



## **Cadastral procedures for Local Electricity Grids**

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**Key words:** utility, easement, cadastre, procedure, compensation

## SUMMARY

The paper describes how the Swedish state cadastral authority has practised the Utility Easements Act in a major assignment.

The need for modernisation of local electricity grids has become evident with the changing climate. From 2011 all grid operators are forced to pay damages in case of power cuts lasting longer than 12 hours. The main methods used to secure electric power lines are to locate them underground or to secure a corridor free of trees. Both methods require legal support, either of a cadastral decision according to the Utility Easements Act., or a right based on individual agreements with the property owners.

The claim from the applicant, the electric grid owner Jämtkraft, was to obtain legal access to land for 1300 km of 24 kV power cables in five years. The work was portioned into approximately 70 cadastral cases initiated from 2006 to 2010. At present all of these have established legal access to the necessary land. Around twenty have been finalised and the rest are pending completion of the work on the ground or final valuation for compensation.

The legal costs can be calculated as the total cost for the cadastral procedure including valuation and compensation to property owners. All added together as average figures result in a legal cost of approximately 6900 Euro (62 000 SEK) per km, which equals just about 10 % of Jämtkrafts total cost for getting the cable in place.

Although the Utility Easements Act allows decisions against the will of the individual property owner, there is a strong commitment from the cadastral authorities to reach solutions based on consent. Decisions forced upon individuals have many disadvantages also for the owner of the utility. In this project it was an important factor that the property owners also were customers to Jämtkraft. Secondly the need for fast access to land made it impossible to get involved in the time consuming court procedures that result from appeals.

This study focuses on parameters that are measurable from the procedures. More attention has been directed towards costs and efficiency than towards other issues. It must however be underlined that upholding legal security is the foremost important prerequisite for successful implementation of cadastral procedures. The conclusion is that the cadastral authority was able to do so during this project, and that the positive outcome was only possible because of that.

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## 1. INTRODUCTION

### 1.1 Electricity grids

The national, regional and local networks for distribution of electric power in Sweden have traditionally been owned and operated by public companies. These are companies under the same organisational rules as private companies but owned by municipalities or the state. Public ownership was originally intended to guarantee long term stability, low user fees and reliable service delivery. Many of the public services have been providing good financial returns and have accordingly attracted interest from the private sector. The political changes over the last decades have opened up for privatisation also in this field. One example is the Germany-based E.ON that today distributes electricity to one million customers in Sweden.

The need for modernisation of electricity grids has become apparent with the changing climate. Air carried networks are extremely vulnerable to storms and heavy snow. The storm "Gudrun" in 2005 was an alarm clock for customers, electric power companies and politicians alike. The storm caused an immense destruction of forests and roads. Power and telephone cuts lasted up to several months. The storm also meant economic disaster for many private forest owners.

In the aftermath new legislation was developed to prevent similar consequences in the future. From 2011 all grid operators are forced to pay damages in case of power cuts lasting longer than 12 hours. The main methods used to secure electric power lines are to locate them underground or to secure a wide enough corridor free of trees. Both methods require the support either of a cadastral decision according to the Utility Easements Act, or a right based on individual agreements with the property owners.

The distribution grid that is subject for this project technically connects regional power lines of 40-130 kV with local lines to individual properties. The connection point to the individual lines is a transformer station, most often a small building with a few m<sup>2</sup> building area.

### 1.2 Jämtkraft

Jämtkraft has four business areas: Power, Grid, Heat and IT. The company produces 60 % of the total distributed electricity, with the help of Jämtland's natural resources. Jämtkraft supplies electricity throughout Sweden, but is rooted in Jämtland.

The electricity grid is owned by the subsidiary Jämtkraft Elnät AB (the Electricity Act prevents production and distribution of electricity within the same company). The grid is 8300 km long and covers 35 % of the county of Jämtland. Around 60,000 customers are connected and the target is to have a grid free of disruption.

Jämtkraft also supplies district heating in the municipalities of Östersund, Åre and Krokom and offers pellets heating to customers outside the district heating network. Jämtkraft owns, and is constructing and running, a fibre optic broadband network allowing telecommunication by multiple service providers up to 100 Mbit/s.

