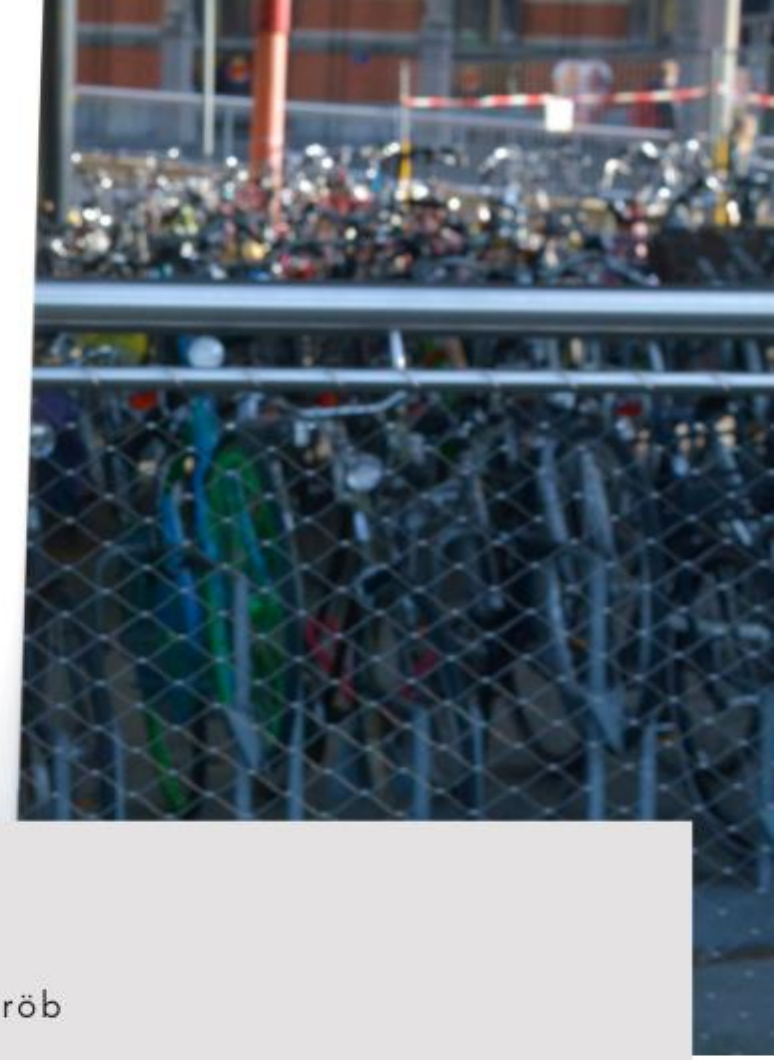

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The Role of Local Energy Initiatives in the provision of Electric Vehicle Charging Infrastructure

Lessons Learned from front-runner cases in the Netherlands and Germany

Bachelor Thesis Geography, Spatial Planning & Environment (GPE)
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Photo Cover Page: A charge point in Groningen. © Hannah Fröb

Preface

Dear reader,

You have my bachelor thesis in front of you, on which I have worked for the past five months. In this process, I have tried to integrate many bits and pieces, concepts, and ideas that I encountered during the past three years of my studies into one project. Although I feel relieved writing the last sentences that mark the end of quite a long and challenging process, I still experienced this thesis trajectory as pleasant, interesting, and inspiring most of the time, just as my whole Bachelor of Human Geography, Spatial Planning and Environment – a study choice I am still more than happy with.

I am very pleased that I had the chance to combine the interesting, though complex and sometimes dry field of Electric Vehicle Charging Infrastructure (at least if you are a non-technical person as me) with a dive into the "cooperative world". Looking back, both sustainability transitions and participatory concepts already thrill me for a long time (I even wrote my first academic paper about a cooperative solar project!). It was a great coincidence that I now had the possibility to get to know the world of energy cooperatives even better. I want to thank all the energetic, positive, open-minded hands-on people within this field that shared their knowledge and experience with me, took their time, showed interest in what I was doing, and inspired me during the past few months. Helping and supporting each other with joy seems to be very normal in the "cooperative world". I could experience the resulting productive, but at the same time intimate atmosphere myself, and I hope that at least some of the inspiration I found in the cooperative world can be transmitted to you, the reader, through this thesis.

Before that, however, I want to thank a few people that supported me during my thesis trajectory. I want to start with Tonnie Tekelenburg, the elektrip working group, and others within LochemEnergie that welcomed me in their cooperative, took their time for me, and from whom I learned a lot. Secondly, I want to thank all my respondents for the interesting interviews, that were inspiring conversations at the same time.
I would also like to thank my supervisor Ary Samsura, who took a lot of the time to discuss my research with me, smoothened my doubts, and gave me valuable advices.
Special thanks go to my father, who is a true role model to me with regard to hands-on and pragmatic sustainable action! He also provided me with useful articles and tips, and even ended up being one of my respondents. Only now, I can fully understand the scope of his cooperative´s work and commitment. I also generally want to thank my parents, for awakening initial interest for diverse environmental and societal topics in me many years ago, and for always supporting me (even if that meant sacrificing a whole Sunday evening for turning my Dutch-German hybrid text into a proper German summary 😉).
Last but not least, I want to thank my dearest friends and study colleagues, who helped me out in last minute by checking my long thesis on language mistakes, who gave me valuable feedback and critique on my writings, who hosted me during my fieldwork in Groningen, and who de-stressed me whenever I needed it.

