indicators for the efficiency of the legislation are for example the number of regulations applied by the authorities, the amount of additional requests for information before completeness, and the frequency of procedural errors.

Public resistance is for instance reflected by objections, higher appeal, and the presence of a communication programme prior to application or even community demonstrations.

The level of expertise is amongst others determined by the number of similar permits the authorities issued before, the presence of training materials and technical guidance's, and the innovative level of the technology. One may expect that the more the technology becomes established, the more permitting procedures become streamlined.

In sum, based on literature, we propose the following Quality Management Schedule:

Figure 4. Proposed generalized Quality Management Schedule (QMS).



Inhomogeneities

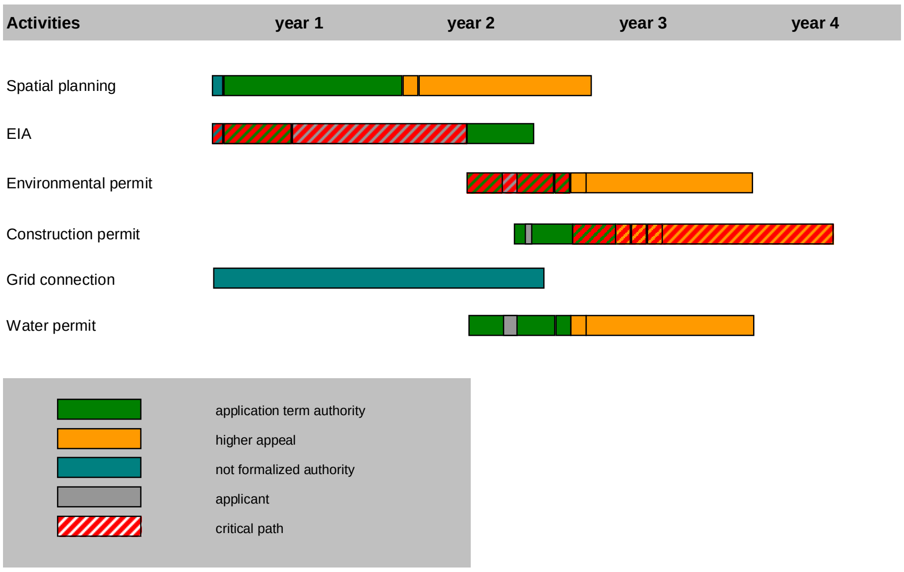
In this study, we also consider inhomogeneities in for example the average length of the total procedure • or in the length of one its components •$_n$. They can be quantified in terms of the mean square variance <•^{2}>, where • is the deviation.

3.2.1 Critical path analysis

The critical path analysis will be used to analyze the permitting procedure. All relevant activities and the stakeholders are collected and their start and end dates are determined. By establishing the so-called critical path, it is possible to infer the reasons for the delay or vice versa for an unusual short phase. A delay means that the activity lasts longer than the benchmark.

As an example, a typical critical path analysis is shown for the maximal terms by law for the Netherlands for a virtual vast biomass project including a land use plan change and an Environmental Impact Assessment (EIA):

Figure 5: Example critical path analysis for the Netherlands (formal).



Even from an abstract point of view, the length of the critical path is almost four years. Apparently, on the path are the environmental and construction permits followed by the higher appeal. For real permit applications, five to seven years are no exception[4].

The next examples depict the critical path for a real life Bulgarian project concerning a biomass fired boiler (several permits required) and a waste wood plant in Germany (only one permit, several appeals).

Figure 6: Critical path analysis for the Bansko Boiler Bulgaria (2 x 5 MW). Feedstock is (waste) wood and wood fuels. The plant supplies hot water and heating to two municipal schools, a cultural centre, the municipal administrative building and a telephony equipment factory. In this case, there are 3 to 4 serial activities.

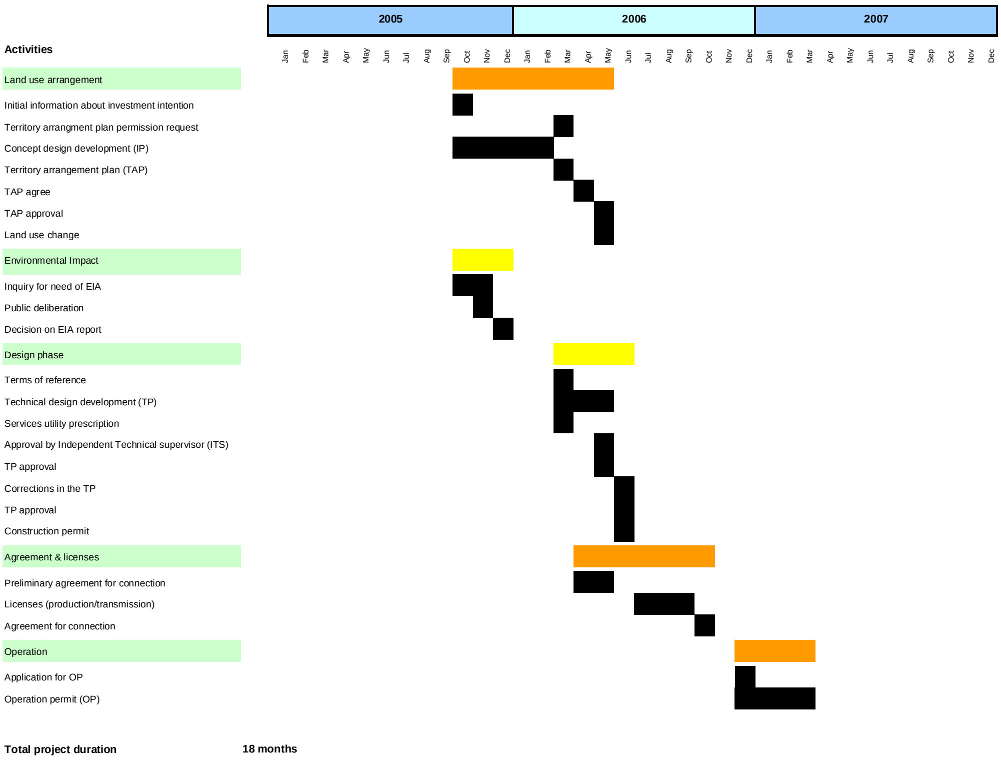
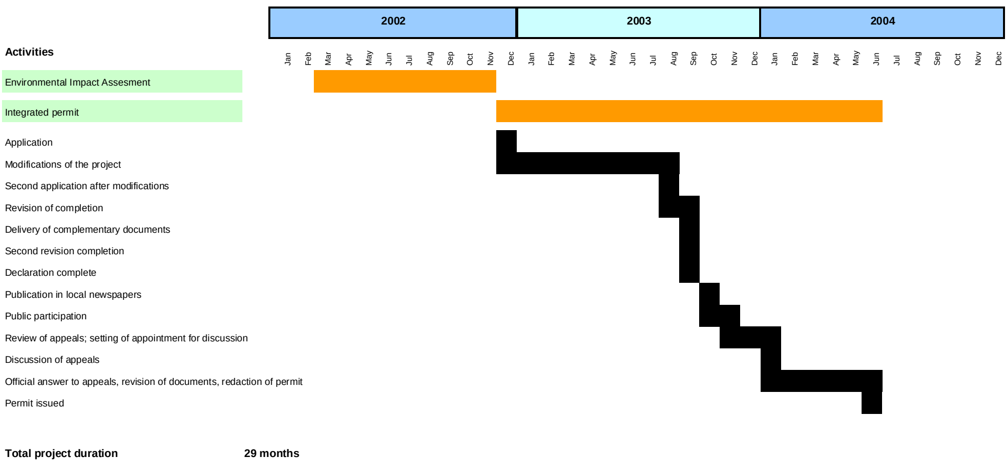


Figure 7: Critical path analysis for the Siegerland CHP plant Germany (15 MWe). Feedstock is waste wood. Now, only two activities control the lead time.



4 Benchmark of the real cases

This study shows that based on real cases that the real lead time equals two years on average and increases to approximately three years for the larger biomass projects including an Environmental Impact Assessment. The lead time averaged over the technologies is weakly dependent on geographical differences. The major steps leading to delay are the spatial planning procedure, the Environmental Impact Assessment, the (integrated) environmental permit, the grid access and the legal case (if applicable).

Many projects breakdown; on average, the permit application failure rate exceeds 30% going onto extremes for codigestion and biomass combustion plants. Codigestion plants are also found to be relatively expensive in terms of costs to have all permits collected. Activities not linked to a mandatory time frame have the longest durations.

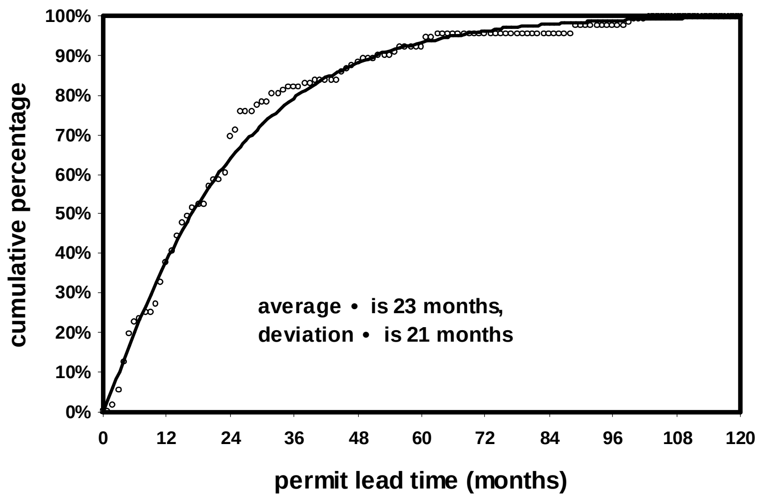
In approximately one third of all analyzed cases, permits for bioenergy installations were appealed or objected to. After the final decision of the responsible authorities, still ~13% of the cases were appealed to higher authorities. The technology category which faces the most resistance is Cofiring, followed by Combustion, Biogas and Biofuels.

The most frequent reasons for appeal are the expected emissions of the bioenergy installations, followed by traffic movements, land use and sustainability aspects. In case of higher appeal, emissions are again the main reason for objection, followed by sustainability issues. In case of emissions, the most common named by the appellants are noise, smell, NO_x and fine dust. In most of the appealed cases, the projects were objected by the residents, followed by non-governmental organisations (NGO's) and other stakeholders (private companies, neighbour cities, applicant, etc.).

4.1 Lead time

The most important criterion of the permitting procedure is its lead time •, i.e. the time between the application of the first permit and the irrevocable issuance of the last permit. Because of the time value of money, the project delay strongly influences the return on investments. Besides, a long delay may lead to cash flow problems for the project developer thus delaying the overall project realisation. For our cases, the lead time is almost two years on average, which is higher than previous studies[45,46]. However, we include elements like the Environmental Impact Assessment, the legal case and resubmissions (if applicable) in this number.

Figure 8. Distribution (ogive) of the lead times of all the projects of this study (around 60% of the projects has a lead time below two years, and 90% below five years). The solid line is the Gamma-distribution with •~1,1 and •~20.



For procedures including an Environmental Impact Assessment (EIA), the average lead time increases to almost three years (•~34 months). Inclusion of both an EIA and a legal case[47] even stretches the duration to almost five years (•~59 months).

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[45] S. da Empoli and F. D'amore: Views regarding the licensing processes within the energy sector in the EU countries (Workshops in frame of this project, Brussels 2008).
[46] PROGRESS: Promotion and growth of renewable energy sources and systems (March 2008).
[47] Also referred to as public inquiry; what matters is that the responsible authorities change.

		Environmental Impact Assessment	
		no	yes
Legal case	no	16	28
	yes	31	59

Table 4: Average real lead time in months for various permit procedures in the Union including an Environmental Impact Assessment and/or a Legal case.

The second dominant couple is the effect of the land use approval and the grid access. Both boost the duration with a year; although the mutual inclusion apparently no longer rises the lead time (probably because the grid access is complicated in rural areas whereas for land use approval it is in community areas). Nevertheless, these types of procedures can be very important for specific BTC in specific regions.

		Land Use Approval	
		no	yes
Grid access	no	17	29
	yes	28	31

Table 5: Average real lead time in months for various permit procedures in the Union including a Land use approval and/or Grid access.

4.1.1 Spatial dependency

We have calculated the 90%-confidence intervals for the average lead time[48] averaged over the selected technologies for the different European countries and the Union as a whole:

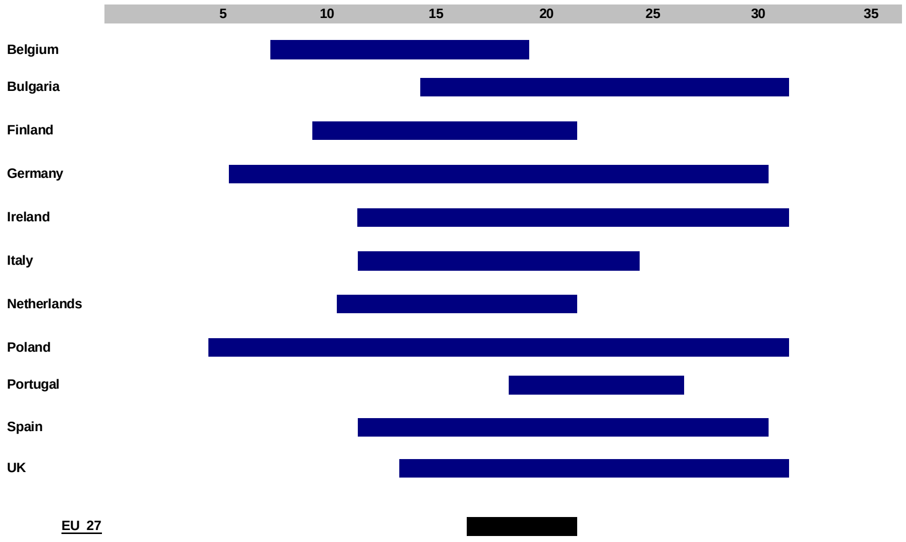


Table 6: Real lead time (90%-interval in months) for the selected technologies for various European countries.