Jämtkraft is owned by the three municipalities Östersund, Krokom and Åre, with altogether 75 000 inhabitants and covering an area of 17 666 km<sup>2</sup>. The operating income for 2009 was 1500 MSEK (ca 170 MEuro).

Jämtkraft Elnät AB is in the following sections referred to as Jämtkraft, if nothing else is specified.

### **1.3 The Storsjö Region**

Östersund is the regional capital of Jämtland and has approximately 50 000 inhabitants. Outside of Östersund towns and villages are smaller and seldom exceed 1000 inhabitants. The rural landscape is built of farmland as well as forests and the population is spread over large areas with many small roads connecting villages and individual homes. Storsjön (The Great Lake) and many other lakes provided transportation long before the development of road traffic and were important when people first settled down. These patterns still exist although the lakes have lost their role for transportation. These circumstances indicate that building and maintaining a reliable distribution of electricity is not an altogether easy task.

## **2. LEGISLATION**

### **2.1 The cadastral procedure**

The cadastral procedure is the legal work model for property formation and related tasks carried out by the cadastral authorities. It is regulated by the fourth chapter of the Property Formation Act, and also by the Swedish Code of Judicial Procedure. The main characteristics of the cadastral procedure are impartiality, openness and the obligation to arrive at legally binding decisions also when parties have conflicting claims.

All decisions from a cadastral authority can be subject to appeals, which are handled within the court system. The cadastral procedure can accordingly be described as a simplified court case. The main difference between a court procedure and the cadastral procedure is that the cadastral procedure does not as a court case rely on the parties to provide investigations and facts. The cadastral authority can with proactive approach independently collect information and summon the parties to a meeting. At this meeting the parties will be heard, possible solutions can be discussed and tried and a binding decision delivered based on all relevant facts. Decisions must whenever possible be based on mutual agreements between the parties. Only when negotiations fail the cadastral authority will decide in favour of or against the claims from the applicant.

### **2.2 Utility Easements Act**

The Utility Easements Act came into legal force 1974. It provides a legal institute for the establishment of rights for vital public infrastructure like electric power lines and underground utilities. This type of right can be allotted either to a legal person or to a property unit associated with the utility. The right is unlimited in time and will exist regardless of property ownership transfers or changes of the real property division. The establishment is carried out in a cadastral procedure where conditions are issued for both the utility owner and the property owners. Economic compensation is decided in the process as well as conditions for access to the land in question. The right will once it has come into legal force be registered in the cadastre and in the cadastral index map.

### **2.3 Electricity Act**

The Electricity Act regulates activities related to production, distribution and use of electricity.

Amendments to the Electricity Act 2005 state the obligation for electricity grid operators to pay damages in cases of disrupted supply for more than twelve hours continuously. The new regulations are legally in force from 2011.

## **2.4 Expropriation Act**

The Expropriation Act is the legal basis for most cadastral procedures involving economic compensation. It is practised in all situations where a public body or a public interest obtains ownership or rights to real property. The basic principles are that economic compensation shall be issued based on loss of property market value and on loss of income for the property owner. From 2010 property owners are entitled to an additional 25 % compensation for loss of market value.

## **3. WORK PROCESS**

The claim from Jämtkraft Elnät AB was to obtain legal access to land for 1300 km of electricity power cables during a period of five years. Jämtkraft launched a project organisation under the name “Destination 2011” with responsibility for all necessary activities to complete this new distribution grid.

The name “Destination 2011” connects to the amendments to the Electricity Act described here above, and to the overall target to increase the reliability in distribution of electricity.

The work process was outlined during discussions between Jämtkraft Elnät AB and the cadastral authority. The measures described in this section are based on the cadastral procedure but also allowed for Jämtkraft to carry out the planning and field work and for the property owners to take part and interact before the decisions were made. All protocols, decisions and other important documents have either been sent to the property owners or communicated by a specific web site for each case.