Hannah Fröb

Nijmegen, 27 June 2019

Executive Summary

Combating climate change requires a transition towards low-carbon systems among all sectors, including the energy and transportation sector. No energy transition will be possible without a transport transition. Within the latter, the electrification of the transport sector plays an important role – among other solutions, such as hydrogen and renewable liquid fuels. Many governments as well as citizen initiatives have therefore put the stimulation of e-mobility on their agenda. However, the roll-out of publicly accessible electric vehicle charging infrastructure (EVCI) is seen as an important prerequisite for stimulating the uptake of electric vehicles (EVs), as one cannot expect that many people will switch to EVs without feeling the security that they can charge wherever they are.

The provision of EVCI has so far predominantly been implemented in collaborations between governmental and market parties. This can be regarded as surprising, given the recent political shift that bottom-up initiatives and the collaboration between governments, market-parties and civil society are increasingly encouraged. In line with this shift, Local Energy Initiatives (LEIs) have developed throughout Europe in the past decades and their number has increased tremendously in the past years. LEIs are diverse and know many different forms, but their common denominator is that they are citizens initiatives that aim at realizing sustainable energy generation-, energy efficiency- and related projects collectively. One can expect that including such LEIs in the provision of EVCI can be beneficial, as they can provoke more embedded behavioral change due to their participatory character. They might also help to make the e-mobility sector more sustainable by supplying locally generated renewable energy. Given these potential benefits as well as the fact that an increasing number of LEIs is attempting to get active on the field of e-mobility, including EVCI, the purpose of this research is to gain a better understanding of the roles that LEIs can play in the provision of EVCI, given their specific capacities and local contextual circumstances.

Four front-runner cases in the Netherlands and in Germany (=LEIs that are already providing publicly accessible EVCI themselves) have been studied with regard to their capacities, as well as their implemented EVCI-concepts. Based on experiences from these cases, lessons learned have been formulated for other LEIs. Specifically, one Dutch LEI, LochemEnergie, that currently endeavors to start providing EVCI as well, has been studied and compared to the front-runner cases to assess whether and in which ways they might be able to provide EVCI. In this qualitative case study research, data has been collected by holding semi-structured in-depth interviews with active members of the studied LEIs as well as relevant partners, such as municipalities or local businesses. Besides, relevant (municipal) policy documents have been analyzed.

The research is based on the framework of Middlemiss & Parrish (2010), offering four capacities that community initiatives (such as LEIs) can draw on to realize sustainable projects within their community. The framework refers to personal capacities (= the initiative member's skills and resources), cultural capacities (= the legitimacy of sustainability objectives within the community), organizational capacities (= the attitudes of the formal organizations and the initiative's relation to these organizations) and infrastructural capacities (= existing facilities in the region). It has been enriched with concepts of other scholars, that are either based on viewing LEIs as grassroots organizations or as social enterprises. The EVCI-concepts of the studied front-runner-initiatives have been grasped by exploring their technical aspects, accessibility, billing mechanisms, the business models and the allocation of the different market roles that are needed to provide EVCI.

Results of the research show that the peculiarity of the four capacities and related aspects does indeed influence the possibilities LEIs have to provide EVCI. Although the level of professionalization and the availability of capacities varied among the studied cases, all cases had a few capacities in common that are therefore seen as crucial or even necessary for providing EVCI. All of them had a mix of motives, including intrinsic (environmental), as well as practical and self-serving ones, that motivated them to start providing EVCI. Besides, all LEIs had aligned their EVCI-vision with the visions of relevant partners such as municipalities or local businesses, that helped them to mobilize resources. Important is also the role of individual and collective entrepreneurs within the organization that push forward the EVCI project, lobby for it and give it sufficient attention. Moreover, it seems to be crucial to have interdisciplinary skilled teams of active members that equip the LEI with sufficient skills and knowledge to implement proper project planning (e.g. financial, administrative, fund raising, marketing and engineering skills). Specific EVCI-knowledge seemed to be less important, as it can also be acquired learning-by-doing or via one's networks. Connected to this aspect is that strong local, personal as well as cooperative networks proved to be decisive, to be able to practically implement the project as well as to learn from other's cooperatives experiences or to disperse one's own concept. Comparably, it turned out to be helpful if LEIs had already implemented earlier successful projects, not only to learn from these earlier experiences, but also to build trust within the population, the municipality and other relevant actors. Last but not least, government backing (from any governmental level) proved to be crucial for financial support and legitimacy in front of other actors. Municipal support is important when realizing EVCI on public ground, as public parking spots are needed for this.

If a LEI appears to have sufficient capacities for providing publicly accessible EVCI themselves, there are different options. Most of them take the market role of the Charge Point Operator (CPO), become an energy supplier via a white label contract (=supplying energy under their own name, but via an energy company), or combine these two roles with each other. One studied LEI even became E-mobility Service Provider (EMSP) themselves. As this requires a lot of administrative capacity, it seems to be more advisable for most LEIs to outsource this service to another party. Realizing EVCI on public ground only seems to be advisable if sufficient municipal support is given, as this is needed to receive public parking spots. Furthermore, if the LEI is active in a rural area, it appears to be a good strategy to combine the provision of EVCI with other social services or local businesses to make it more attractive in regions where most people do not depend on public parking and charging in their daily lives.

Regarding the business models for "cooperative EVCI", it needs to be clearly stated that none of the studied EVCI-models are profitable yet, nor are most of them cost-effective. In order to become cost-effective, a normal AC charge point needs a utilization degree of an equivalent of two well used e-car sharing cars (ca. 6,000 kWh per year) if charging sessions cost 35ct/kWh (which is the current average market price in the Netherlands). Achieving such a utilization degree might be doable in very well-connected and central locations, but most studied LEIs just took over charge points (CPs) that were not utilized sufficiently or built up CPs in locations where no market party dares to do so because of the low utilization degree. However, LEIs have several possibilities to make the costs bearable. They can increase the utilization degree, for example by connecting it to an e-car sharing fleet. They can make use of their own locally generated renewable energy, thus sell them via the charge point. This generates some income for the LEI, but also gives possibilities to make use of fiscal advantages or subsidies for renewable energy. These made at least a difference in the business cases of Dutch LEIs. Last, but not least, they can cooperate with others from within the cooperative world for e.g. EMSP-services or administration to save costs.