From the table, it becomes clear that the observed range for the average of the lead time for the individual countries does not differ statistically significant from the range for the average lead time of the EU 27 (confidence interval for the Union is 17-21 months). Apparently, the average of a selection of projects in a part of the community is the same as of the Union as a whole. Quite remarkable, the type of permitting system and the number of permits required (see Table 1) appear not to influence the real lead time.

We have also calculated the 90%-confidence intervals for the average lead time[48] averaged over the selected technologies for the different European regions and the European Union as a whole:

[48] Excluding resubmissions and countries with less than three data points.

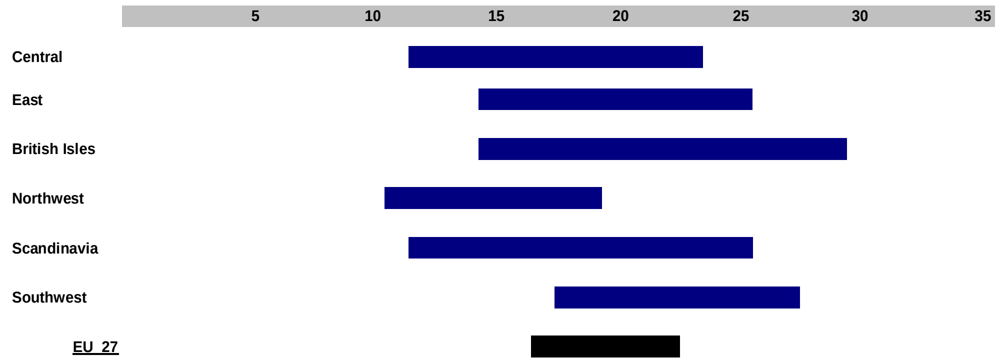


Table 7: Real lead time (90%-interval in months) for the selected technologies for various European regions.

The unexpected conclusion does not alter; apparently, the average lead time is not strongly dependent on the geographical area.

4.1.2 Technological dependency

In contrast to the geographical dependence, the average lead time • strongly depends on the type of technology. However, as will be discussed later on, the effect is indirect since more complex technologies require more activities:

BTRC		Scandi-navia	British Isles	North west Europe	Central Europe	South west Europe	Eastern Europe
Biofuels		28	25	36		61	27
Biogas	manure or crops		2	4	5		
	codigestion	18	50	31	15	36	38
	landfill		18			25	
	effluent			14		14	
Combustion	EIA		29	36	28	34	
	No EIA		8	7	22		
Cofiring		36	9	39	18		9
Boiler	• 1 MW	15		14		6	13
	< 1 MW		9		2	3	

Table 8: Average lead time • in months per region & technology (underlined values reflect one sample only).

Of all technologies, the Biofuels include on average the longest durations and the Boilers the shortest. Depending on the technology and the region, the lead time is highly inhomogeneous and varies between ~2 and ~60 months. In particular the category Cofiring is quite inhomogeneous, but Cofiring facilities themselves are technically quite different as well. Furthermore, the data suggest that the average lead time in central Europe is rather low and in the Southwest rather high, although the difference is small and may be statistically not significant.

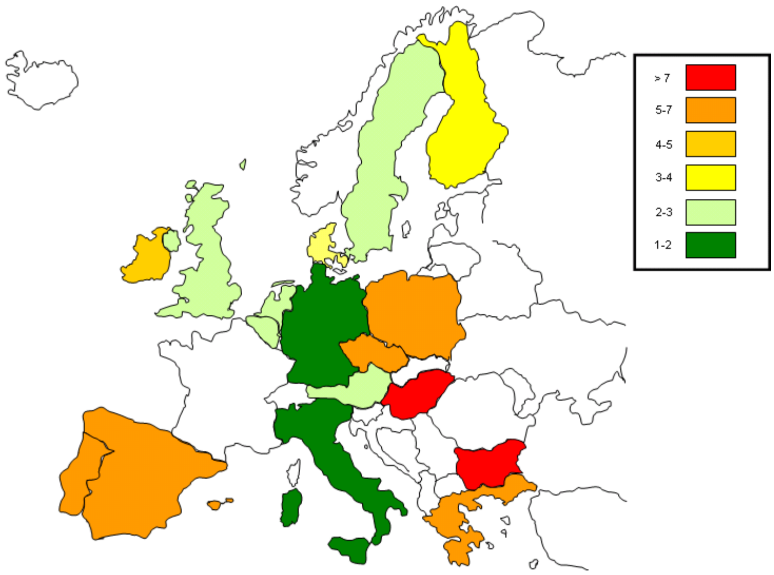
Extremes are observed for all technologies in particular for codigestion in the UK (e.g. both Holsworthy and South Shropshire cases encountered strong problems and are well described in literature[49]) and in the East (Újgalambos plant, Hungary); Cofiring facilities in the Netherlands (related to lengthy legal case procedures caused by the implementation of the IPPC directive) and Finland (power plant in Joensuu, authority was waiting for the changes in the LCP-regulatory); Combustion in the UK (Cricklade[50], Bracknell[50] , Banham Poultry Ltd[51] and Winkleigh[52] cases) and Biofuel production facilities in the Netherlands and Sweden (well known Lund case, failed because of strong neighbour opposition[53]).

These results - in particular the spatial and technological influences on the lead time and their significance - are elaborated on in the subsequent Chapters.

4.2 Real number of permits

The real number of permits[54] needed for a biomass project is graphically depicted below:

Figure 9: Average number of real permits required for biomass projects.



[49] S. Bowley: Holsworthy biogas plant, for instance (November 2007).
[50] M. Hodson: Crickdale Bioenergy Power Station and Bracknell Biomass CHP Energy Centre (Create Acceptance, FP6 August 2005).
[51] Refusal of permission in January 2005 on the grounds of lack of information on odour control.
[52] P. Upham and S. Shackley: Stakeholder opinion on a proposed 21.5 MWe biomass Gasifier in Winkleigh (UK ERC, 2005).
[53] E. Heiskanen: Västerås Biogas Plant and Lund Biogas Plant (Create Acceptance, FP6 June 2006).
[54] For the Czech Republic and Greece the number of permits is derived from the formal process.

As expected, in the South and the East the number of permits on average is higher than in central Europe, where the permits are relatively integrated (see also Table 2). However, the number of real permits does not correlate with the lead time and/or the costs.

4.3 Costs

We have inventoried the applicants' costs needed to obtain all the permits required. These costs consist of two components: the legally required administrative fees to be paid to the authorities and the costs to prepare the necessary documents and forms. The latter usually reflects the cost for subcontracting an external consulting agency, but may also be the expenses (in terms of hours) in case the applicants prepare the permit applications themselves.

These average costs in percentage of the investments are listed below:

	Costs	Fees
Biofuels	~0,2%	< 0,1%[55]
Biogas[56]	0,4 - 7%	0,1 - 1%
Combustion	0,1 - 1%	0,1 - 1%
Cofiring[57]	0,01 - 3%	< 0,1%
Boilers	0,1 - 1%	~0,2%
Total	~1,1%	~0,1%

Table 9: Permitting costs and fees (in percentage of the investments) for selected technologies.

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[55] Exclusion of an unusually high value for a Spanish biodiesel plant (Madrid case).
[56] Excluding landfill and sewage (effluent) digesters.
[57] Some assumptions were made for the investments of the 600-1200 MW coal combustion plants; in particular these big power facilities reveal very low costs for the permitting procedure (< 0,1% of the investments). For smaller Cofiring plants (< 100 MW), the costs are in line with the costs for the stand-alone combustion plants (absolute values range between 30 and 600 k€).

On average we have observed that:

- The costs are highly **inhomogeneous** – they strongly vary from case to case and the variations from case to case are larger than from technology to technology or from region to region. Hence, averaging values has little or no significance;

- Besides a few exceptions, the total expenditures are generally speaking relatively low. Typically, they are around or below 1% of the investments with the exception of the dedicated biogas plants for which they are on average ~3,5% of the investment costs. However, if the applicant has to apply at several locations simultaneously to have just one location fully permitted, the cumulative costs may be high indeed;

- In general, the longer the procedure lasts, the higher are its costs. On the other hand, permits for large power plants are not necessarily more expensive than for small size plants (this is also why some Cofiring facilities call for relatively very low costs).

- The major driver for the costs is the **Environmental Impact Assessment** (EIA). The presence of the EIA increases the median value[58] of the total costs from 49 k€ to 400 k€. This suggests that the costs for the EIA can be as high as 350 k€. This influence is not observed for other types of procedures such as the legal case. The reasons for the cost dependency of the EIA are speculative presently; possibly the EIA requires (repeatedly) technical studies, which have to be subcontracted and may be expensive.

All in all, it seems that little additional information can be obtained from monitoring the costs.

Nevertheless, some authorities in a number of countries (a.o. Italy, Spain) call for extraordinary **high administrative fees**. These inhomogeneities in fees may be similar to variations in taxation and accounting systems in the European community and in-depth investigations of the underlying reasons are outside the scope of this work.

We recommend to the commission to further investigate these anomalies in the administrative fees in conjunction with the factors mentioned above.

[58] Since the costs are inhomogenous, the median value is selected instead of the average .

4.4 Public resistance

The public resistance against bioenergy projects can be measured by means of analysis of the appeals (objections) and higher appeals (or legal cases) of the different permitting processes. The influence of the appeal is listed below; as can be expected, the inclusion of a legal case drastically lowers the success ratio.

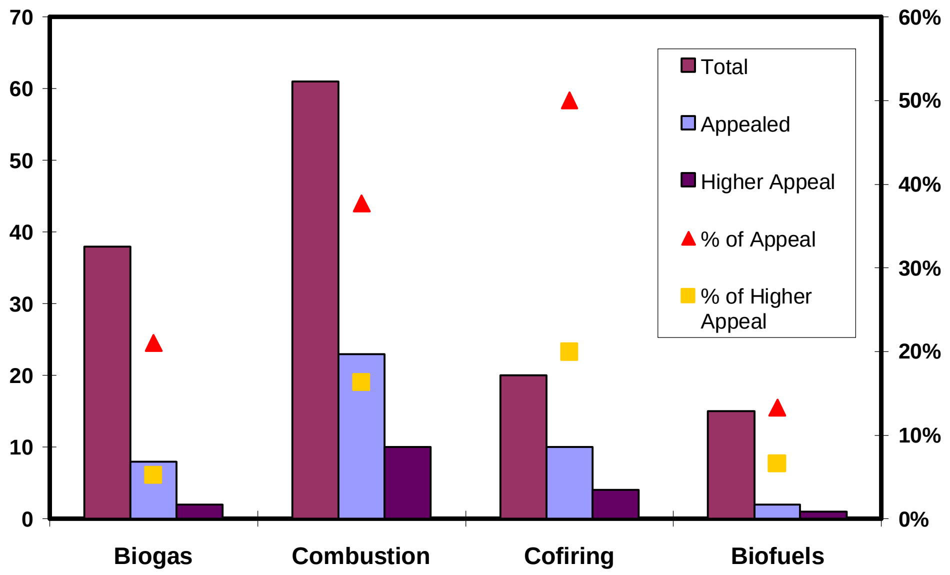
		Higher appeal	
		no	*yes*
Appeal	*no*	82%	-
	yes	63%	29%

Table 10: Effect on the outcome (success percentage) of the appeal and the higher appeal (legal case) for the various real cases.

Generally spoken, in approximately one third of all analyzed cases permits for bioenergy installations were appealed or objected. After the final decision of the responsible authorities, still **13% of the cases** (17 cases in total) were appealed to higher instances.

The technology category which faces the most resistance is Cofiring (in percentage of the total cases per category), followed by Combustion, Biogas and Biofuel plants.

Figure 10: Public resistance versus the technology.

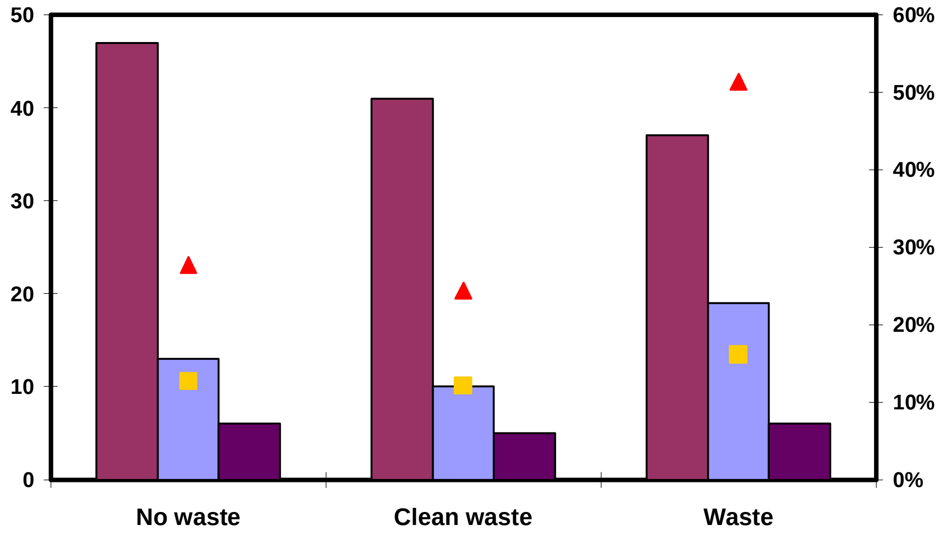


Regarding the type of feedstock, all projects were categorized in three groups, taking into account the nature of the biomass used. These three types are defined as:

- No waste: Biomass produced for energy purposes, such as energy crops;
- Clean Waste: Waste streams which are normally not highly contaminated or are considered as relatively safe (manure, not contaminated wood residues, etc);
- Waste: More complex and mixed waste streams (municipal waste, sewage sludge, contaminated waste or demolition wood, etc). This is waste in the sense of the Waste directive.