The assignment was portioned into approximately 70 cadastral cases initiated from 2006 to 2010. Each case comprises a geographic area or leg where existing air carried power lines were to be replaced by ground cables. An important issue for the cadastral authority in this respect was to have an adequate number of property owners involved in each procedure. Too many would have limited the chance to have an open discussion at meetings. Too few would as this analysis also shows increase the costs per km or property unit.

Although the Utility Easements Act allows decisions against the will of the individual property owner, there is a strong commitment from the cadastral authorities to reach solutions based on consent. A cadastral procedure for a utility could typically be described as big company versus small land owners. But also in these situations the cadastral authority must consider the rights of the individual. Decisions forced upon individuals have many disadvantages also for the owner of the utility. In this project it was an important factor that the property owners also were customers to Jämtkraft. Secondly the need for fast access to land made it impossible to get involved in the time consuming court procedures that result from appeals.

### **3.1 Initiation phase**

During the first phase Jämtkraft submits applications for around ten specific cases. The cadastral authority is provided with a preliminary location for each power cable in digital format. By adding this polygon to a database containing a section of the cadastral index map it is possible to identify the property units likely to be affected. As the cables are often located

along local roads it has been frequent practise from Jämtkraft to change side of the road when difficult passages are identified. During this first phase it is therefore necessary to include properties on both sides of the road. The sometimes limited accuracy of the cadastral index map also makes it necessary to include more property units.

Names and addresses of the individual property owners are then collected digitally from the cadastre and land register.

### **3.2 First meeting**

The cadastral authority invites all property owners by a personal letter and advertisements in local newspapers, thereby fulfilling the demand for a legally correct notification. At the meeting Jämtkraft presents the proposal for the cable and channelization for broadband that are laid down together. Also details for removal of old air carried lines are shown. The surveyor presents the work model for the cadastral procedure and the target to achieve a consensus. The property owners are then asked for information about obstacles, facilities or other circumstances that affect the proposed location for the cable. A schedule for implementation is established with sufficient time for the preparation phase. All staff who will deal directly with property owners are introduced with names and contact details.

### **3.3 Preparation phase**

Immediately after the first meeting Jämtkrafts field personnel stake out the proposal on the ground. Property owners then have a few weeks according to the schedule to contact Jämtkraft with comments or demands to change the location. Site plans are established for the transformer stations and written consent collected as signatures on the plans. Building and environmental permits are obtained during this phase as the planning goes forward.

When all discussions have been settled the valuer makes a first field inspection and documents all objects that can be affected by the construction work. Jämtkrafts field planner sends a new polygon resembling the now adjusted location to the surveyor.

### **3.4 Decision meeting**

When summoning the property owners to the second meeting the surveyor checks that some kind of contact has been established with all property owners.

At the meeting Jämtkraft informs about the measures taken and adjustments made during the preparation phase.

A definite proposal for the right according to the Utility Easements Act is presented, including specific conditions for Jämtkraft and the property owners.

The preliminary valuation is presented in simplified form with figures for compensation based on the proposal. Jämtkraft will then ask to pay preliminary compensation. After discussions and clarifications the surveyor makes a legal decision comprising the establishment of an easement, payment of preliminary compensation and conditions for legal access.

### **3.5 Construction phase**

When the decision has acquired legal force Jämtkraft will commence the construction work. This phase lasts from 6-12 months as Jämtkraft awaits the following summer season to make final readjustments of the ground surface.

The survey authority registers the easement in the cadastre and in the cadastral index map,

when it has acquired legal force.

After the construction is finalised, Jämtkraft will measure the actual location of the cable and the transformer stations and deliver it to the survey authority in digital format.

### **3.6 Valuation for Compensation**

The valuer checks the final result on the ground against the preliminary valuation and makes adjustments when necessary. During the field inspection the valuer also examines properties on the rim of the specified corridor to see if they are affected by the easement or not. The result is presented in a specific report for each property unit and delivered to the survey authority. For properties with a low level of effraction a basic compensation of 1000 SEK (111 Euro) is always proposed.