All in all, one can say that many LEIs like the idea of connecting their already existing projects of e.g. energy generation and their own/their member's charging demand by providing their own EVCI. This can be regarded as a logical step. Most importantly however, they are driven by their intrinsic environmental motivations which move them into the situation in which they boost and provide EVCI especially in those locations where the market is not willing to do it. Given this notion, the question remains whether the role of LEIs in the provision of EVCI will only stay in place and develop on the short or medium run, until the transport transition will be in full swing, or whether LEIs will also be important EVCI providers on the long run.

Other LEIs can thus definitely learn from front-runner cases, and they are already learning from them, thanks to the "cooperative world", in which everyone gladly and enthusiastically shares knowledge and experience with each other. However, EVCI is at the moment a risky business case and complex to implement. Taking this into account but knowing that there are quite some possibilities and concrete examples on how to implement "cooperative EVCI", every LEI should decide for themselves whether they have sufficient capacities and whether they find it worth it to enter a new niche.

Limitations of this research are, that not for all cases enough respondents with a sufficient range of viewpoints were interviewed. However, the data from the "extra" cases with a small number of respondents could be to some extent be triangulated with the findings from the other cases. Furthermore, the scope of the research is limited. For instance, smart charging options, which is an important topic in the field at the moment, were not taken into account. Moreover, as the EVCI market and technology is developing rapidly, and the provision of EVCI is a rather new activity for LEIs, it is not clear, it is not clear yet whether LEIs will be able to become a relevant EVCI-provider on the long run. For this, a similar research in a few years from now will be needed. Next to this, possible future research on the topic, might be implemented using a rather quantitative approach so that more LEI front-runners from more countries can be studied. This might make it possible to find clearer patterns between certain capacities and local circumstances and the chosen EVCI-model.

Samenvatting

Als we het willen opnemen tegen klimaatverandering, moet een transitie naar koolstofarme systemen in alle sectoren plaatsvinden. Hierbij hoort onder andere de energietransitie, die niet realiseerbaar gaat zijn als niet ook de transportsector mee beweegt. De elektrificatie van de transportsector speelt daarom een belangrijke rol, naast andere sub-oplossingen zoals waterstof en hernieuwbare vloeibare brandstoffen. Veel overheden, maar ook burgerinitiatieven hebben daarom het stimuleren van e-mobiliteit op hun agenda's gezet. Echter wordt het uitrollen van openbaar toegankelijke laadinfrastructuur (*Electric Vehicle Charging Infrastructure*, afgekort *EVCI*) als belangrijke voorwaarde gezien voor een toename van het aandeel elektrische auto's (*Electric Vehicles,* afgekort *EVs*) op de markt. Men kan immers niet verwachten dat veel mensen elektrische auto's gaan kopen als ze maar op weinig plekken opgeladen kunnen worden.

Het aanleggen van laadinfrastructuur werd tot nu toe met name door overheden en marktpartijen doorgevoerd. Dit is opvallend, aangezien de recente ontwikkeling waardoor bottom-up initiatieven en zogenaamde triple helix samenwerkingen tussen staat, markt en samenleving een steeds belangrijkere rol zijn gaan spelen. In het verlengde van deze politieke trend, zijn in de afgelopen jaren veel lokale energie-initiatieven en energie coöperaties ontstaan en hun aantal neemt steeds verder toe. Lokale energie-initiatieven kennen diverse vormen, maar hun gezamenlijke noemer is dat

het burgerinitiatieven zijn die als doel hebben collectief projecten omtrent hernieuwbare energieopwekking, energiebesparing en gerelateerde thema's te realiseren. Het kan worden aangenomen dat het voordelig is om dit soort initiatieven te betrekken bij het aanleggen van laadinfrastructuur, omdat ze participatiemogelijkheden bieden en hierdoor meer langdurige gedragsverandering kunnen stimuleren. Daarnaast kunnen energiecoöperaties ook een bijdrage leveren aan het verduurzamen van e-mobiliteit door het leveren van lokaal opgewekte hernieuwbare stroom. Gezien deze potentiële voordelen en het feit dat steeds meer energiecoöperaties ernaar streven om actief te worden op het gebied van e-mobiliteit en laadinfrastructuur, is het doel van dit onderzoek om een beter begrip te verkrijgen van de rollen die energiecoöperaties kunnen spelen in het aanleggen van publiek toegankelijke laadinfrastructuur, gegeven hun specifieke capaciteiten en lokale contextuele factoren.

Vier koplopers in Nederland en Duitsland (dus coöperaties die zelf al laadpaalinfrastructuur hebben aangelegd) werden onderzocht. Hierbij lag de focus op hun capaciteiten en hun gerealiseerde laadinfrastructuur-modellen. Gebaseerd op de ervaringen uit deze casussen zijn leerpunten voor andere energiecoöperaties geformuleerd. Daarnaast werd LochemEnergie, een Nederlandse energiecoöperatie die momenteel erover nadenkt om ook laadinfrastructuur te realiseren, onderzocht en vergeleken met de vier koploper casussen, om te kunnen beoordelen of zij ook in staat zouden kunnen zijn om zelf laadinfrastructuur aan te leggen. In dit kwalitatief case study onderzoek werd data verzameld door middel van semigestructureerde diepte interviews. Deze werden gehouden met actieve leden van de vijf energiecoöperaties, maar ook met relevante partners van de coöperaties, zoals gemeenten en lokale ondernemers. Daarnaast zijn relevante (gemeentelijke) beleidsdocumenten geanalyseerd.