Considering this definition, the highest resistance was found, as expected, on projects based on complex and/or contaminated materials. Between projects with no waste and clean waste as feedstock, no statistical difference was found. The results are shown in the following chart.

Figure 11: Public resistance versus the type of feedstock (Legend as above).



In most of the appealed cases, the projects were objected by the residents (56%), followed by NGO's (40%) and other stakeholders (private companies, neighbour cities, etc). Regarding the higher appeal, residents are again the largest group of objectors, followed by the applicants themselves.

	Residents	NGO's	Applicant	Authority	Other
Appeal	56%	40%	14%	23%	26%
Higher appeal	24%	12%	18%	6%	12%

Table 11: Type of applicants appealing to the permit.

Another interesting result is the role of the NGO in the appeal process. In around 60% of the projects where NGO's appealed to the permits, the cases were appealed to higher agencies. For the Residents, the quotas reach 40% and only 25%, respectively, if the projects were objected only by residents and no NGO's.

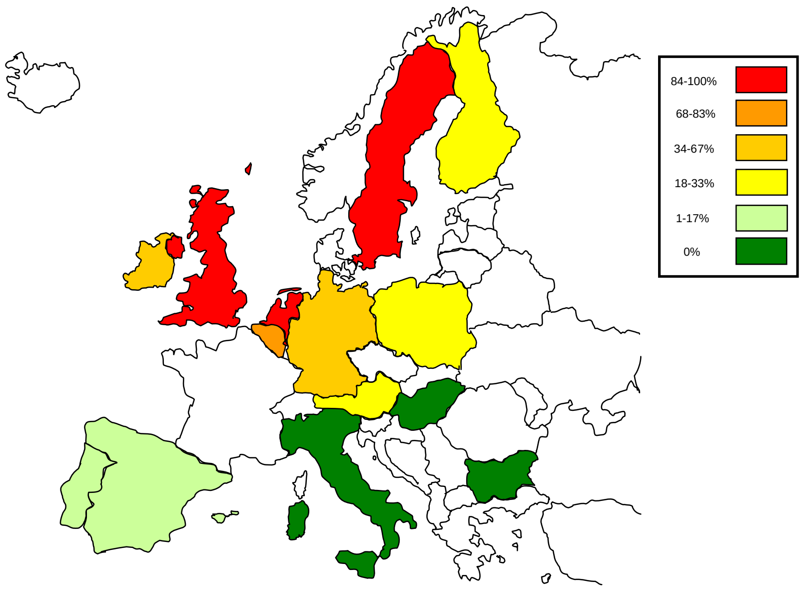
The most common reason for appeal are the **expected emissions** of the bioenergy installations, followed by **traffic movements, land use** and **sustainability aspects**. In case of higher appeal, emissions are again the main reason for objection, followed by sustainability issues. In case of emissions, the most common mentioned by the appellants are noise, smell, NO_x and fine dust.

	Appeal	Higher appeal
Traffic	26%	0%
Sustainability	19%	29%
Visual aspects	16%	6%
Procedural aspects	16%	18%
European law	5%	12%
National law	9%	12%
Jurisdiction	5%	6%
Land use	19%	6%
Emissions	51%	35%

Table 12: Reasons for appealing to the permit (several answers possible).

The geographical dependence of the stakeholder appeal is depicted in the graph below. It appears the resistance is limited to Northwest Europe only. In the South and the East, formal opposition is virtually absent. The Central and Scandinavian region show values comparable with the mean of all cases (around 30% for appeal and 15% for higher appeal).

Figure 12: Stakeholder appeal during the consultation phase.



Finally, we have investigated which facilities faced an anomalous strong resistance (at least four protests or more from various stakeholders). As expected taking into account the material listed before, they are located in the North or Northwest Europe (in particular the United Kingdom) and mostly involve conversion of waste:

Project name	Country	Technology
Electrawinds Lebbeke	Belgium	Combustion of vegetable oils
Industriekrawtwerk Andernach	Germany	Combustion of municipal waste
Fibroned	Netherlands	Combustion of chicken litter
Biogas/bio-ethanol Norrköping	Sweden	Biofuels from energy crops and by-products
Cricklade biomass plant	United Kingdom	Combustion of wood and wood fuels
Bracknell biomass plant	United Kingdom	Combustion of wood and wood fuels
The Elean power station	United Kingdom	Combustion of by-products and residues
Banham poultry	United Kingdom	Combustion of chicken litter
Bioflame Moors National Park	United Kingdom	Gasification of wood fuels and energy crops
Winkleigh biomass project	United Kingdom	Combustion of crops and municipal waste

Table 13: Bio-energy facilities that encountered a well above average number of appeals.

4.5 Type of process step

In order to reveal which process steps in the procedure dominate the duration, we have analyzed the average values for the activities described in paragraph 2.2.1. Data are from the real cases; they are compared to the legislative (formal) values.

Type of step	Duration (weeks)	
	Real	Formal
Land use approval	37	~17
EIA screening	21	~7
EIA	46	n.t.f.[41]
Environmental permit	39	~20
Construction permit	17	~10
Operational permit[59]	39	~6
Legal case	68	~60 / n.t.f.
Water permit[59]	40	~19
Grid access	49	n.t.f.
Planning permit	28	~13
Production license	25	~13
Integrated IPPC permit[59]	30	~26
Void	92	n.t.f.
EU average	**32**	**~20**

Table 14: Real duration •n in weeks per permitting activity (for legislative values see Table 2). The average excludes resubmissions (voids).

Not coincidentally, activities most often not connected to a mandatory time frame (legal case, grid access, EIA, interval between submissions) have the longest durations.

Linking these real data to the data from Table 2, it is concluded that the real durations of the activities on average exceed the maximal durations stated by law by almost three months. However, first of all a few activities are included in the real average without a time frame (or for some countries without a time frame), and secondly the authorities are allowed to stretch the lead time in case of vast and complex projects, an Environmental Impact Assessment, appeals and/or in case of additional questions to the applicant.

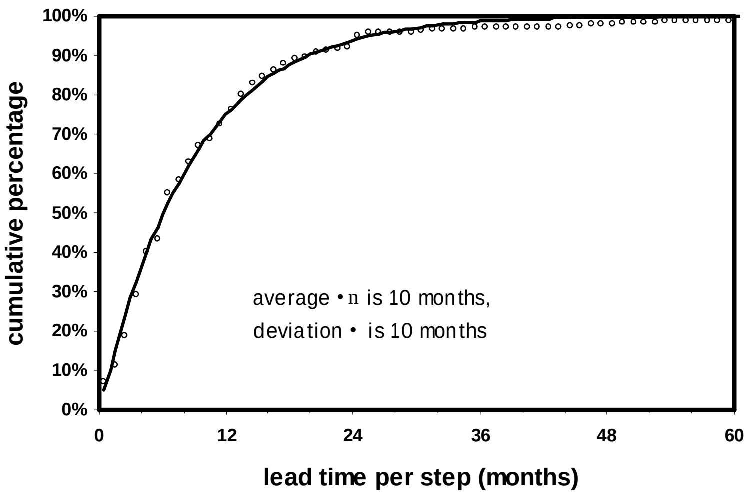
[59] Few cases only (less than five).

The lead time of the recent IPPC permit is in line with those of the other permits, telling that it is possible to have a single integrated permit without stretching its duration too much.

4.5.1 Distribution lead times of the process steps

Analogously to the lead time •, we have reviewed the distribution of the lead times per step •$_n$, including the period between resubmissions (voids). The phase length •$_n$ is the time between the formal application of a specific permit (or beginning of an activity such as the legal case or the Environmental Impact Assessment) and its issuance (or ending). The lead time per step is almost nine months on average; if resubmissions are excluded, it drops to around eight months. So, quite interestingly, the average lead time <•> is almost three times as high as the average length per phase <•$_n$>.

Figure 13: Distribution (ogive) of the lead times per phase of all the projects of this study (around 75% of the lead times is below one year, and 90% below two years). The solid line is the Gamma-distribution with •~1 and •~8.



In the subsequent Chapter "Analysis of the real cases", we further investigate the dependency of the step length on various parameters.

4.6 Outcome of the procedure

The project with regard to this work is a **success** in case its time period matches the benchmark and the eventual construction and/or operation of the facility is not cancelled by permitting issues. A project is considered to be a failure otherwise. Besides the lead time, the other benchmark is the costs.

Benchmarking is done in terms of standard deviations from the average. This of course is a bit arbitrary, but we have defined as failure thresholds for the lead time and the relative costs four years (too long) and 5% of the investment costs (too expensive), respectively. However, the number of failures is not that sensitive to these assumptions (most failed projects are well above these thresholds or fail for other reasons).

Per technology, the average success rate is listed below (Table 15). It should be stressed that these experimental observations may not be representative for the permitting ambiance in reality. For instance, applicants may decide after an extensive site scrutiny or tentative negotiations with the local stakeholders to abstract from actual application. Obviously, these kinds of failures that occur in the informal phase preceding the actual application do not show up in the concluding statistics.

Unfortunately, the overall success rate does not surpass a disappointing 70% figure. Supplementary analysis reveals both anaerobic digestion (61%) and stand-alone combustion (61%) illustrate unusual low success rates.

The Codigestion (digestion of manure together with energy crops and/or residues) projects encounter anomalous resistance as revealed by a below par 34% accomplishment rate. Possibly, this is caused by the innovative level of these technologies, immature legislation and slumbering fears either justified or not of the residents (smell, traffic, noise, etc.).

For combustion, the critical parameter is the presence of existing facilities rather than the type of feedstock. In case of the erection of a new facility, the success rate drops to an unsatisfactory 48%. This suggests that opposition, in whatever form, is reduced in case of plants already being in operation. Reasons may be that community people may get used to the plant after a while; authorities may have become more experienced, reduced attention of NGO’s, etc.

Generally speaking, the difference between the outcome of all the thermal conversion technologies for biomass (71%) and waste (60%) seems to be not as much as may be expected.

Another remarkable observation is that Boilers are more successful than Combustion (combined heat and power) installations. This may be partially explained by their size (on average there capacity is somewhat smaller, although in the North they are substantial); reduced noise levels (no turbine); the absence of a grid access application procedure or a combination of these factors.

Possibly, their location plays a role; they are compared to the other technologies located more often close to residents, which may either increase (NIMBY effect) or decrease the community resistance (it is generally assumed that decentralisation increases the visibility of renewable energy production)

Biofuel plants	**73%**				
		Biodiesel	**85%**		
		Bioethanol / biomethanol	**67%**		
		Biogas for transport[59]	**50%**		
Biogas	**70%**				
		Anaerobic digestion	**61%**		
				Monoculture	**100%**
				Codigestion	**34%**
				Effluent	**100%**
		Landfill gas	**91%**		
Combustion	**61%**				
		Existing facilities	**68%**		
				Biomass	**73%**
				Waste	**63%**
		New facilities	**48%**		
				Biomass	**50%**
				Waste	**43%**
		Vegetable oils	**82%**		
Cofiring	**78%**				
		Biomass	**89%**		
		Waste[59]	**50%**		
Boilers	**90%**				
		Biomass	**94%**		
		Waste[59]	**75%**		
Total	**70%**				

Table 15: Real success rate for selected biomass technologies. The values well below the benchmark (the average of all technologies) are in red.

4.7 Legislative acts and institutional stakeholders

Some other relevant parameters for the permitting project listed in Table 1 were additionally established from analyzing the real cases:

	Number of legislative acts	Number of authorities	Number of stakeholders
Austria	>15	1	3-5
Bulgaria	~30	5-6	>12
Denmark	~9		
Finland	~6		
Germany	~15	~3	~5
Hungary	>50	4-6	>35
Ireland	~9	~4	5-7
Netherlands	~6	3-4	
Poland	~12	3-4	~7
Portugal	~5	~3	6-7
Spain	~5	3-4	4-5
United Kingdom	~5	4-6	>20
EU average	**9**	**4**	**7**

Table 16: Selected real project parameters.

Our results confirm the common feeling among the various stakeholders as far as the permitting procedure is concerned. The actual application is subject to large amounts of legislative acts, sensitive to more than just a few institutional authorities and susceptible to the opinion of a multitude of stakeholders. Somewhat surprisingly, the number of authorities is relatively constant in the Union.

4.8 Role of communication

Applicants were asked to answer questions related to the stakeholder communication process during the application. Parameters that are supposed to promote the process (i.e. positively from the viewpoint of the applicant) are the presence of a public information campaign, the informal discussion with the authorities prior to the application, the discussion with the NGO's (also prior to application) and the absence of shifts in the responsible contact persons (either on the side of the applicant or the authorities) during the process. It is believed that a good communication process favours the outcome. The factor communication is determined by the sum of the dichotomous variables and thus ranges from 0 to 4. The outcome is listed by the success percentage.

	Communication score				
	0	**1**	**2**	**3**	**4**
Outcome	100%	77%	69%	29%	33%

Table 17: Outcome of the permitting process in terms of the success ratio as a function of the communication score.

The results show unambiguously that the 'better' the communication, the worse the outcome. This somewhat counterintuitive result can be explained by either the assumption that communication raises more awareness amongst the stakeholders and thus increases appeal (let sleeping dogs lie), or by assuming that in case the applicants expect the licensing process to become problematic, they anticipate by increasing their communication efforts, and in this case the analysis fails since there is no cause-effect relationship.