### **3.7 Closure**

The surveyor checks the first decision against the actual location of the cable and the reports from the valuer. If the difference is small, the easement will be interpreted as legally defined by the actual location of the cable. If there are significant differences the surveyor must summon a new meeting to make alterations to the easement. The final decision may include relocation of the easement within a property as well as new properties affected or the easement being removed from properties that are not affected.

The valuation reports are then sent to the property owners who are urged to contact the surveyor if they have complaints or questions. Depending on the response and the need for alterations to the first decision the surveyor will decide whether to summon a final meeting or not.

The cadastral procedure is closed with decisions on alterations if necessary and on final compensation to property owners. After the decisions have acquired legal force the alterations will be registered in the cadastre. The geographic representation of the easement will be registered over again in the cadastral index map but this time based on the actual location of the cable.

## 4. KEY INDICATORS

Nineteen cadastral procedures of the total 70 have been finalised and stored in the cadastral archives. A large part of the remaining stock is in the final phase. However they are still not suitable for analysis until they have been closed. The statistics collected from the nineteen procedures are:

- Total cost
- The sum thereof related to work and costs at the cadastral authority
- The number of work hours from the cadastral authority
- The sum of the total cost related to valuation for compensation
- The number of work hours from valuers
- The dates for application, first meeting, legal access to land and closure.
- The length of the cable and easement in kilometers
- The number of properties affected
- The compensation paid to property owners

From these indicators it is possible to calculate the cost and number of work hours per kilometre and property unit and also to separate cadastral activities from valuation for compensation. It is also possible to look into how long time that has been needed to establish legal access to land and to close the procedures. Finally it can also be evaluated how much compensation that has been paid per property unit and kilometre.

### 4.1 Limitations

The figures and numbers collected are not checked for accuracy in every detail. It must also be noted that the number of procedures in the comparison is not sufficient for a scientific study. Although the same basic work model has been used in all procedures there are slight differences that affect the results.

The length of the cable or easement per procedure varies from 0,5 km to 36 km. After some consideration the procedures with the shortest easements have been excluded. The shortest one after this limitation is 2,1 km.

Economic compensation varies depending on property values and land use in the area where each procedure was carried out. The figures are for this reason difficult to compare.

## 5. ANALYSIS

### 5.1 Choosing the Utility Easement

The most common way to obtain a legal right for a power line or cable has traditionally been for the grid owner to negotiate with each property owner individually. A written agreement would then be used to register a servitude in the land register.

Cadastral procedures according to the Utility Easements Act are often practised to register a right after negotiations with the property owners. But the cadastral procedure can also manage the properties where negotiations have failed or where an existing utility is undisputed but agreements don't exist.

Jämtkraft stated at an early stage of the project that time was too short for the company to handle individual negotiations. The ability to enable dialogue with many property owners and grant a right based on consent is the most important reason for the relative success of the cadastral procedure in this project.

### 5.2 Costs

#### 5.2.1 The cost factor

The cost for establishing a legal right is critical when there are other options. But the cost factor should be evaluated also in relation to the total cost for building the power line. Another issue is if bad quality in the legal process can cause increased costs in the construction phase. It seems likely but has not been analysed here.

Throughout the project Jämtkraft has stated that the costs for building a power cable underground are substantially higher than for building an air carried power line. The additional cost is seen as a long term investment that will reduce future costs for maintenance, repairs and damages and guarantee a better reliability in the grid.

#### 5.2.2 Production costs

According to Jämtkraft the average cost during 2006-2010 has amounted to 67 000 Euro (600 000 SEK) per km 24 kV power cable including transformer stations and relocation of connecting low voltage lines.

#### 5.2.3 Legal costs

The legal costs can be calculated as the total cost for the cadastral procedure including valuation and compensation to property owners. All added together as average figures result in a legal cost of approximately 6900 Euro (62 000 SEK) per km, which equals just about 10 % of Jämtkrafts total cost for getting the cable in place.

#### 5.2.4 Cost efficiency

The study shows a clear relation between the number of affected properties or the length of the easement on one hand and the work hours or cost on the other hand. The longer easement handled per procedure, the lower the costs if they are split per property unit or km. At the far

end there is however an increasing risk of reducing legal security.