Het onderzoek is gebaseerd op het framework van Middlemiss & Parrish (2010), dat vier capaciteiten hanteert waarvan community-initiatieven (zoals energiecoöperaties) gebruik kunnen maken om duurzame projecten te kunnen realiseren. Het model verwijst naar persoonlijke capaciteiten (= de vaardigheden en hulpbronnen van leden), culturele capaciteiten (= de legitimiteit van duurzaamheidsdoeleinden binnen de lokale gemeenschap), organisatorische capaciteiten (= de houding van formele organisaties en de relatie van het initiatief tot deze organisaties) en infrastructurele capaciteiten (= bestaande faciliteiten in de regio). Voor dit onderzoek werd boven beschreven model aangevuld door concepten uit literatuur over *social enterprises* (SEs) en *grassroots initiatieven*. De laadinfrastructuur concepten van de koploper-coöperaties werden in kaart gebracht door te kijken naar de technische aspecten, de toegankelijkheid van de laadpalen, betaalmethoden, business modellen en de verdeling van de verschillende markt rollen die nodig zijn om laadinfrastructuur te realiseren.

De resultaten van het onderzoek laten zien dat de mate van aanwezigheid van de vier capaciteiten en de daaraan gerelateerde aspecten invloed hebben op de mogelijkheden die energiecoöperaties hebben om laadinfrastructuur te realiseren. Hoewel de mate van professionaliteit en de aanwezigheid van capaciteiten onder de verschillende coöperaties variëren, hebben alle coöperaties bepaalde capaciteiten gemeen. Deze worden daarom als bijzonder belangrijk gezien voor het aanleggen van laadinfrastructuur. Ten eerste hadden alle coöperaties een mix aan motivaties om laadinfrastructuur aan te leggen, waaronder intrinsieke milieu-motieven als ook motivaties uit eigenbelang. Verder hadden alle coöperaties "shared storylines" met relevante partners, dat wil zeggen dat ze hun visie met betrekking tot laadinfrastructuur wisten samen te brengen met die van relevante partners zoals gemeenten of lokale ondernemers. Deze shared storylines hielpen hen om

(financiële) middelen te mobiliseren. Belangrijk bleek ook de rol van zowel individuele als ook collectieve entrepreneurs binnen de coöperaties te zijn, die het laadpaalproject voldoende aandacht geven, het aansturen en ervoor lobbyen. Daarnaast bleek het cruciaal te zijn om interdisciplinaire teams en dus leden met veel kundigheid van diverse achtergronden te hebben, die de coöperatie voorzien met voldoende kennis om hun projecten professioneel uit te voeren (e.g. administratieve, financiële, fundraising, marketing en technische vaardigheden). Specifieke kennis over laadinfrastructuur leek minder cruciaal te zijn, omdat deze ook learning-by-doing of via het coöperatieve netwerk kan worden verworven. In het verlengde hiervan bleek dat het van groot belang is om sterke lokale, persoonlijke en coöperatieve netwerken te hebben. Deze kunnen een coöperatie in de praktische uitvoering van hun laadinfrastructuur project ondersteunen, of mogelijkheden bieden om van andere coöperaties te kunnen leren of zijn eigen concept te verspreiden. Het leek ook van voordeel te zijn al eerder projecten succesvol te hebben geïmplementeerd. Niet alleen omdat energiecoöperaties van hun eerdere ervaringen leren, maar ook hielpen eerdere projecten erbij vertrouwen binnen de bevolking, de gemeente en bij andere relevante actoren op te bouwen. Tenslotte bleek overheidssteun van groot belang te zijn voor het verwerven van financiële middelen en legitimiteit voor andere actoren. Ondersteuning door gemeenten specifiek is erg relevant wil men laadinfrastructuur op publieke grond realiseren, omdat hiervoor publieke parkeerplaatsen nodig zijn, waar de gemeenten voor verantwoordelijk zijn.

Als een energiecoöperatie boven genoemde capaciteiten blijkt te hebben, zijn er verschillende opties voor het aanleggen van laadinfrastructuur. De meeste onderzochte koploper-coöperaties spelen de markt rol van de Charge Point Operator (CPO), of zijn een white-label energieleverancier (= het leveren van energie onder hun eigen naam, maar via een energiebedrijf), of een combinatie van allebei. Een coöperatie werd ook zelf E-mobility service provider (EMSP), maar aangezien dit een hoge administratieve capaciteit vraagt, zou het voor de meeste coöperaties een betere optie kunnen zijn om deze service aan andere partijen uit te besteden. Laadinfrastructuur op publieke grond realiseren blijkt alleen aan te raden te zijn als voldoende ondersteuning door de gemeente gegeven wordt, omdat deze benodigd is voor het verkrijgen van publieke parkeerplekken. Daarnaast lijkt het in rurale gebieden, waar niet veel mensen afhankelijk zijn van het parkeren en laden op publieke grond, een goede strategie te zijn om laadinfrastructuur te verbinden aan andere sociale functies of bestaande ondernemingen, om publieke laadinfrastructuur aantrekkelijker te maken en voor een hogere bezettingsgraad te zorgen.