The remark that communication increases rather than decreases appeal has been observed before[4]. The second hypothesis can not be tested based on our information.

Other process parameters possibly associated with communication have been established to be minor. In more than 70% of the cases, the applicant considered the authorities to have high experience regarding the handling of the permit application, and in 79% of the projects their role was considered to be constructive rather than destructive. It should be admitted, however, that in case their role actually was considered to be destructive, the success rate matches 33% only.

General guidelines on how to improve the communication among the various stakeholders can not be given, but some issues that should be taken into account by the applicant are:

- The size of the project; for a vast project communication with especially NGO's is relatively more important;
- The permitting history for that location; i.e. have there been many protests in the past (and consider by whom and why);
- The type of feedstock (for waste conversion, protests are more likely);
- The opinion of the various local and national NGO's regarding the secondary fuel and conversion technology;
- The type of communication tools (flyers, information events, advertorials, etc.);
- The type of communicating interfaces (an independent communication agency, the applicant, the authorities, an autonomous expert, etc.).

Be aware that pro-active communication only has meaning if input from stakeholders can be processed in the permit (application). Therefore, pro-active communication should start before the first permit application draft is delivered to local government

4.9 Location of the power plant

The last parameter to be established is the location. Four different types of locations have been defined: bio-energy facilities in agricultural areas, on an industrial site, close to a natural (protected) area and in the vicinity of a residential neighbourhood. The lead time (the success ratio) has been determined by averaging over the various technologies. The differences in the outcome and the lead time are quite small (at most a few percent and three months, respectively) and statistically not significant, although there is a striking difference in the appeal percentage. As may be expected, facilities near natural areas reveal the strongest resistance considering the appeal percentage.

	Location			
	Agricultural	Industrial	Natural[59]	Residential
Lead time	20	26	27	22
Appeal	23%	44%	63%	24%
Higher appeal	7%	12%	25%	11%
Outcome	64%	74%	63%	72%

Table 18: Lead time in months, appeal, higher appeal and the outcome (success ratio) of the permitting process as a function of the location.

The final parameter measured is the issue if the new facility is an extension of **existing facilities** or not; the success rate decreases from 71% to 60% in case it’s not. This suggests that opposition is reduced for plants already being in operation. However, the general difference is small and may not be statistically significant (also the average lead times are almost equal for both cases).

5 Analysis of the real cases

We have analyzed the real data for the costs and the full lead time. It is revealed that the lead time is almost fully controlled by the procedure and thus the legislation, with the exception of the legal case that stems from the public resistance. Thus, the various possible actions to streamline the permitting process should aim at streamlining the procedure rather than the permit content or the permit process. Based on our findings, we propose a Quality Management Schedule that reveals the criteria and their factors controlling the outcome of the procedure.

5.1 First order analysis of the real cases

The first order analysis consists of analyzing the dependency of the main criteria, the costs and the lead time, on their constituting components; the number of steps and the step length. In this way, we try to reduce the high value for the observed inhomogeneities of in particular the lead time.

5.1.1 Lead time

The permitting procedure consists of a series of activities rather than a series of permits. The Environmental Impact Assessment, for example, should be considered as an (project) activity rather than a permit. The same holds for the legal process. Furthermore, some projects require an environmental permit only (for instance Cofiring projects) while others starting from scratch require many more permits. An applicant may have to resubmit his permit in case of a refusal by the authorities. This implies that it is very difficult to determine unambiguously a single and unique lead time; in contrast, the definition for the lead time is project dependent.

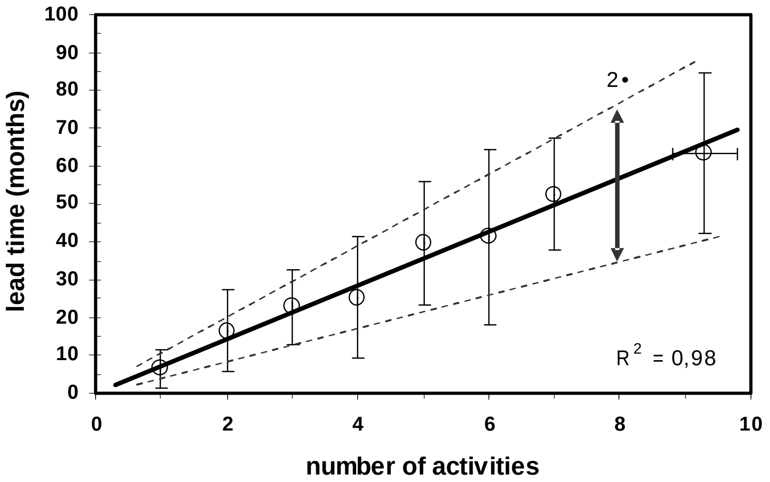
The lead time for a procedure is thus determined by the sum of its individual lead times; the average lead time • is controlled by its average number of process steps (<*n*>) steps and their average length (<•$_n$>). By analyzing these two components, it may be easier to resolve the underlying parameters influencing the lead time.

Number of process steps

For further analysis, we have estimated how many serial process steps (*n*) were really involved per project. This is plot versus the integral average lead time <•> in Figure 14. It can be observed that the lead time is strongly related to the number of process steps; in fact, the correlation is almost one and the best fit – the solid line in the graph - is through the origin, as may be expected. The average number of steps for all projects <*n* > = 3,2.

The inhomogeneities (dotted lines) depend on the number of steps, but are typically ~13 months[60]; they stem primarily from the fluctuations in the average step length (<•$_n$>). A typical duration of a particular step or activity is around eight months although there are quite some fluctuations in the length per step for a specific number of steps (as the number of process steps increases, the average step length increases as well).

Figure 14: Average lead time • in months versus the number of activities (process steps) of the permitting procedure (the solid line is the best fit).



Average step length

The second factor determining the lead time • is the step length •$_n$. The average lead time is plot versus the step length in Figure 15; a good correlation is observed as well, albeit less than for the number of activities. Again, the average inhomogeneities in the lead time are ~15 months and now they originate predominantly from the variations in the average number of process steps, although they also arise from the width of the interval for •$_n$ and the error in determining •$_n$ exactly (a few months as well).

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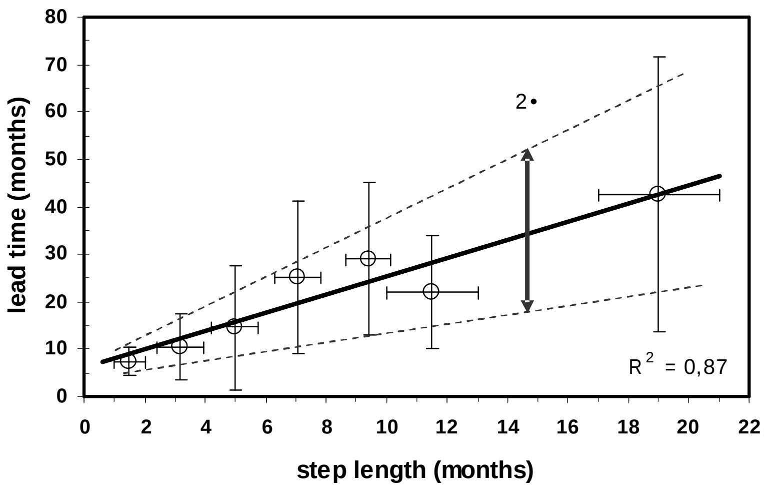
60 See Appendix I for the deviation versus the number of process steps (• n).

Figure 15: Average lead time • in months versus the step length of the permitting procedure (the solid line is the best fit).



5.1.2 Influence of technology and region

In this paragraph, we research the possible influence of geographical differences and the technological variations on the lead time and the step length.

Regional differences

Countries in the Northwest seem to have relatively long lead times and countries in central Europe enclose relatively short lead times (Table 2). Other countries are in between. It can be tested from the *F*-value by an ANOVA analysis while varying the technology if the value for the central countries is below the statistical significant threshold, for example. This is not the case for the 90%-level ($F < F_{crit}$), and hence it can not be concluded that the central countries have shorter lead times.

This result is not expected since the environmental legislations of the inner countries (e.g. France, Germany and Italy) often include an integrated permit. It is also not expected since Table 2 exhibits major inhomogeneities in the formal lead time per country and/or region. In practice, however these differences appear to be almost absent or are at most in the order of two months.

	Scandi-navia	British Isles	Northwest Europe	Central Europe	Southwest Europe	Eastern Europe	<•$_R$(•)>
•	24	23	26	19	23	23	~2

Table 19: Average value for the duration and the deviation (in months) of the permit process as a function of the geographical region.

The second step is to calculate the values for the length per type of step per region in months. It is found that $F < F_{crit}$ and thus the length of the step does not depend on the region. In other words, the duration of the various steps in the permitting process (e.g. environmental permit, construction permit, etc.) is not geographically dependent either.

	Scandinavia	British Isles	Northwest Europe	Central Europe	Southwest Europe	Eastern Europe	<•$_R$(•$_n$)>
•$_n$	7	6	9	8	8	6	~1,5

Table 20: Average value for the step length and the deviation in months as a function of the geographical region.

Secondly, the *F*- statistic is calculated for the various technologies. Again, the results for the *F*-value are not significant either and it can be concluded that apparently the technology has no effect on the average step length (•$_n$~32 weeks) either.

	Biofuels	Biogas	Cofiring	Combustion	Boiler	<•$_T$(•$_n$)>
•$_n$	7	7	9	9	5	~1,5

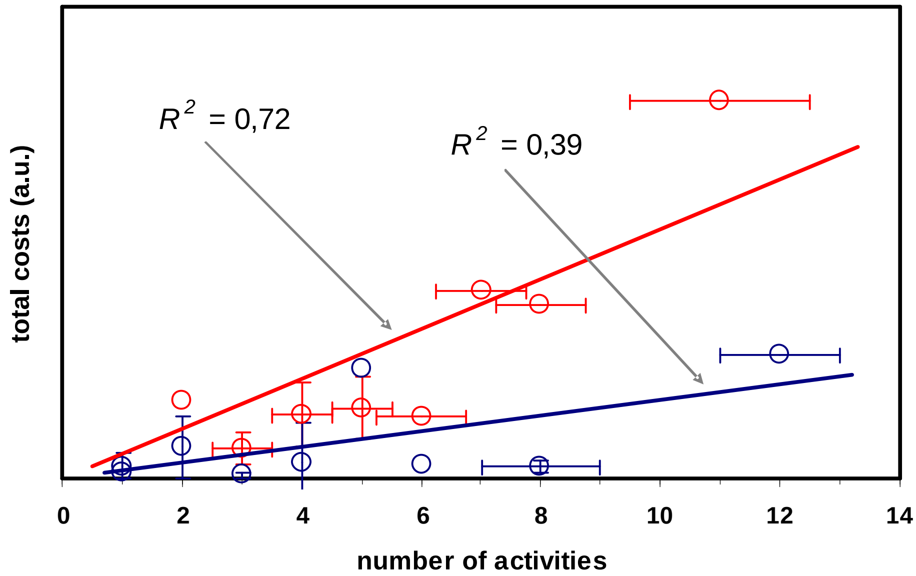
Table 21: Average step length and deviation per activity (in months) as a function of the technology.

We have investigated to what extent the number of activities *n* is different for the various regions and technologies too. The *F*-test shows that the number of process steps differs significantly from technology to technology (as expected), but not from region to region.

5.1.3 Costs

The absolute costs for the whole procedure have been analyzed in a similar way; taking into account their dependency on the Environmental Impact Assessment:

Figure 16. Costs (in arbitrary units) versus the number of activities of the permitting procedure for procedures including an EIA (upper curve) and procedures excluding an EIA (lower curve). The lines are best fits (although the fit for the samples excluding the EIA is weak).



It is observed that the absolute costs depend on the number of activities (process steps) as well, although the correlations are weaker than for the lead time. The inclusion of the Environmental Impact Assessment in the permitting process at least triples the costs.

Since the costs include various components (fees, opportunity costs, internal hours, subcontracts, etc.), it is unlikely very high correlations will be observed.

5.2 Second and third order analysis of the real cases

Second order analysis of the real cases

In this paragraph, we explore the inhomogeneities in the average step length for a specific number of process steps (on average around three). By monitoring the number of process steps, the average inhomogeneities in the lead time have been reduced from ~21 months to ~13 months (Figure 14).

On the next level, the latter figure is composed of the contribution of two constants: (i) errors in establishing the value for $\bullet_n$ per case exactly (a few months) and (ii) variations in the average length of the step because of differing step types. This number reflects the observation that on average construction permits require less process time than environmental permits, for instance.

From Table 14, it can be concluded that the contribution of this component to the deviation is ~10 months if resubmissions are included, but only ~6 months if they are excluded. It is not possible to break down this value even further, since the lead times of most step types are determined by law.

Third order analysis of the real cases

The last move is to explore the average variations in the length of the step per step type, reflecting that the length of the construction permit, for example, differs from case to case.

Type of step	Deviation
Land use approval	8
EIA screening	< 1
Environmental Impact Assessment	6
Environmental permit	7
Construction permit	4
Operational permit[59]	14
Legal case	12
Grid access	9
Production license	3
Planning permit	5
Integrated permit[59]	< 1
Void[59]	61
Total	**~8**[61]

Table 22: Real deviation of the lead time in months per type of permitting activity.

[61] Taking into account the frequency of the activity and excluding the voids .

Again, the void has a strong effect on the real deviation amongst the various activities; if it is included in the average it doubles to ~17 months.