The work hours needed per property unit range from 7 to 34 in the 19 procedures. If the three shortest easements (less than 2 km and 8 affected properties) are excluded the average will be 11,8 hours or just below 1200 Euro per property unit.

The work hours needed per km easement range from 20 to 180 in the 19 procedures. If the three shortest easements (less than 2 km and 8 affected properties) are excluded the average will be 49 hours or just below 4900 Euro per km.

### 5.2.5 Comments

These figures are substantially higher than was expected at the start of the study. It can at least to some extent be explained by the high level of involvement from the cadastral authority. The cadastral procedure has included all stages of the process from the initial proposal until the cable has been built and the ground restored. Secondly the number of properties included in each procedure is much higher than the number of properties where an easement is finally registered.

Costs for compensation to property owners average at approximately 2000 Euro per km which may seem as a comparatively small figure. A contributing factor is that cables are located along roads which reduces the effraction on properties substantially. Secondly it is also possible to avoid sensitive land or facilities with a cable by for instance changing side of the road.

## 5.3 Valuation for compensation

### 5.3.1 Competence

Competence in valuation for compensation is necessary for the cadastral authorities. Since it is not permitted for an authority to carry out valuation services on a consultancy basis, there are small possibilities to employ valuation experts full time. Lantmäteriet (The Swedish mapping, cadastre and land registration agency) is now working towards increasing the general knowledge in valuation among cadastral surveyors. There is also a network of specialists who can assist or advise cadastral surveyors. But for large scale valuation or complex situations there is still a need to appoint private valuers in cadastral procedures.

### 5.3.2 Project specific conditions

The effraction on the individual properties is valued twice during each procedure. The first valuation is preliminary and communicated with the property owners before the easement is granted. Also if preliminary the first valuation is necessary to establish the situation on the ground. Timber volumes, technical facilities, fences etc can only be estimated before the construction is commenced. The cadastral authority can then decide on advance payment of compensation based on the first valuation. Knowledge of property values is also necessary in order to judge if an easement can be granted.

The second valuation is carried out when the construction work has been completed. It is based on the first one but combined with an inspection of the actual changes on the ground. The second and final valuation is documented in a report for each property unit, which is communicated with the owner and with Jämtkraft. The cadastral authority will make its decision on compensation at the closure of each procedure.

This work model provides an accurate judgement in all situations but is not mandatory by

law. It is also possible to decide on compensation based only on a first valuation before the cable is laid down. Doing so would reduce procedure costs considerably, but would on the other hand also lessen the room for adjustments in the construction phase.

## **5.4 Time**

### **5.4.1 The time factor**

The time factor has been important throughout the project. Jämtkraft had engaged a large work force of private contractors with special machinery and equipment for the project. Supplies such as cables, pipes and transformer stations had to be ordered in advance. The climate and seasons also imposed a necessity to follow a carefully drawn timetable. For each application Jämtkraft had expressed a date when they asked for legal access to the work area.

### **5.4.2 Legal Access**

The study shows that legal access to the work area was established in average 7 months after the date of application. Construction on the ground could with few exceptions start according to Jämtkrafts schedule. In this respect the work has been successful.

### **5.4.3 Closure**

The time needed to finalise and close the procedures is considerably longer. The construction phase lasts 4-6 months. Final restoration of the work area is usually done the following summer. Technically it would be possible to close each procedure within a year from the start of the construction, thereby using a total of approximately 20 months. The study shows that the average time for each procedure is 32 months, or a full year longer.

### **5.4.4 Comments**

There are two obvious explanations to why it takes so long to bring the procedures to a close. The first one is that the demand from clients to commence processing new applications is much stronger than the one to finalise old ones. This applies both to Jämtkraft and also to other clients who were given lower priority during the more hectic periods. The second one is that final valuation has been a bottleneck. Personnel from the appointed valuation company have been limited, and the cadastral authority has not been able to find capacity elsewhere. Also the valuers have had to prioritise first valuation of new applications before completing old ones.