Wat betreft verdienmodellen, moet duidelijk benoemd worden dat geen van de onderzochte coöperatieve laadinfrastructuur projecten winstgevend is en de meeste ook niet kostendekkend zijn. Momenteel is bij een normale AC-paal een bezettingsgraad van 6000 kWh per jaar nodig (dit is equivalent aan twee goed benutte deelauto's), om hem over een looptijd van 5 jaar rendabel te maken, als de momentele marktprijs van 35 ct per kWh gehanteerd wordt. Dit kan haalbaar zijn in goed ontsloten, centrale plekken, maar de meeste coöperaties nemen juist palen met een slechte bezettingsgraad over of willen palen realiseren in plekken waar marktpartijen nog niet bereid zijn om in laadpalen te investeren – vanwege de verwachte lage bezettingsgraad. Echter hebben energiecoöperaties meerdere knoppen waaraan ze kunnen draaien om de kosten dragelijk te maken. Ze kunnen de bezetting verhogen, bijvoorbeeld door hun laadinfrastructuur project te verbinden aan een e-carsharing fleet. Ook kunnen ze hun eigen opgewekte energie via de palen afzetten, wat niet alleen directe inkomsten door verkoop voor de coöperatie genereert, maar wat ook de mogelijkheid biedt om fiscale voordelen of subsidies voor hernieuwbare energie te gebruiken. Daarnaast kunnen ze

met andere coöperaties samenwerken voor bijvoorbeeld EMSP-services of administratieve taken en op die manier kosten besparen.

Concluderend kan men zeggen dat veel energiecoöperaties het idee aantrekkelijk vinden om hun al bestaande projecten (bijvoorbeeld opwekking van hernieuwbare energie) te verbinden door eigen laadinfrastructuur. In veel gevallen kan dit ook inderdaad als logische stap beschouwd worden. Het zijn vooral echter de intrinsieke motivaties van energiecoöperaties, die ze aandrijven om juist in situaties in publieke laadinfrastructuur te investeren, waar de markt er nog niet toe bereid is. Gezien dit inzicht blijft het de vraag of energiecoöperaties op lange termijn een belangrijke rol in het aanleggen van laadinfrastructuur gaan spelen, of dat dit alleen het geval gaat zijn totdat de transport transitie in volle gang is en de markt dit volledig gaat overnemen.

Andere energiecoöperaties kunnen zeker leren van koploper-coöperaties, en dat doen ze al binnen de “coöperatieve wereld” waarin iedereen graag ervaringen en kennis deelt. Echter moeten energiecoöperaties die EVCI-aspiraties hebben zich ervan bewust zijn dat laadinfrastructuur en de daarbij horende markt complex is en dat het lastig is om verdienmodellen rendabel te krijgen. Hiermee rekening houdende, maar wetende dat er definitief mogelijkheden voor energiecoöperaties zijn, moet elke energiecoöperatie zelf beslissen of ze het waard vinden om een nieuwe markt te betreden.

Beperkingen van het onderzoek zijn dat niet voor alle casussen voldoende respondenten met een voldoende variatie aan perspectieven geïnterviewd werden. Echter kon de data van deze “extra”-casussen tot op een bepaalde hoogte getrianguleerd worden met de bevindingen uit andere casussen. Daarnaast is de inhoudelijke omvang van het onderzoek beperkt. Zo werd smart charging, een momenteel erg relevant onderwerp binnen de laadinfrastructuur-markt, niet meegenomen. Verder ontwikkelen laadinfrastructuur technologie en de bijhorende markt snel, en is het aanleggen van laadinfrastructuur een redelijk recente coöperatieve activiteit. Hierdoor is het nog niet duidelijk of coöperaties op lange termijn een relevante laadinfrastructuur aanbieder gaan worden. Om dit uit te vinden zou een vergelijkbaar onderzoek over een paar jaar moeten worden uitgevoerd. Een ander mogelijk toekomstig onderzoek zou een kwantitatief onderzoek zijn, waardoor meer koploper-coöperaties uit meer landen zouden kunnen worden onderzocht. Dit zou het mogelijk maken duidelijkere patronen tussen bestaande capaciteiten en geïmplementeerde EVCI-modellen te vinden.

Zusammenfassung

Um den Klimawandel zu bekämpfen, wird ein Wechsel zu kohlstoffarmen Systemen in allen Sektoren benötigt. Die Energiewende wird nur umsetzbar sein, wenn sie auch einher geht mit einer Verkehrswende. Innerhalb dieser spielt die Elektrifizierung des Transportsektors eine wichtige Rolle – neben anderen Teillösungen wie Wasserstoff oder erneuerbaren Treibstoffen. Viele Regierungen, aber auch Bürgerinitiativen, haben darum die Förderung von E-Mobilität auf die Tagesordnung gesetzt. Allerdings wird der Ausbau von öffentlich zugänglicher Ladeinfrastruktur (Electric Vehicle Charging Infrastructure, kurz EVCI) als wichtige Voraussetzung für eine Zunahme des Marktanteils von E-Autos (Electric Vehicles, kurz EVs) gesehen. Immerhin kann nicht erwartet werden, dass viele Menschen auf ein elektrisches Auto umsteigen werden, ohne die Sicherheit zu verspüren, laden zu können, wo immer sie sind.