Finally, we explore the sources of the deviations per step type (~8 months) starting with its possible regional and/or technological dependency. The values for the inhomogeneities, $\bullet^{2}_{R}$ (the deviation from region to region) and $\bullet^{2}_{T}$ (from technology to technology), respectively, both are around three months (see Appendix II for the derivation of these values).

These numbers reflect that complex technologies require more time for their impact assessment than simple ones, for instance, or that these assessments in e.g. the East are shorter than in the other European regions. The other component is the error term (a few months as well).

Type of step	**Deviation**	
	Regional	**Technological**
Land use approval	5	2
EIA screening	< 1	< 1
EIA	4	3
Environmental permit	4	< 1
Construction permit	2	2
Operational permit	3	5
Legal case	3	7
Grid access	2	1
Production license	1	< 1
Effluent	4	2
Planning permit	6	3
Integrated permit	1	1
Total	**~3**	**~3**

Table 23: Real deviation of the lead time in months per type of permitting activity versus the region and the technology.

The average deviation averaged over all steps for both the technology and the region is ~3 months:

	Scandinavia	British Isles	Northwest Europe	Central Europe	Southwest Europe	Eastern Europe
Biofuels	3	2				5
Biogas monoculture			<1			
Biogas codigestion	<1	<1	3			5
Biogas sludge					3	
Bio-oil			3	2		
Cofiring	3		7	<1		
Combustion CHP		4		9	7	
Boiler	3		5		<1	3

Table 24: Real deviation of the step length in months averaged over all types of permitting activities versus the region and the technology. The average is ~ 3 months.

From these observations, we conclude that the contribution of all the other possible parameters besides technology or region (process and/or content related like location, stakeholder interaction, additional information requests, feedstock, etc.) to the inhomogeneities in the lead time is ~3 months at most, and thus per parameter in the order of weeks rather than months or years. The same maximal estimate is derived for their part to the lead time per step type (Table 14). This figure of two to three months is surprisingly low compared to the original deviation of ~21 months.

From these results, the following view emerges: inhomogeneities observed in the lead time for bio-energy facilities stem from different lead times for different technologies. The variation in the lead time is related primarily to the variation in the number of process steps. Technologies inhibit different figures for their number of process steps according to their size, their complexity, their feedstock, spatial planning legislation, their output (heat and/or electricity) and the specific strength of the public resistance. The second major factor is the variation in the step type. Both factors are primarily determined by law. Apparently, all these factors also are more or less homogeneous through the Union and the geographical influences are small.

5.3 Quality management schedule

In Chapter 3.2, we proposed a quality management schedule (QMS) for describing the permitting process. Based on the statistical analysis and the results described in the previous paragraphs, we conclude that the schedule is relatively simple (see Figure 17).

The established QMS suggests that there are only two factors relevant for the criteria: namely the legislation and the public resistance; this is discussed below.

Outcome

The outcome is almost fully determined by the integral duration and the costs. In fact, we have found very few failures (less than 5%) that can be linked to other causes. This suggests that in time the resources of the applicant become depleted and the project is moved to another location or abandoned entirely. Although this result may be expected, it is less trivial that there are many factors (e.g. location, type of feedstock, level of innovation, number of legislations, changing authorities, communication, etc.), that apparently do not influence the outcome too much.

The one other significant factor is the public resistance; resistance may lead to an appeal. The appeal itself has not much effect, but the appeal may lead to a legal case (public inquiry) and the legal case increases the lead time drastically, may lead to a resubmission or may even end the application abruptly.

Duration

The duration of the procedure is the result of the product of the number of the activities and their average lead times (established to be on average near 7,5 months). The presence of the Environmental Impact Assessment influences the lead time indirectly by increasing the number of activities. This also holds for the public resistance that may lead to an appeal and a subsequent legal case thus increasing this number as well.

The relationship between the outcome and the BTC (Table 15) apparently is caused by the intimate relation between the biomass technology combination and the characteristics of the procedure. In other words, biogas codigestion plants are characterized by a high number of activities (change of land use plan, execution of EIA[62], application for a digestion spread license, effluent permit, etc.) causing them to have a low success rate.

Costs

The absolute costs are determined by the number of procedural activities and the environmental impact assessment as well (the inclusion of the EIA at least triples the costs). The activities to be performed for the permitting procedure and the obligation of the EIA are most often stated by law (dictated by feedstock, capacity and location). This also applies to the length of a particular activity.

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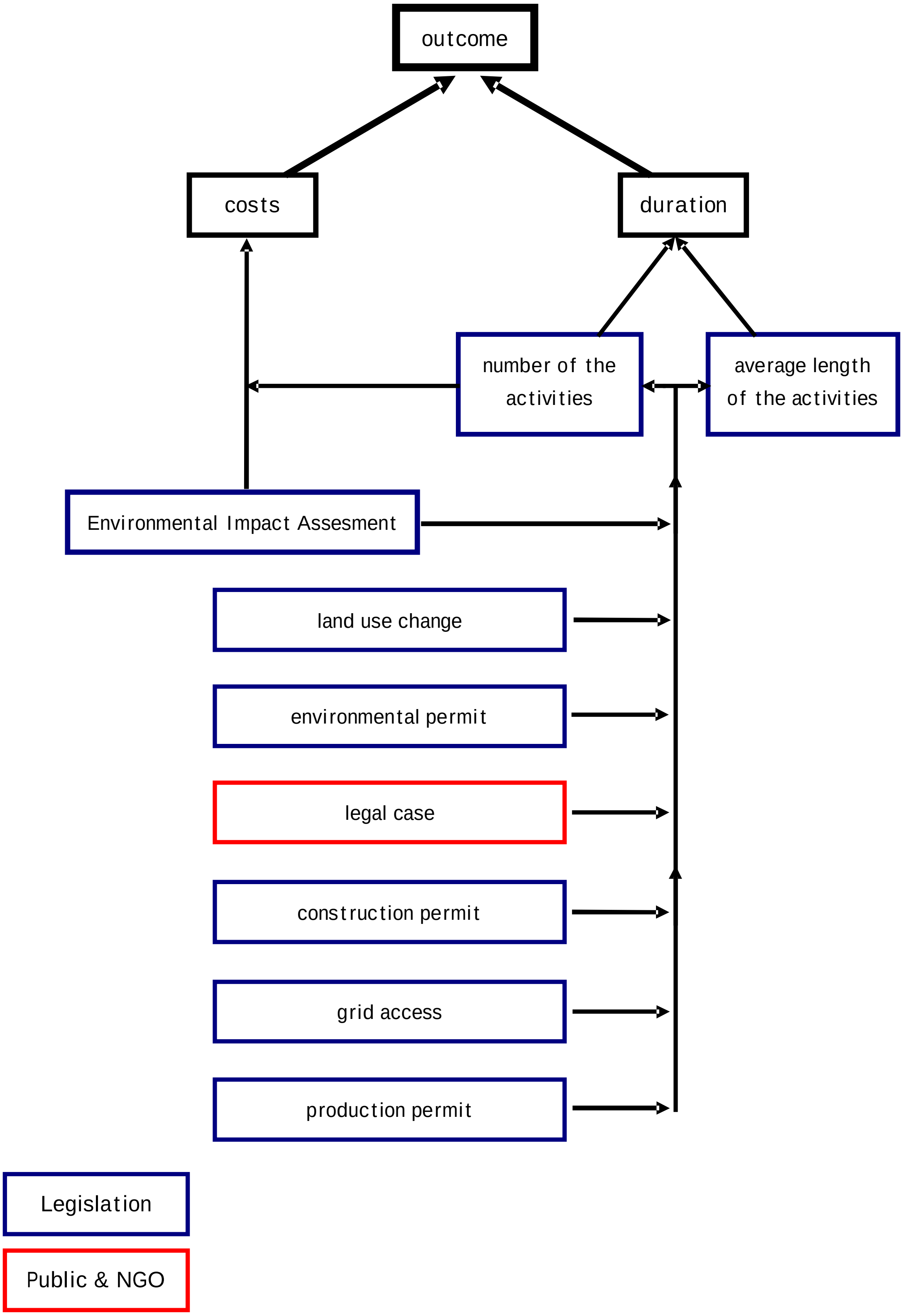
[62] Because of a low dry matter percentage, the caloric content of the feedstock of biogas plants is relatively low. This causes them to have a high capacity and to easily exceed the threshold for the EIA (thus increasing the lead time and the costs).

From this, it can be concluded that it is the (national) legislation that controls the entire permitting project and that many other criteria as bureaucracy, resistance and expertise play a marginal role only with the exception of the resistance leading to the legal case.

Figure 17: Final Quality Management Schedule (QMS).



These analytical results suggest that there are only a few major actions required to reduce the duration, the costs and the failure percentage considerably:

1. Reduce the number of activities by the application of an integrated procedure;
2. Reduce the length per activity by the provision of a maximal value (for example 26 weeks, excluding steps like a higher appeal and/or an Environmental Impact Assessment);
3. Impose a mandatory time frame on activities that abstain from such a clause;
4. To reduce the costs for the Environmental Impact Assessment, further research the factors determining these expenses.

6 Workshops

6.1 Introduction

The preliminary results of this survey were presented and discussed in four technology based workshops organised in Brussels in the second week of June 2008. The objective of the workshops was to discuss and propose recommendations to improve the current permitting procedures.

For each of the countries studied, stakeholders from several sectors were invited:

- representatives of public authorities and agencies;
- researchers;
- project applicants;
- representatives of equipment manufacturers and suppliers;
- representatives of NGO's.

6.2 Workshop Structure

The four workshops were focused on the following four technology categories (BTC):

1. Biomass combustion: installations where combustion of solid biomass is conducted for electricity or heat production*;*
2. Co-firing and gasification: installations where co-firing of various types of feedstock and gasification is conducted for energy generation;
3. Gas production and use from anaerobic digestion and landfill sites: installations where direct combustion of landfill gas or combustion of biogas generated by anaerobic digestion of various types of feedstock is conducted for energy generation;
4. Biofuel production and bio-oil combustion: installations where biofuels (biodiesel, bioethanol) are generated by means of biological / chemical transformation of energy crops and other feedstock.

The workshop structure was the same over the four days. In the first part the preliminary results of Work Packages 1-3 were presented by the project team, and the invited participants made presentations on specific aspects of the permitting procedure or on real cases.

The second part was dedicated to the discussion (of the permitting procedures) based on expert knowledge by the participants of permitting procedures in different EU countries, focusing on bottlenecks and trying to identify solutions and actions.

6.2.1 Presentation of Case Studies

Representatives of the industry presented their perspective on the local permitting procedures and on the bottlenecks commonly encountered.

CASE 1 - ITALY Bioenergie Investment S.p.A., Italy

An important bottleneck in permitting procedure was identified to be the uncertainties in the permitting procedure. In Italy, the advantage of the permitting procedure is the existence of the 'one-stop-shop' concept, where the environmental permit includes the construction permit and the water discharge permit as well as the operation permit. When an application is made, the “Conferenza dei servizi” (Conference of services) enables all the public agencies (authorities that issue permits) to be directly in contact with the applicant in a face to face meeting and debate the problems concerning installation with the applicant.

Two permit application procedures were presented. Both installation were proposing to use only untreated (virgin) wood as feedstock: the first one in Sicily (thermal power: 46 MW, electrical power: 15 MW) and the second one in Piedmont (thermal power: 38MW, electrical power: 11 MW).

The application for the plant in Sicily was presented on November 16, 2004. The Sicily Region identified 13 agencies which had to give their approval. At the first official meeting on February 15, 2005, only 6 agencies attended. The additional information requested by the agencies was submitted on April 7, 2005. At the second meeting on July 1, 2005, 19 agencies were invited, including ENEL (**E**nte Nazionale per l'energia **EL**ettrica), at that time the public grid operator, which gave the authorization for grid connection. Following the meeting, the investor had to wait for the approval of the 19 agencies invited. for a delay occurred due to the appointment of a new Director to the Special Agency for High Environmental Risk Area, whose agreement was required for the permit application., The permit was issued on February 9, 2007, 27 months after the application date. Unfortunately, during this time the connection rules to the Italian grid had changed so the permit for grid connection given by ENEL at the second meeting was not valid anymore. At the time of writing, the applicant was still waiting for the permit to connect to the grid.

The application for the second plant, located in Coniolo, Alessandria (northern Italy) was presented on April 4, 2006. The Province of Alessandria identified 14 agencies which had to give their approval. The first meeting was held on June 7, 2006; among the 8 agencies invited to the meeting ENEL and TERNA (Trasmissione Elettricità Rete Nazionale is a large-scale operator of transmission grids) did not attend. The complete design was submitted on January 12, 2007 and the second meeting was held on February 27, 2007.

All the agencies gave their own approval except the Province of Alessandria, which asked for reduction of air emission to a lower level than existing limits. A new design of the combustion chamber was produced, with a NSCR included in the boiler to reach the required level.

The third meeting was held on June 15, 2007 and all the agencies gave their approval but the Mayor of the town of Coniolo, who participated in both meetings, asked not to give the authorization before the Technical Commission of the municipality had provided an opinion.

The Technical Commission gave its approval on July 2, 2007 and the permit was issued on September 28, 2007, but since neither ENEA nor TERNA had participated in the meeting, the proceeding was suspended until the permit to grid connection was issued. On April 17, 2008 TERNA gave the permit for grid connection and 24 months after the application date the developer could start the construction.

The lesson learned by these cases is that even if the integrated permit (Decree 387/03 in Italy identified as a *best practice* from a preliminary overview) streamlines procedures, thanks to a reduction in the number of contact points for the applicant:

- the involved authorities do not have a "standard" way to act;
- the economic/financial "rules" can change almost every year.

CASE 2 – HUNGARY, Pilze-Nagy Ltd.