The outcome is that property owners have had to wait longer than what is reasonable for full payment of compensation. It can also be expected that costs for the cadastral procedures increase when they are put aside instead of processed coherently.

## **5.5 Legal security**

The term legal security is here used to point out that

- Sufficient information about the affected properties, land use, facilities and land values must be collected for each procedure.
- All property owners must be notified and given the opportunity to participate in the process. Claims and questions from the property owners must be dealt with openly and cor-

rectly.

- All decisions from the cadastral authority must be based on a thorough consideration of relevant legislation and the specific circumstances for each procedure.
- Decisions to grant an easement must be presented and explained during meetings. Once a decision has been taken it must be documented and communicated with all affected property owners, usually within a week.
- All property owners have the right to lodge appeals against a decision from the cadastral authority. An appeal will halt the process and usually prevents access to the property belonging to the appellant.

It is the cadastral authority's foremost duty to uphold legal security in all procedures. The possibilities to measure and evaluate if a satisfactory level of legal security has been achieved are

- The number of appeals lodged against decisions in the procedures and the Land Court's rulings in those cases.
- Informal complaints from stakeholders
- Internal quality control.

The records so far show that only a few appeals have been lodged against decisions to grant an easement in these procedures. The Land Court has also ruled in favour of Jämtkraft in those cases. There are a number of situations when Jämtkraft has been able to avoid appeals by dialogue and ability to adjust the location of the cable or the transformer stations.

Criticism and feedback from property owners has not been measured but the general response has been positive.

## **5.6 Process oriented comments**

### **5.6.1 Incentives**

Working with these cadastral procedures has generally been a pleasant mission. The property owners have had lots to gain from the project.

- Increased reliability of electricity distribution
- An improved visual environment as air carried power lines are replaced by cables underground
- Productive land in return when air carried power lines are removed
- Access to broadband
- Economic compensation

These factors have all contributed to the successful outcome.

### **5.6.2 Planning**

The planning phase during which Jämtkrafts field planners deal directly with the property owners is important. This is when they arrive at a precise location that must both be accepted by a majority of the property owners and also technically realistic to implement.

In the cases where this work is successful very little input is needed from the cadastral authority at the end of the procedure. When the cable is in place it will correspond to the easement and the property owners will still be content. Preliminary valuations will prove to be accurate and no changes in the easement will be necessary. In these cases it would be quite possible to close the procedure at the second meeting.

In the cases where the field planning does not achieve sufficient quality there will be much more to sort out during the final phase. There may be needs for both amendments to the easement and additional valuation. A third meeting with the property owners will be necessary to make legal decisions based on the new circumstances.

### 5.6.3 The Cadastre

Poor quality in the cadastre will increase the legal costs if it is not possible to obtain correct information about boundaries, existing rights, owners etc. Especially the cadastral index map is important as the source of information about which properties are affected. It is still common that boundaries have to be checked on the ground, and that additional research by the cadastral authority is necessary.

The problems related to insufficient quality or completeness of the cadastre have been subject for a thorough investigation by Lantmäteriet. A cost-benefit analysis of necessary measures has been documented in a report. Planning and initial activities are under way.