Der Ausbau von Ladeinfrastruktur wird bis jetzt vor allem durch staatliche und private Marktakteure ausgeführt. Dies ist überraschend in Anbetracht des gesellschaftlichen und politischen Trends, dass „bottom-up“ Initiativen sowie die Zusammenarbeit von Staat, Markt und Zivilgesellschaft als stets wichtiger angesehen werden. In Zusammenhang mit dieser Entwicklung sind in den letzten

Jahrzehnten, vor allem aber in den letzten Jahren, viele „lokale Energieinitiativen“ *(Local Energy Initiatives, kurz LEIs)*, oftmals Bürgerenergiegenossenschaften, in ganz Europa entstanden. Lokale Energieinitiativen sind divers und kennen viele verschiedene Organisationsformen, aber ihr kleinster gemeinsamer Nenner ist, dass sie Bürgerinitiativen sind, die kollektiv Projekte im Bereich erneuerbarer Energien, Energieeffizienz und damit zusammenhängender Themen umsetzen wollen. Es ist zu erwarten, dass es vorteilhaft ist solche Bürgerinitiativen am Ausbau von (öffentlicher) Ladeinfrastruktur zu beteiligen, da sie Partizipationsmöglichkeiten bieten und hierdurch wirkungsvolleren Verhaltenswandel stimulieren können. Außerdem können sie durch das Liefern von lokal erzeugtem erneuerbarem Strom den E-Mobilitätssektor nachhaltiger gestalten. In Anbetracht dieser potenziellen Vorteile sowie dem Fakt, dass immer mehr Bürgerenergiegenossenschaften darüber nachdenken, auf dem Gebiet der E-Mobilität sowie der Ladeinfrastruktur aktiv zu werden, ist das Ziel dieser Untersuchung besser zu verstehen, welche Rollen Bürgerenergiegenossenschaften beim Aufbau von Ladeinfrastruktur in Abhängigkeit von Ihren spezifischen Kapazitäten und lokalen Kontextfaktoren spielen können.

Vier Vorreiterprojekte in den Niederlanden und Deutschland, in denen Bürgerenergiegenossenschaften schon selbst Ladeinfrastruktur aufgebaut haben, wurden sowohl in Bezug auf ihre Kapazitäten als auch auf ihre realisierten Ladeinfrastruktur-Projekte untersucht. Basierend auf ihren Erfahrungen, wurden gewonnene Erkenntnisse als „lessons learned“ für andere Energiegenossenschaften formuliert. Spezifisch wurde eine niederländische Genossenschaft, LochemEnergie, untersucht, die momentan untersucht, ob und wie sie Ladeinfrastruktur aufbauen könnte. Hierfür wurden die Kapazitäten von LochemEnergie mit denen anderer Fälle verglichen. In dieser qualitativen Fallstudie wurde durch semi-strukturierte Tiefeninterviews Daten erhoben. Diese wurden mit Mitgliedern der Energiegenossenschaften gehalten wurden, sowie mit relevanten Partnern dieser, wie z.B. mit kommunalen Vertretern oder lokalen Unternehmern. Außerdem wurden relevante (kommunale) Strategiepapiere analysiert.

Die Untersuchung basiert auf dem Modell von Middlemiss & Parrish (2010), welches vier Kapazitäten beinhaltet, auf die „community initiatives“ (in diesem Falle Bürgerenergiegenossenschaften) bauen können, um ihre Nachhaltigkeitsprojekte auszuführen. Diese vier Kapazitäten sind persönliche Kapazitäten (= die Fähigkeiten und Ressourcen der Mitglieder), kulturelle Kapazitäten (= die Legitimität von Nachhaltigkeitszielen innerhalb der lokalen Gesellschaft), organisatorische Kapazitäten (= die Werte und Einstellungen der formalen Organisationen vor Ort und das Verhältnis der Genossenschaft zu diesen Organisationen) und Infrastrukturelle Kapazitäten (= vorhandenen Fazilitäten in der Region). Das oben beschriebene Modell wurde ergänzt durch andere Konzepte aus der wissenschaftlichen Literatur zu *Social Enerprises (SEs)* und *grassroots organizations*. Die Ladeinfrastrukturprojekte wurden mit Hilfe der folgenden Aspekte erfasst: technische Gegebenheiten und Zugänglichkeit der Ladesäulen, Zahlungs- und Abrechnungsmethoden, Geschäftsmodelle, sowie die Besetzung der verschieden Marktrollen, die benötigt werden, um Ladeinfrastruktur und Ladeservice zu realisieren.

Die Resultate dieser Untersuchung zeigen, dass die Ausprägung der vier Kapazitäten und der ihnen zugeordneten Aspekte von Einfluss sind auf die Möglichkeiten, die Bürgerenergiegenossenschaften haben, um Ladeinfrastruktur bereit zu stellen. Obwohl das Maß an Professionalität und die vorhandenen Kapazitäten zwischen den untersuchten Genossenschaften variieren, hatten alle bestimmte Kapazitäten gemeinsam. Diese werden darum als essentiell angesehen, um Ladeinfrastruktur realisieren zu können. Alle fünf Genossenschaften hatten eine Mischung aus intrinsischen (Umwelt-) und eigennützigen Motiven. Außerdem spielte immer eine „konkrete Anleitung“ eine Rolle, die aus lokalen Umständen heraus entstanden war. Alle Genossenschaften hatten Ihre Ladeinfrastruktur-Visionen auf die relevanter Partner ausgerichtet

(sowie auf Kommunen als auch auf lokale Unternehmen) und auf dieser Grundlage einige „shared storylines“ erstellt. Diese halfen Ihnen, (finanzielle) Mittel zu mobilisieren. Außerdem sind sowohl individuelle, als auch kollektive „entrepreneurs“ wichtig, die das Ladeinfrastruktur-Projekt voran treiben und dafür werben. Daneben scheint es essentiell zu sein, ein interdisziplinäres Team von aktiven Mitgliedern zu haben, die Fähigkeiten und Wissen aus diversen Professionen mitbringen und dadurch die Genossenschaft in die Lage versetzen Projekte professionell zu planen und auszuführen (z.B. finanzielle, administrative, Fund Raising, Marketing und technische Fähigkeiten). Spezifisches Wissen über Ladeinfrastruktur schien weniger notwendig zu sein, da man sich dieses auch durch learning-by-doing oder über seine (genossenschaftlichen) Netzwerke aneignen kann. In Zusammenhang hiermit ist es entscheidend, starke lokale, persönliche sowie genossenschaftliche Netzwerke zu haben, die Genossenschaften bei der praktischen Umsetzung ihrer Projekte unterstützen können, über die von Erfahrungen anderer gelernt werden kann, oder über die man seine eigenen Konzepte und Ideen verbreiten kann. Außerdem scheint es hilfreich zu sein, schon in der Vergangenheit Projekte erfolgreich ausgeführt zu haben. Nicht nur, weil Genossenschaften aus ihren früheren Erfahrungen lernen konnten, sondern auch weil frühere Erfolge Vertrauen innerhalb der Bevölkerung, der Kommune und bei anderen relevanten Akteuren aufgebaut haben. Zu guter Letzt schien Rückendeckung und Unterstützung von staatlicher Seite sehr wichtig zu sein, um finanzielle Mittel zu generieren und generell ernstgenommen zu werden. Kommunale Unterstützung erwies sich vor allem als unerlässlich bei der Realisierung von Ladeinfrastruktur auf öffentlichem Parkraum, wofür die Kommunen zuständig sind.