An important bottleneck in permitting procedure was identified to be high costs associated with the different local and regional approaches and rules needed to fulfilled to be able to install and to operate a plant within an acceptable timeframe. The time required to obtain all the permits and the economical impact of the costs of these procedures are strongly connected. The question raised is whether in Hungary the level of standardisation from region to region is adequate.

An example of a permitting application was presented for a new biogas power plant with a 330 kW electrical capacity and 400 kW thermal capacity cogenerator utilizing agricultural residues (3200 tons of spent substrate, 4000 tons of corn waste from canning industry). The investor was the country's largest oyster mushroom producer and exporter, and has made 8 applications with 5 approving authorities within 16 months at a significant cost. The contract for connection to the grid was implemented in 24 months and involved two energy organizations (total cost was Euro 42,000 including documents and new equipment for the distribution network). The cost of the permitting procedure was 3.4% of the total project budget.

The relevant issues of the presentation were the following:

- Legislation is not standardised: over 50 different law decrees regulate the permitting procedure;
- As many permitting bodies there are, as many interpretations of the regulations exist. There is no superior body who could promptly make decisions over disputes;
- Energy policy changes frequently, causing uncertainty to investors;
- There is no legal framework for a clear, transparent regulation of biogas power plants in Hungary;
- Possibility of easier permitting procedure for small sized power plants with duration of the permitting procedure limited to 60 days in most cases.

Other presentations from representatives of research institutions, companies and NGOs gave a more general perspective on the local permitting procedure and are available at the following website: http://ec.europa.eu/energy/renewables/bioenergy/installations_en.htm.

6.2.2 Workgroup discussions

The workshop discussion was based on a Logical Framework ("log frame") approach. A log frame is a tool for identifying problems and related solutions, in order to define a set of actions to solve those problems. This consisted of all participants providing an input to define the problems, and to review the assumptions and implications identified in the literature study and the analysis of real cases.

As a result, a problem tree was developed and the problems were turned into objectives on input from all participants.

Figure 18: The problem tree.

Figure 19: Stakeholders suggest modifications to the problem tree.

6.3 Outcome

The purpose of the workshops was to define a generic set of permitting procedures based on the results of WP3.

Ideally, this could have been achieved by collecting good practice examples of permitting procedures, to which correlate the real cases, and finally recommending appropriate actions for streamlining or resolving inconsistencies between the real cases and a generic suite of permitting procedures.

In fact, there are many laws and different authorities in each country concerning permitting procedures and the process is therefore quite complex. The different laws cover different interests and usually they are not aligned with each other.

To assess the benchmark comparison among countries, some topics have been identified as most relevant by the project team:

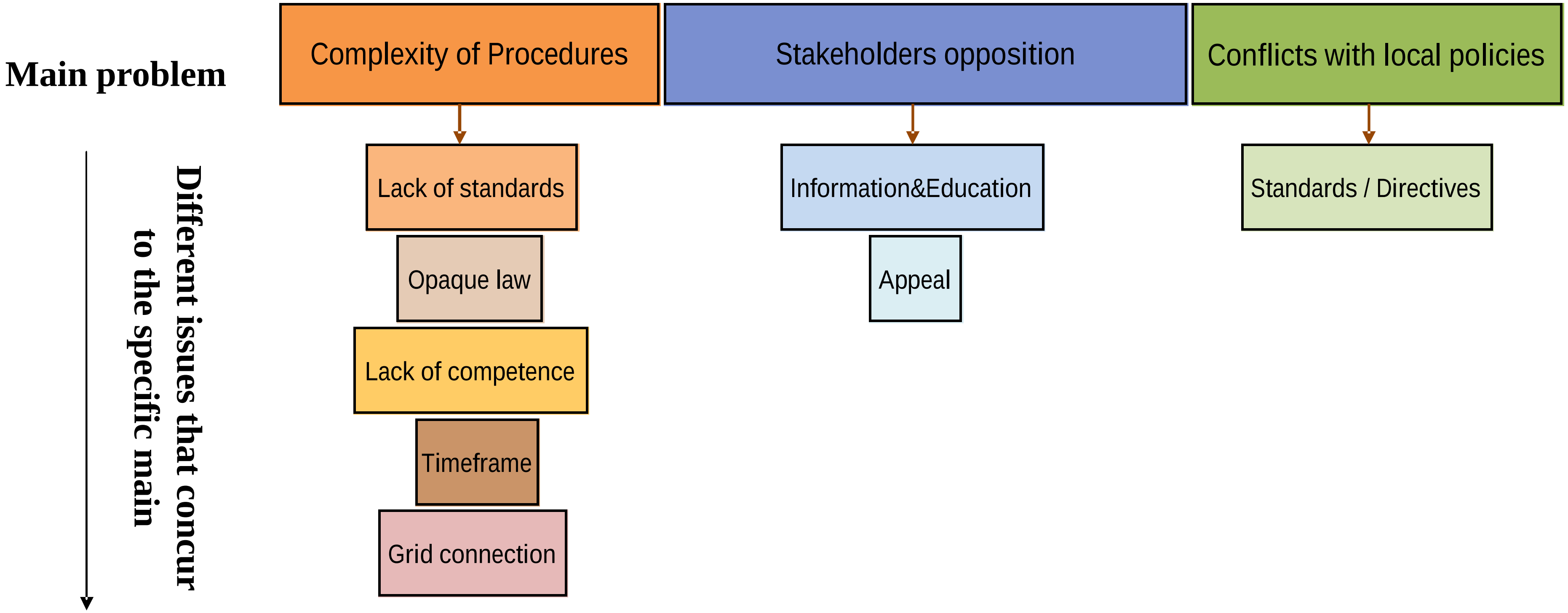
- Complexity of procedure;
- Stakeholder opposition;
- Conflicts with local policies.

From these categories the main issues proposed by the stakeholders as identified during the workshops are presented in the graphs 1-4.

The graphs represent the structure of the logical framework in which the problem categories are classified and then explained in detailed subsets, including the different issues that concur to the specific main problem.

In particular graphs 2, 3 and 4 are the elaboration of graph 1.

GRAPH 1 – Main categories of bottleneck identified by workshop participants.



GRAPH 2 – Main categories of bottleneck related to *Complexity of procedure*.

Complexity of Procedures

Lack of standards
- Lack of a clear technical guidance to an EU-wide formula on classification of: waste, by-products, digestate and biomass (crop residues as compost, biofertilizers are not dangerous waste)
- Lack of EU regulations on local biogas
- Lack of flexible guidelines to give support to new technologies
- Lack of differentiated timeframe for procedures regarding different technologies (support more advanced and/or sustainable technologies)

Opaque law
- Lack of strict interpretation of the law
- Discrepancy between national versus local and regional authorities (several authorities at local, regional and national level for permitting procedures for both permitting and financial support)
- Contradictions between different permitting bodies
- Lack of a global vision of the whole procedure (only applicants have it)
- Lack of compliance with the law and non-transparency of legislation present a barrier for banks to support plants
- Relevant documents are numerous and massive
- Lack of favourable and stable conditions: legal, economic and financial framework
- Environmental Impact Assessments do not take into account the positive impacts of RES

Lack of competence
- Qualify those who should grant permits, give them clear criteria for decision, allocate accountabilities, provide information/education
- Lack of education of civil servants. Sometimes they are overloaded with many different tasks, and are not able to address the permitting procedure properly

Timeframe
- Timeframe not guaranteed: the majority of installations wait very long for a response (the authorization has not been denied but not given either accorded, so a rejection rate cannot established
- Lack of defined timelines for every regulatory step: especially spatial planning related permits can take many years
- Exact length of procedure not known upfront
- Long times for grid connection

Grid connection
- Grid connection is not properly regulated. EU directive needed
- Grid connection should not be denied or delayed once the connection permit has been granted
- Grid connection procedure not fully transparent: data (grid availability, costs, technical) presented by DSO (Distribution System Operator) cannot be verified
- In some cases DSO is still strongly related to conventional electricity generator (=> objectiveness of grid authorization procedure is not fully guaranteed)
- Connection of biogas to gas grid. Definition of quality standards and connection charges.

GRAPH 3 – Main categories of bottleneck related to *Stakeholder opposition*.

Stakeholders opposition	
Information & Education	Appeal
There is a lack of transparency and information, most public authorities rarely publish this kind of information	Any stakeholder opposition should be presented in one step. Duplications cause delay
Lack of social acceptability of RES energy production	Lack of issue-oriented debate (technical rather than political)
Lack of communication among stakeholders (few information and monitoring campaigns, lack of info-desk)	

GRAPH 4 – Main categories of bottleneck related to *Conflicts with local policies*.

Conflicts with local policies

Standards / Directives

Many local permitting authorities do not know the technology and stop the procedure just to avoid problems or conflicts with other authorities.

Involving public in responsible waste management. Information schemes should be planned

Acknowledge and enshrine EU directives in national and local policy

Based on the analysis and the results presented in the table, the main bottlenecks as revealed from the workshops and seem to be represented by:

- lack of **transparency** of procedures;
- lack of **coordination among the authorities;**
- lack of clear **timetables**.

The lack of **transparency** (and standards) relates to the lack of clarity and unique interpretation of the rules that can make the permitting process very difficult and long. There is a certain degree of difficulty in finding information on the procedure, but above all the relevant documents can be numerous and massive. The permitting topic is new for renewable energy, so the procedures are in a developing phase, as is the relevant legislation. For these reasons norms, decrees, regulations, directives, etc. refer to each other with a high degree of complexity. There is no organic legislation.

The lack of **coordination among the authorities** can make these issues worse, eventually leading to a reduced implementation and beneficial effects of renewable energy projects. The **timetable** for the permitting procedure is not always specified, which introduces an important element of uncertainty in a key aspect of the procedure. The time required to obtain all the permits has in fact a direct impact on the economics of every renewable energy project.

Given the complexity and diversity of the permitting procedures in the various countries, the most effective way to influence the process is to give recommendations that address the issues identified by the stakeholders.

The following recommendations are the result of the discussions at workshop level:

Issue: Lack of transparency of procedure

Recommendations: *a) Define an independent authority and b) create an accessible communication tool*

The legislator is not always supported by the executive power: various permitting bodies have difficulties to control a permitting procedure. Often the interest of an applicant crashes against the bureaucracy.

a) The recommendation is to define an independent authority ("super party") as a guarantor of equity at EU or national level.
b) The recommendation is to create a suitable communication tool, supported by selected qualified experts, so the authorities can have the necessary relevant information and the applicants can have an easy access to data in a common language (data and information about renewable energy targets, active projects, approval rates and duration of the permitting procedure).

Issue: Lack of coordination among authorities

Recommendations: *a) Stimulate a higher level of standardization and b) a "One-stop-shop"*

a) The recommendation is to stimulate a higher level of standardization of applications permit across the EU
b) The Italian system of a "One-stop-shop" could be taken as a best practice to follow. The main advantage is that an applicant only has to deal with one reference point on the authority's side that also acts as a focal point for all the other authorities involved. This contributes a lot to insure a more effective and clear procedure and to frame the time required for completing the permitting procedure.

Issue: Timetable
Recommendations: *a) Development of a protocol among the involved authorities*
The time required to complete the permitting procedure is usually long. There are some measures to reduce the time required.

a) The recommendation is to define a protocol, especially on the timetable, among the involved authorities (departments, provinces, union of municipalities and other institutions) in which each authority is bound to comply with this protocol. The main purpose is to reduce the total time required for the whole permitting procedure.

In this framework, all the recommendations that came out of the discussion are summarized in the following table containing as key elements:

- Agreed Recommendations – intended to the define the objectives to address the critical issues identified by the stakeholders;
- Expected Action/Results – the changes to be implement to reach the desired objectives.

TABLE OF RECOMMENDATIONS			
Issues addressed	**Agreed recommendations**	**By whom**	**Expected action/result**
Lack of competence	Train civil servants and establish a **formal qualification** for the permitting staff.	EU Commission	• Collect different successful models and best practices to be evaluated and adapted to special conditions in the respective country.
Lack of standards Lack of transparency	Set **EU standards** for biomass feedstocks. **Certification/Qualification** schedules differentiating biomass as a fuel from process waste and by-products.	EU Commission	• Dissemination events targeting specific groups able to replicate or encourage successful projects. • A handbook (freely accessible on the Internet) defined for each type of RES and scale of size. These unique handbooks must be valid for all EU members. In this way it becomes easy for an authority to find detailed information about a RES installation without asking for it.

Lack of standards Lack of competence	Set clear technical **EU guidelines** for bioenergy plants permitting procedure, differentiating with respect to feedstock and technology applied. New, more efficient and sustainable technologies should be pushed forward. The time to obtain a permit must be not inconsistent with the size of the RES system in order to avoid unreasonable extra costs. The economical cost must be output based.	National environmental agencies	• Development of biomass guidelines for the development of projects (related to feedstock and technology applied). • Awareness on the state-of-the-art technologies and standards as well as on the methods to identify sustainable technologies.
Timeframe Lack of transparency Conflict with local policies	**ONE STOP SHOP** Integrate all permits in a single procedure to be managed by one suitable authority.	National authorities	• A comprehensive overview of how the time required to obtain all the permits has a direct impact on the feasibility and economics of each renewable energy project (evaluation of cost of delay).
Timeframe	**IMPROVING ONE STOP SHOP** on the example of member states already having such regulation. Introduce defined **timeframe** to grant permit and enforce it through **silent approval** principle.	EU Commission	• Facilitate the cooperation among national agencies and authorities at European level to develop common policies focusing on standardization issues.