### 5.6.4 Staffing

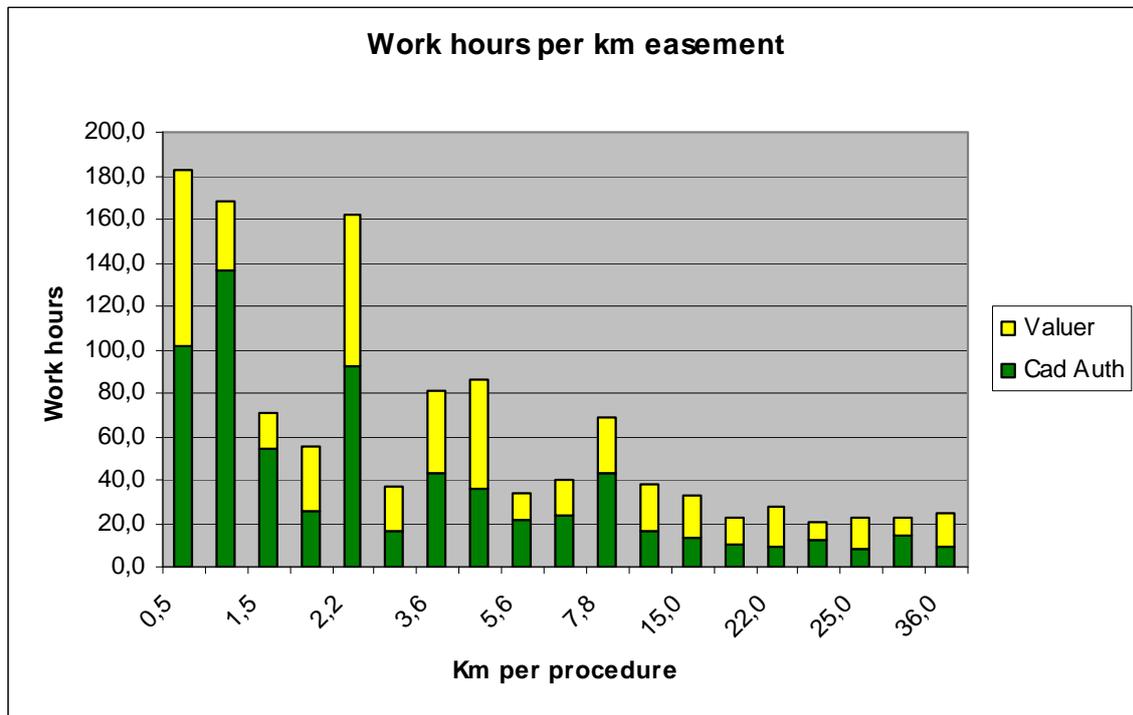
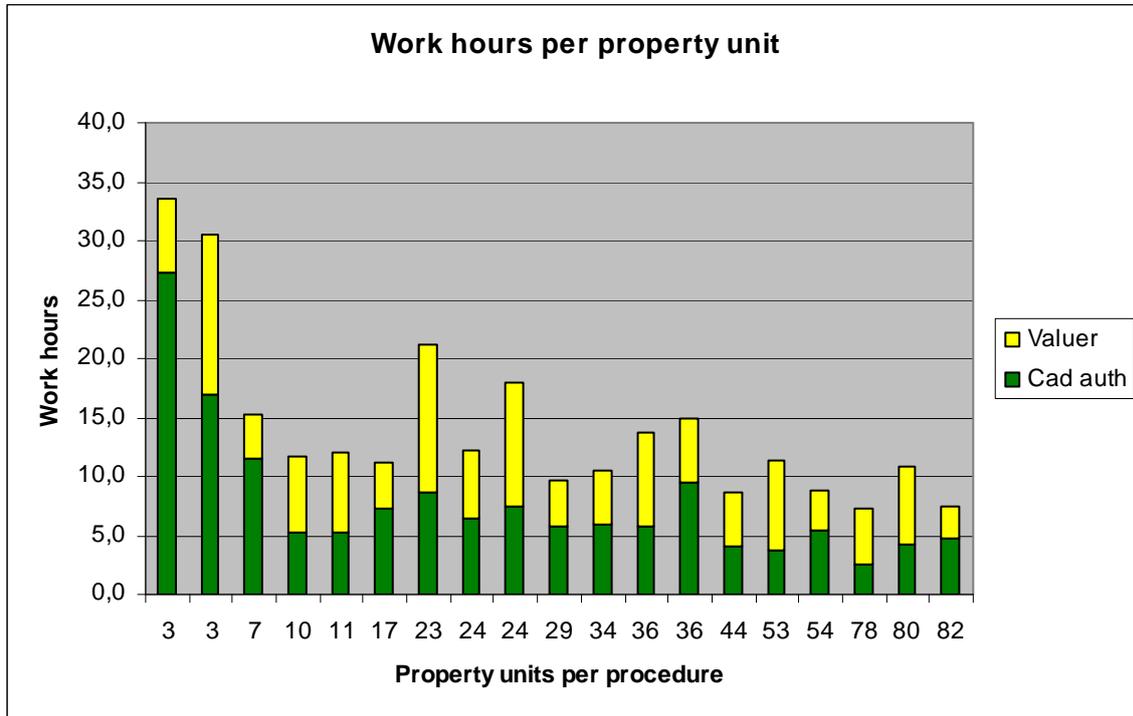
During the course of the project the cadastral authority has engaged up to ten persons simultaneously. Manuals and templates have been developed for different measures and documents. The attempt to structure the work has been well received and the model has been implemented by everyone involved.