Wenn eine Energiegenossenschaft genügend Kapazitäten zu haben scheint, gibt es mehrere Möglichkeiten, wie sie Ladeinfrastruktur selbst realisieren kann. Die meisten untersuchten Genossenschaften haben die Rolle des *„Charge Point Operators“ (CPO)* übernommen, sind also Betreiber der Ladesäulen, und/oder sind Energielieferant für den Ladestrom geworden. Letzteres tun viele über einen *white label* Vertrag. Hierbei wird die Energie unter eigenem Namen angeboten, aber über einen anderen Energielieferanten vermarktet. Eine untersuchte Genossenschaft hat auch die Rolle des *„E-Mobility Service Providers“ (EMSP)* selbst übernommen. Da dies jedoch eine relativ hohe administrative Kapazität erfordert, ist es für die meisten Bürgerenergiegenossenschaften wahrscheinlich eher anzuraten, diese Dienste extern in Auftrag zu geben. Ladeinfrastruktur auf öffentlichem Grund scheint nur bei gegebener kommunaler Unterstützung empfehlenswert zu sein. Für rurale Gebiete, in denen nur wenige Menschen auf öffentliche Park- und Ladefazilitäten angewiesen sind, scheint es außerdem eine gute Strategie zu sein, Ladeinfrastruktur mit anderen sozialen Diensten oder bestehenden Unternehmen zu verknüpfen, um auf diese Art und Weise die öffentlichen Lademöglichkeiten attraktiver zu machen.

Mit Bezug auf Geschäftsmodelle für „Genossenschaftliche Ladeinfrastruktur“ muss deutlich gesagt werden, dass keines der untersuchten Ladeinfrastruktur-Modelle bisher profitabel ist und viele auch noch nicht kostendeckend sind. Dies zu erreichen ist momentan noch schwierig. Um in den Niederlanden eine gängige AC Ladesäule über einen Zeitraum von fünf Jahren kostendeckend zu betreiben, wird eine Ladestromabnahme von ca. 6000 kWh pro Jahr benötigt, was etwa zwei gut genutzten Car Sharing Autos entspricht. Diese Berechnung basiert darauf, dass Elektrizität für den heutigen Durchschnittsmarktpreis (in den Niederlanden) in Höhe von 35 ct/kWh an den Endkonsumenten verkauft wird. Solch einen hohen Nutzungsgrad zu erreichen ist nur an gut angebundenen, zentralen Standorten möglich. Allerdings übernehmen viele Genossenschaften gerade unrentable Ladesäulen von anderen Anbietern oder realisieren selbst Ladesäulen an Standorten, an denen Marktparteien noch nicht bereit sind in öffentliche Ladeinfrastruktur zu investieren – wegen des erwarteten niedrigen Nutzungsgrades. Jedoch haben Energiegenossenschaften Möglichkeiten, um Kosten zu reduzieren: Sie können den Nutzungsgrad z.B. erhöhen, indem ihre Ladesäulen von e-Car

Sharing Flotten genutzt werden. Energiegenossenschaften sollten Ihre eigene erneuerbare Energie über ihre Ladesäulen vertreiben. Dies erbringt nicht nur Einnahmen durch den Verkauf ihres Stroms, sondern ermöglicht es Genossenschaften auch fiskale Vorteilen oder Subventionen zu nutzen, die für erneuerbare Energieprojekte vergeben werden. Zumindest in den Niederlanden konnten so bedeutende finanzielle Mittel genutzt werden. Außerdem können Genossenschaften innerhalb ihres genossenschaftlichen Netzwerkes kooperieren, z.B. was EMSP- oder administrative Dienste betrifft, um so Kosten zu sparen.

Alles in allem kann man sagen, dass die meisten Genossenschaften die Idee attraktiv finden, ihre bereits existierenden Projekte (wie z.B. Erzeugung erneuerbarer Energie und ihren eigenen Ladebedarf, bzw. den ihrer Mitglieder) durch eigene Ladeinfrastruktur verbinden zu können. Dies kann oftmals auch als logischer Schritt betrachtet werden. Viel wichtiger erwies sich allerdings, dass Energiegenossenschaften, angetrieben durch Ihre intrinsischen (Umwelt-) Motive, eine Rolle übernehmen, in der sie vor allem dort öffentlich zugängliche Ladeinfrastruktur realisieren, wo der Markt (noch nicht) bereit dazu ist darin zu investieren. Diese Rolle wird auch von externen Akteuren, wie z.B. Unternehmen aus dem Sektor der Energiewirtschaft oder Kommunen teilweise erkannt. Angesichts dieser Erkenntnis bleibt die Frage bestehen, ob Energiegenossenschaften sich auf lange Sicht als relevanter Ladeinfrastruktur-Betreiber entwickeln werden, oder ob sie diese Rolle nur werden übernehmen können, bis die Verkehrswende in vollem Gange ist und Marktparteien dies übernehmen werden. Andere Genossenschaften können von den untersuchten Vorreiter-Projekten lernen, dies tun sie bereits innerhalb ihrer „genossenschaftlichen Welt“, in der jeder jedem gerne hilft. Allerdings ist öffentlich zugängliche Ladeinfrastruktur zur Zeit noch ein risikoreiches Geschäftsmodell und komplex zu realisieren. Vor diesem Hintergrund muss jede Energiegenossenschaft für sich selbst abwägen, ob Sie mit Ihren gegebenen Kapazitäten ein neues Marktsegment betreten können.