Stakeholders opposition Lack of information Lack of competence	Produce a **database** of real cases to be used as: 1 tool for monitoring the progress 2 reference for information 3 collection of best practices 4 assessment, when possible, of costs of permitting delays	Local promoters and local authorities	• Best practice booklets • Awareness rising campaigns by participation in exhibitions and seminars • Website • Identification of important regional stakeholders to promote biomass technologies • Offer partnerships to stakeholders to prevent opposition
Stakeholders opposition Lack of information	**Publish data and information** about RES targets, approval rates and duration of the permitting procedure	Regional/local authorities	• Training & specialization courses, masters, visits, workshops about biomass technologies and opportunities in order to define barriers and solutions.
Connection to the grid difficult Lack of transparency	**Create transparent and fair criteria for connection to the grid** Consider also biogas connection possibility.	National authorities	• A quantified assessment of costs and benefits of increasing RES shares for real distribution networks, making use of more classical network approaches as well as its comparison to enhanced response alternatives.

Lack of support at local level	**Acknowledge and promote EU directives** in national and local policy, ensuring that local authorities are trained and are aware of EU Directives and their implications.	National authorities	• Europe-wide dissemination of project results, exchange of implementation instruments and tools as well as of know-how and experiences between internal and external project partners.

7 Conclusions and recommendations

In this work, the project team has inventoried and analyzed various bioenergy permitting procedures in the European Union.

Many projects breakdown; on average the permit application failure rate exceeds 30% especially for codigestion and biomass combustion plants. Codigestion plants are also found to be relatively expensive in terms of costs to have all permits collected.

Furthermore, it was found that there are strong differences among the formal procedures. The number of permits, the order of the permits and the duration of a permit all strongly differ. Furthermore, the formal public resistance is highly dependent on the geographical area going from low in the south and the east to (very) high in the northwest of Europe.

In contrast, the project team has found from the cases that the real lead time equals two years on average and increases to approximately three years for larger biomass projects which require an Environmental Impact Assessment. The lead time is determined by the number of process steps rather than by technological and/or geographical differences.

Hence, in order to reduce the lead time, rather than to reduce the number of permits, the main issue is try to reduce the number of serial steps and/or to reduce the average length of the steps to.

The major steps causing delays are the spatial planning procedure, the environmental impact assessment, the (integrated) environmental permit, the grid access and the legal case.

Recommendations for legislative actions at the EU or the national level are:

- National authorities should **reduce the number of permits**, **institutional authorities and relevant legislative acts**. This holds in particular for the countries in the East (Bulgaria, Romania, Hungary, etc.) and the South (Spain, Portugal and Greece);

- A first step is that for the countries where the **environmental permit** is the most important permit, measures should be taken to have them include at least the construction, the water and the operational permits in the environmental permit;

- Reduce the duration of the procedure**,** introducing a **mandatory timeframe** to a level in accordance with the benchmark levels as has been observed elsewhere in the Union. The recommendation is to define **a protocol** on the timeframe, among the involved authorities (departments, provinces, union of municipalities and other institutions) in which each authority is bound to comply with this protocol;

- Authorities should increase the **validity of a permit** to a minimum of ten years;

- **Measures should be taken to prevent appeal** and higher appeal to the permits. This implies, among others, good training and information materials for all stakeholders, effective communication among them at an early stage in the process (creating an accessible communication tool as an easy access to data and information in a common language), unambiguous legislation and well trained authorities to prevent procedural mistakes. In case of higher appeal, a mandatory timeframe should be imposed on the higher authorities;

- The Commission should propose **standard regulations, guidelines and requirements** with regards to the environmental performance of plants and the sets of documents required to prove it;

- The **Italian and the German permitting procedures** may be good examples for the other member states, as they are one-stop-shop procedures. These procedures should be implemented in other member states;

- **Well proven technologies and/or small plants** should be exempted from permitting procedures by defining basic performance requirements. This could be done at EU or national level.

Recommendations for the **permitting authorities** are:

- Identify **favourable bioenergy sites** both from the biomass resource potential and from the local planning perspectives;

- Inventory the **number of national legislative acts** and reduce their amount where possible;

- Revise the **local planning policy** to make it suitable for renewable energy production from biomass;

- Introduce the concept of a **single reference point** for all permits;

- Remove **superfluous permits** such as the installation permit in Greece and the declaration of public benefit in Spain or have them included in other permits.

General recommendations for **project developers** are**:**

- Make a thorough review of all permits and steps needed for the permitting of the projected plant. Ask for advice if the information is not easily available. A good overview of the serial and parallel steps, as well as of the responsible authorities for each sub procedure will give valuable help to plan the whole permitting process;

- Recognize critical aspects of the applied technology early in the planning, in order to search for economical alternatives (use of Best Available Technology). For example, consider the use of the best flue gas cleaning technology or the use of closed halls with air filters for handling with wastes (MSW) for installations near to habited or protected natural areas;

- Contact the permitting authorities in early stages of the project, in order to overcome prejudices and to include eventual exigencies in the planning of the project. The most widely spread prejudices and objections against this kind of installations are dust and NO_x emissions, smell, excess of traffic movements and noise. The planning for the construction and operation of the installation and their presentation to the authorities should handle these aspects explicitly and present plausible solutions;

- In some cases, an information campaign about the planned installation addressed to the residents and, if needed, to involve NGOs, in early stages of the process, may help to overcome prejudices of the inhabitants and reduce the risk of appeal. For more complex projects, the advice of professional consultants (technical experts, negotiators, etc) could help to establish a good communication channel with the different stake holders. It is very important to reduce the risks of appeal and especially higher appeal by involving the community in the process and including their concerns as far as economically possible;

- When possible, take into account the experience of the permitting authorities on the proposed technology for the selection of the location of the projected installation. In some cases, it could be very useful to provide the authorities with independent information from recognized advisors on the actual state of the technology, being honest in showing the problems and constructive in searching for solutions;

- Sustainability of the feedstock is a critical issue and might increase the resistance of NGOs or residents against the project. It could be very helpful to take this into consideration during the planning of the installation and to gather information about the currently discussed sustainability schemes for biomass resources in order to incorporate measures to ensure the compliance of the sustainability criteria.

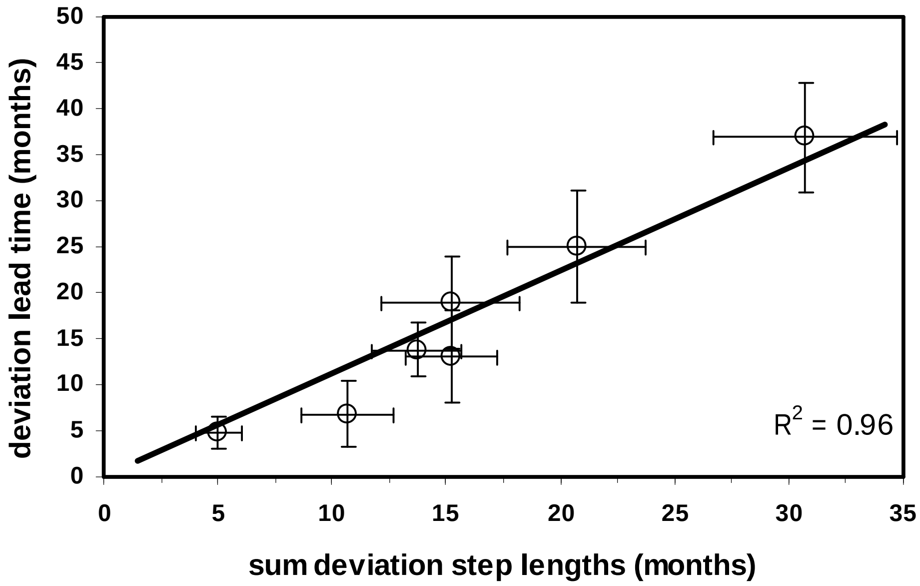
Part 3: Annex

Annex 1 Deviation of the lead time versus the deviation of its process steps

Here, we plot the deviation of the lead time versus the sum of the deviations of its step lengths. The resultant graph shows a linear effect as well. The length per step is not constant: procedures with a relatively long lead time have relatively high values for the average length per step as well. Moreover, since on average no correlation[63] exists between *n* and $\bullet_n$, it follows for the inhomogeneities in the total lead time • that:

$$\bullet^2(\bullet) = \bullet \; \bullet^2(n, \bullet_n(n))$$

Figure 20. Deviation of the lead time • in months versus the sum of the deviations of its constituting steps (the solid line is the best fit).



[63] Thus the Correlation •(n, $\bullet_n$) ~ 0.

Annex 2 Geographical dependency of the lead time per type of procedure step

	Scandinavia	British Isles	Northwest Europe	Central Europe	Southwest Europe	Eastern Europe	• R
Land use approval			14	18	5	6	
EIA	12	7	12	8	14	4	
Environmental permit	9		9	11	15	7	
Construction	2		4	2	6	5	
Planning	20	6		3			
Operational				7	11	4	
Legal case	18	7	17	18			
EIA screening			5	5			
Effluent	3		13		8	4	
Waste management		8			37		
Production permit				4	6	6	
Integrated permit		9		7		6	
Grid access				10	13	9	
Void	76	8	18	53	18		
Average[64]							**3,3**

Table 25: Average lead time of the step length per type of permitting activity versus the geographical region. The value for the deviation • is determined by taking the root of <•^{2}>.

[64] Excluding the void.

Annex 3 Technical dependency of the lead time per type of procedure step

	Biofuels	Biogas	Cofiring	Combustion	Boiler	• T
Land use approval	3	8		11	7	
EIA	12	7	15	10	7	
Environmental permit	10	9	8	11	8	
Construction	5	4	2	5	2	
Planning	10	3		7	4	
Operational	2	6	4	15	3	
Legal case	13	8	26	13		
EIA screening			6		5	
Effluent	10	5	12			
Integrated permit			7	7	6	
Production permit		6		6	6	
Grid access		13		12		
Average						**3,1**

Table 26: Average lead time of the step length per type of permitting activity versus the technology. The value for the deviation • is determined by taking the the root of <•^{2}>.

Annex 4 Overview of real cases

	Reference	Country	Technology	Capacity (MW boiler / kton)	Outcome
1	AT-01	Austria	Stand alone CHP solids	4	Failure
2	AT-02	Austria	Stand alone CHP solids	0.2	Failure
3	AT-03	Austria	Biogas monoculture	1.2	Success
4	AT-04	Austria	Stand alone CHP solids	0.4	Failure
5	BE-01	Belgium	Bio-oil	8	Success
6	BE-02	Belgium	Bio-oil	50	Success
7	BE-03	Belgium	Co-firing	602	Success
8	BE-04	Belgium	Co-firing	255	Success
9	BE-05	Belgium	Co-firing	879	Success
10	BE-06	Belgium	Biofuel plant	150	Success
11	BE-07	Belgium	Bio-oil	36	Success
12	BE-08	Belgium	Bio-oil	150	Failure
13	BE-09	Belgium	Biofuel plant		Success
14	BG-01	Bulgaria	Boiler (heat only)	10	Success
15	BG-02	Bulgaria	Boiler (heat only)	1.2	Success
16	BG-04	Bulgaria	Biofuel plant	20 kton/yr	Success
17	BG-05	Bulgaria	Biofuel plant	60 kton/yr	Success
18	CZ-01	Czech Republic	Biogas codigestion		Success
19	CZ-02	Czech Republic	Stand alone CHP solids		Success
20	FR-01	France	Stand alone CHP solids	7	Success
21	DK-01	Denmark	Biogas codigestion	25	Failure
22	FI-01	Finland	Co-firing	15	Success
23	FI-02	Finland	Biogas codigestion	0.1	Success
24	FI-03	Finland	Biogas codigestion	1.5	Success
25	FI-04	Finland	Co-firing	25	Success
26	FI-05	Finland	Co-firing	200	Failure
27	FI-06	Finland	Co-firing	477	Success
28	FI-07	Finland	Boiler (heat only)	9.5	Success
29	FI-08	Finland	Boiler (heat only)	13.6	Success
30	FI-09	Finland	Boiler (heat only)	5.5	Success
31	FI-10	Finland	Boiler (heat only)	12	Success
32	DE-13	Germany	Biogas codigestion	1	Success
33	DE-14	Germany	Stand alone CHP solids	50	Success
34	DE-15	Germany	Stand alone CHP solids	60	Failure
35	DE-16	Germany	Boiler (heat only)	0.9	Success
36	DE-17	Germany	Biogas monoculture	2	Success
37	HU-01	Hungary	Biogas codigestion	4	Failure
38	HU-02	Hungary	Biofuel plant	1300	Success
39	HU-03	Hungary	Biogas codigestion	1.4	Success
40	HU-04	Hungary	Co-firing	100	Success
41	IT-01	Italy	Co-firing	40	Success
42	IT-02	Italy	Co-firing	40	Success
43	IT-03	Italy	Bio-oil	36	Success
44	IT-05	Italy	Bio-oil	0.5	Failure
45	IT-09	Italy	Bio-oil	15	Success
46	IT-10	Italy	Stand alone CHP solids	2	Success
47	IT-11	Italy	Stand alone CHP solids	60	Failure
48	IT-12	Italy	Stand alone CHP solids	60	Failure
49	IT-13	Italy	Stand alone CHP solids	20	Success
50	IT-14	Italy	Stand alone CHP solids	60	Success
51	IR-01	Ireland	Stand alone CHP solids	6	Success
52	IR-02	Ireland	Biogas codigestion	250	Failure
53	IR-03	Ireland	Biogas - landfill		Success
54	IR-04	Ireland	Stand alone CHP solids		Success
55	NL-01	Netherlands	Stand alone CHP solids	150	Success
56	NL-01b	Netherlands	Stand alone CHP solids	150	Success
57	NL-02	Netherlands	Bio-oil	20	Failure
58	NL-03	Netherlands	Bio-oil	20	Success
59	NL-04	Netherlands	Stand alone CHP solids	110	Failure
60	NL-06	Netherlands	Biogas codigestion	0.6	Failure
61	NL-07	Netherlands	Biogas codigestion	0.6	Failure
62	NL-08	Netherlands	Co-firing	600	Failure
63	NL-09	Netherlands	Co-firing	600	Failure
64	NL-10	Netherlands	Stand alone CHP solids	75	Failure
65	NL-11	Netherlands	Boiler (heat only)	10	Success
66	NL-12	Netherlands	Stand alone CHP solids	75	Success
67	NL-13	Netherlands	Biofuel plant		Failure
68	NL-14	Netherlands	Biogas codigestion	2	Failure
69	NL-16	Netherlands	Co-firing	406	Success
70	NL-19	Netherlands	Bio-oil	100	Success
71	NL-21	Netherlands	Biogas codigestion	0.6	Failure
72	NL-22	Netherlands	Bio-oil	20	Success
73	NL-23	Netherlands	Biofuel plant	60 ktonne	Success