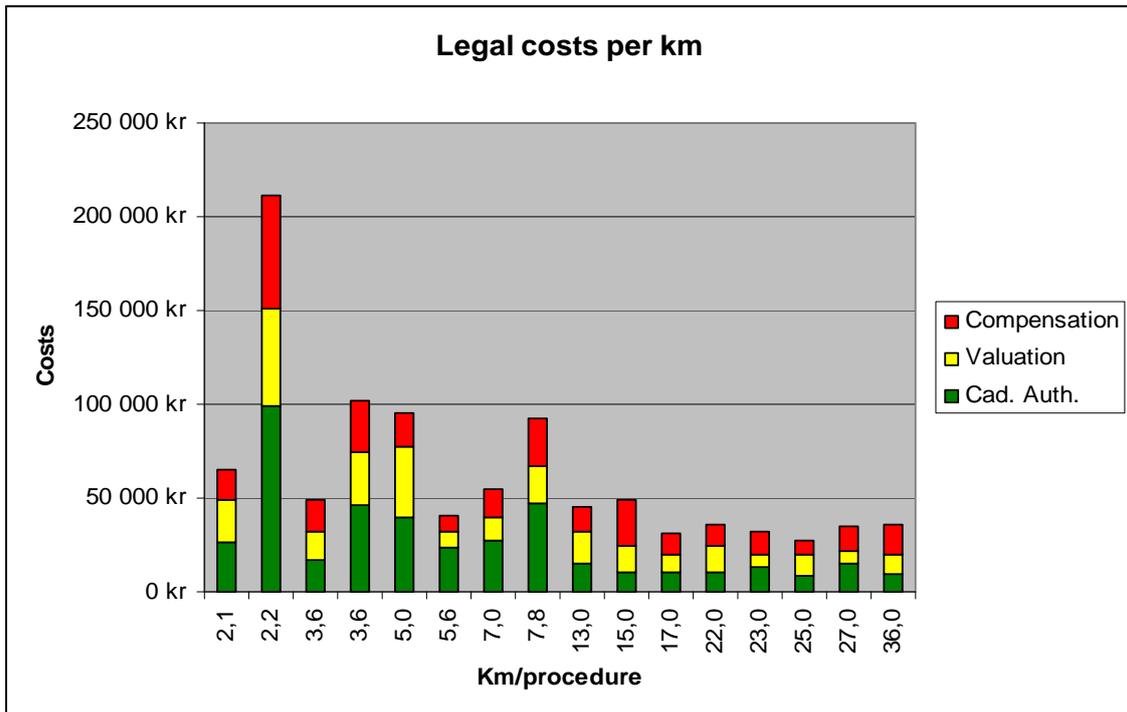
In the end it has become regular to involve two or three persons per procedure, not counting the valuer. One cadastral surveyor must be responsible for all decisions, conduct meetings and sign the legal documents. But a large part of preparation, external contacts, research and cadastral work can be shared.

## 6. CONCLUSION

This study focuses on parameters that are measurable from the procedures. More attention has been directed towards costs and efficiency than towards other issues. It must however be underlined that upholding legal security is the foremost important prerequisite for successful implementation of cadastral procedures. The conclusion is that the cadastral authority was able to do so during this project, and that the positive outcome was only possible because of that.

## 7. APPENDIXES





Cable ditch, electricity and broadband

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## BIOGRAPHICAL NOTES

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