	Reference	Country	Technology	Capacity (MW boiler / kton)	Outcome
74	NL-24	Netherlands	Biofuel plant	150 ktonne	Failure
75	NL-25	Netherlands	Stand alone CHP solids	3	Success
76	NL-26	Netherlands	Biogas monoculture		Success
77	NL-27	Netherlands	Biogas -sludge	0.5	Success
78	NL-28	Netherlands	Stand alone CHP solids	80	Success
79	NL-29	Netherlands	Biogas -sludge		Success
80	NL-29b	Netherlands	Biogas -sludge		Success
81	NL-30	Netherlands	Stand alone CHP solids	80	Success
82	NL-31	Netherlands	Boiler (heat only)	7	Success
83	NL-32	Netherlands	Boiler (heat only)	5	Failure
84	NL-33	Netherlands	Biogas monoculture		Success
85	NL-34	Netherlands	Biogas codigestion	60	Failure
86	PL-01	Poland	Biogas codigestion	10	Failure
87	PL-02	Poland	Boiler (heat only)	100	Success
88	PL-03	Poland	Boiler (heat only)	7	Success
89	PT-01	Portugal	Biogas - landfill	1.1	Success
90	PT-02	Portugal	Biogas - landfill	1.1	Success
91	PT-03	Portugal	Biogas codigestion	1.7	Failure
92	PT-04	Portugal	Biogas - landfill	6	Success
93	PT-05	Portugal	Biogas - landfill	2.2	Success
94	PT-06	Portugal	Biogas - landfill	2	Success
95	PT-07	Portugal	Biogas - landfill	2.9	Failure
96	PT-08	Portugal	Biogas -sludge	1	Success
97	PT-10	Portugal	Stand alone CHP solids	11	Failure
98	PT-11	Portugal	Biogas - landfill	5	Success
99	PT-12	Portugal	Biogas - landfill		Success
100	PT-13	Portugal	Biogas - landfill	5	Success
101	PT-14	Portugal	Stand alone CHP solids	25	Success
102	PT-16	Portugal	Stand alone CHP solids	25	Success
103	PT-17	Portugal	Biogas -sludge		Success
104	PT-19	Portugal	Biogas - landfill	2	Success
105	PT-20	Portugal	Biogas codigestion	3	Success
106	PT-21	Portugal	Biogas -sludge	1	Success
107	PT-22	Portugal	Biogas -sludge		Success
108	ES-01	Spain	Biofuel plant	?	Failure
109	ES-02	Spain	Stand alone CHP solids	2	Failure
110	ES-03	Spain	Stand alone CHP solids	25	Success
111	ES-04	Spain	Stand alone CHP solids	80	Success
112	ES-05	Spain	Stand alone CHP solids	12	Failure
113	ES-06	Spain	Biofuel plant	25 kton	Success
114	ES-01	Spain	Boiler (heat only)	3.5	Success
115	ES-03	Spain	Stand alone CHP solids	2	Success
116	ES-04	Spain	Biogas codigestion	0.2	Success
117	ES-05	Spain	Biogas -sludge	1	Success
118	ES-10	Spain	Stand alone CHP solids	25	Success
119	ES-11	Spain	Stand alone CHP solids	30	Success
120	ES-12	Spain	Boiler (heat only)	4	Success
121	ES-13	Spain	Boiler (heat only)	0.4	Success
122	ES-14	Spain	Boiler (heat only)	1	Success
123	ES-15	Spain	Boiler (heat only)	1	Success
124	ES-16	Spain	Boiler (heat only)	0.1	Success
125	ES-17	Spain	Boiler (heat only)	0.1	Success
126	ES-18	Spain	Boiler (heat only)	0.1	Success
127	ES-19	Spain	Stand alone CHP solids	5	Failure
128	SE-01	Sweden	Biofuel plant		Success
129	SE-02	Sweden	Biofuel plant		Success
130	SE-04	Sweden	Biofuel plant		Failure
131	UK-01	United Kingdom	Biofuel plant		Success
132	UK-05	United Kingdom	Stand alone CHP solids	15	Failure
133	UK-06	United Kingdom	Stand alone CHP solids	8	Failure
134	UK-07	United Kingdom	Stand alone CHP solids	22	Failure
135	UK-08	United Kingdom	Stand alone CHP solids	30	Success
136	UK-09	United Kingdom	Stand alone CHP solids	0.5	Success
137	UK-10	United Kingdom	Stand alone CHP solids	100	Failure
138	UK-11	United Kingdom	Biogas codigestion	1	Failure
139		United Kingdom	Biogas codigestion		Failure
140	UK-12	United Kingdom	Stand alone CHP solids	13	Failure
141	UK-13	United Kingdom	Biogas monoculture	0.1	Success
142	UK-14	United Kingdom	Stand alone CHP solids	3	Success
143	UK-15	United Kingdom	Boiler (heat only)	0.4	Failure
144	UK-16	United Kingdom	Boiler (heat only)	0.4	Success
145	UK-16	United Kingdom	Stand alone CHP solids	2	Success
146	UK-17	United Kingdom	Biofuel plant	1000	Success
147	UK-18	United Kingdom	Co-firing	100	Success
148	UK-18	United Kingdom	Stand alone CHP solids	100	Failure

		Totals
Countries		
	Austria	4
	Belgium	9
	Bulgaria	4
	Czech Republic	2
	Denmark	1
	Finland	10
	France	1
	Germany	5
	Hungary	4
	Ireland	4
	Italy	10
	Netherlands	31
	Poland	3
	Portugal	19
	Spain	20
	Sweden	3
	United Kingdom	18
Technologies		
	Biofuel plant	15
	Biogas (landfill)	11
	Biogas (co-digestion)	19
	Biogas (monoculture)	5
	Biogas (sludge)	8
	Bio-oil	11
	Boiler (heat only)	22
	Co-firing	14
	Stand alone CHP solids	43
Outcomes		
	Successes	105
	Failures	43

Annex 5 Questionnaire

Basic project info Please provide project details		
Project code (e.g. NL-01)		
Project name (for reference)		
Location (city, province, country)		
1. Expansion of existing facility?	☐ Yes ☐ No	
2. Close to neighbourhood?	☐ Yes ☐ No	
3. Close to natural reserved area?	☐ Yes ☐ No	
4. Located in an industrial area?	☐ Yes ☐ No	
5. Located in an agricultural area?	☐ Yes ☐ No	
Owner / applicant name: Confidential?	☐ Yes ☐ No	
Contact details (e.g. name, email, telephone)		
Detailed information available	☐ Yes, see Excel ☐ No, this is all ☐ Will come later	
Capacity	___ MW boiler ___ Ktonne per year (for biofuel)	
Technology level	*Very innovative* ☐ ☐ ☐ ☐ ☐ *Proven technology*	
Feedstock*	☐ Wood or wood fuels ☐ Agricultural by-products & residues ☐ Waste wood ☐ Industrial by-products & residues ☐ Vegetable oils ☐ Energy crops ☐ Municipal Waste ☐ Manure ☐ Sludge / sewage ☑ Landfill ☑ Fossil fuels	
Is any of the feedstock considered as waste by the authorities?	☐ Yes ☐ No	
Technology — *Thermal:*	☐ Co-firing ☐ Combustion ☐ Gasification	
Technology — *Non thermal:*	☐ Aerobic digestion ☐ Anaerobic digestion ☐ Fermentation ☐ Esterification ☐ Other ___	
Output*	☐ Biogas for grid injection	___ m^3/yr
	☐ Biogas for transport	___ m^3/yr
	☐ Electricity	___ MW_e
	☐ Heat	___ MW_{th}
	☐ Biodiesel	___ ktonne/yr
	☐ Bio-ethanol	___ ktonne/yr
	☐ Other: ___	___ ...
Describe project in 2-3 lines:		

Major permits/procedures required

Please indicate which permits are required and give their national names and involved authorities

Number of permits required*	
☐ Land use approval	
☐ Environmental permit	
☐ EIA screening	
☐ EIA scoping	
☐ EIA	
☐ Construction permit	
☐ Operational permit	
☐ Production permit	
☐ Grid connection license	
☐ Water permit	
☐ Planning permit	
☐ Other	
Describe:	

Stakeholders

Please indicate what stakeholders were involved and how many of them?

Number of stakeholders*					
Stakeholder	*Number*	*Level of expertise [High - low]*		*Role [Constructive-Destructive]*	
☐ Local authority		☐	☐	☐	☐
☐ Regional authority		☐	☐	☐	☐
☐ National authority		☐	☐	☐	☐
☐ NGO		☐	☐	☐	☐
☐ Residents		☐	☐	☐	☐
☐ Private company		☐	☐	☐	☐
☐ Agencies		☐	☐	☐	☐
☐ Other		☐	☐	☐	☐
Describe:					

Info on duration

Information to help us understand the attached Excel file on lead times

Date of application of first permit	
Date of issuing last permit (irrevocable)	
Describe process/critical path:	

Outcome

What's the current status? (Failure is defined: 'plant is yet not constructed as of permitting issues')

☐ Success ☐ Failure ☐ In process (duration?)	Describe:

Consultation / appeal
Provide information on appellants / content of appeals during consultation phase (**within a permit procedure**)

Appeal	☐ Yes ☐ No
Number of appellants*	
Appellant	
☐ Local authority	
☐ Regional authority	
☐ National authority	
☐ NGO	
☐ Residents	
☐ Private company	
☐ Commissions	
☐ Applicant	
☐ Other	
Describe:	
Permits appealed to*	Number:
☐ Spatial approval	
☐ EIA screening	
☐ EIA scoping	
☐ EIA	
☐ Environmental permit	
☐ Construction permit	
☐ Operational permit	
☐ Production permit	
☐ Grid connection license	
☐ Water permit	
☐ Planning permit	
☐ Other	
Describe:	
Reasons of appeal*	
☐ Traffic movements	
☐ Sustainability issues	
☐ Visual aspects	
☐ Procedural aspects (errors)	
☐ Applicable European law	
☐ Applicable national law	
☐ Jurisdiction (wrong auth.)	
☐ Land use	
☐ Emissions, namely:	☐ noise ☐ smell ☐ NOx ☐ fine dust ☐ water discharge ☐ other:
☐ Other	
Describe:	

Higher appeal / court appeal

Provide information on appellants, content of appeals during **legal phase**

Higher appeal	☐ Yes ☐ No
Number of appellants*	
Appellant	
☐ Local authority	
☐ Regional authority	
☐ National authority	
☐ NGO	
☐ Residents	
☐ Private company	
☐ Commissions	
☐ Applicant	
☐ Other	
Describe:	
Permits appealed to*	Number:
☐ Spatial approval	
☐ Environmental permit	
☐ Construction permit	
☐ Operational permit	
☐ Production permit	
☐ Grid connection license	
☐ Water permit	
☐ Planning permit	
☐ Other	
Describe:	
Reasons of higher appeal*	
☐ Traffic movements	
☐ Sustainability issues	
☐ Visual aspects	
☐ Procedural aspects (errors)	
☐ Applicable European law	
☐ Applicable national law	
☐ Jurisdiction (wrong auth.)	
☐ Land use	
☐ Emissions, namely:	☐ noise ☐ smell ☐ NOx ☐ fine dust ☐ water discharge ☐ other:
☐ Other	
Describe:	

Legislation*

State the number and what European and national legislations were involved in the project

Total number of legislations	
Number of European legislations involved	
European legislations	☐ IPPC/BAT ☐ LCP ☐ WI ☐ Landfill ☐ Other ☐ Other ☐ Other
Number of national legislations involved	
National legislations	☐ Spatial planning law ☐ Environmental law ☐ Energy law ☐ Construction law ☐ Water legislation ☐ Waste management acts ☐ Feedstock storage acts ☐ Fire & safety regulations ☐ Health requirements ☐ Geodetic legislation ☐ Transport law ☐ Nature conservation acts ☐ Other ☐ Other ☐ Other

Costs for the applicant

If possible, please describe involved costs and if the process was outsourced etc.

Estimated investment costs (M€)	
Total fees for all permits	
Subcontract costs for all permits	
Internal / opportunity costs for permitting	
Describe:	

Communication

Describe the level of communication primarily between the applicant and the authorities

1. Has there been a public information campaign?	☐ Yes ☐ No
2. Have there been informal discussions with authorities prior to application?	☐ Yes ☐ No
3. Have there been informal discussions with NGO's prior to application?	☐ Yes ☐ No
4. Have there been frequent shifts in responsible contact persons?	☐ Yes ☐ No
5. Have there been additional information requests by the authorities?	☐ Yes number: ☐ No
6. What kind of information sources were used by the applicant/authority (e.g. internet, technical guidances, energy & environmental agencies, other applicants, other authorities, consulting agencies)?	
Describe:	