Beschränkungen dieser Untersuchung sind, dass nicht für alle untersuchten Fälle Respondenten mit genügend diversen Blickwinkeln interviewet wurden. Allerdings konnten die Daten, die in diesen „extra“-Fällen erhoben wurden, teilweise mit den Daten aus anderen Fällen trianguliert werden. Außerdem ist der Umfang/die Reichweite der Untersuchung beschränkt. Zum Beispiel wurden smart charging Optionen, ein momentan sehr wichtiges Thema im E-Mobilitätssektor, aufgrund beschränkter Zeit und Kapazitäten nicht miteinbezogen. Daneben entwickelt sich der Ladeinfrastrukturmarkt und die dazugehörigen Technologien sehr schnell und der Aufbau von Ladeinfrastruktur ist noch eine recht neue genossenschaftliche Aktivität. Damit ist noch nicht abzusehen, ob Genossenschaften auf lange Sicht relevante Anbieter werden können und welche Ladeinfrastrukturmodelle sich hierfür durchsetzen werden. Um dies herauszufinden, müsste eine vergleichbare Untersuchung in ein paar Jahren erneut ausgeführt werden. Eine andere Möglichkeit für zukünftige Untersuchungen zu dem Thema könnte eine mehr quantitative Herangehensweise sein, wodurch mehr Genossenschaften, womöglich auch aus mehr Ländern, untersucht werden könnten. Dies könnte es ermöglichen deutlichere Muster zwischen bestimmten vorhandenen Kapazitäten und realisierbaren Ladeinfrastruktur-konzepten zu erkennen.

List of Abbreviations

AC	Alternating Current
BERMeG	BürgerEnregieRheinMain eG
CP	Charge Point
CSO	Charging Service Operator
DC	Direct Current
DSO	Distribution Service Operator
e-CS	e-Car Sharing
EEG	Erneuerbare-Energien-Gesetz
eG	eingetragene Genossenschaft („listed cooperative“ – Author’s own translation)
EMSP	E-mobility Service Provider
EV	Electric Vehicle
EVCI	Electric Vehicle Charging Infrastructure
FTE	Full time employees
GP	GrunnegerPower
ICE vehicles	Internal Combustion Engine Vehicles
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilo-Watt hour
LE	LochemEnergie
LEI	Local Energy Initiative
PCR	Post Code Roos
SDE	Stimulering Duurzame Energieproductie
SE	Social Enterprise
SME	Small/middle Enterprise
TSO	Transmission Service Operator
VE	VrijstadEnergie

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1 Introduction

1.1 Introduction and motive of the research

Climate change is one of the most urgent challenges of our time. The newest report of the Intergovernmental Panel on Climate Change (IPCC) published in October 2018 shows that climate-related risks for ecosystems as well as humans are significantly higher given an increase of global average temperature of 2.0 °C than given an increase of 1.5°C. It is therefore very advisable to strive for no more than 1.5°C of global warming. To achieve this, global anthropogenic greenhouse gas (GHG) emissions need to decline rapidly in the upcoming years and reach a net zero around 2050. This will require a combination of many different mitigation measures and transitions towards low-carbon systems in many sectors, including the energy and transport sector (Intergovernmental Panel on Climate Change, 2018). Achieving a transition to 100% renewable energy across all sectors in Europe by 2050 is possible. One prerequisite for this is however, that the transport sector needs to move from being almost entirely based on fossil liquid fuels to a mixture of renewable liquid fuels, methane, hydrogen and electricity direct (Ram et al., 2018). The electrification of the transport sector thus plays an important role to meet global GHG emission targets.

In order to make use of the full emission reduction potential of Electric Vehicles (EVs), they need to be powered by sustainably generated electricity (Ajanovic & Haas, 2016; Orth & Proll, 2018). This remains problematic in many countries where the share of renewables in the total energy mix is still low, as for example in the Netherlands, where the share of renewables was only 6.6 % in 2017 (Planbureau voor de Leefomgeving, 2018). However, research on the whole lifecycle of EVs - from production to disposal (as compared to the lifecycle´s of Internal Combustion Engine (ICE) cars) has shown that even if using predominantly fossil based electricity, EV usage can reduce 16 – 27% of GHG emissions (Ministry of Economic Affairs, 2016; Nationale Plattform Elektromobilität, 2018). Furthermore, the diffusion of E-mobility can make a significant difference regarding the heavy local pollution that especially many inner cities face and that is connected to considerable health risks (Altenburg, Schamp, & Chaudhary, 2015).

E-mobility in the advance – and a need for charging infrastructure

For the above-mentioned reasons, it is widely acknowledged by scientific literature as well as by many governments that an increased market share of EVs is desirable and necessary. This is reflected in government activities around the world aiming at stimulating the uptake of EVs (on local and national governmental levels, but also within intergovernmental constellations) (Ajanovic & Haas, 2016; Hall & Lutsey, 2017; Ministry of Economic Affairs, 2016). The measures most widely used are monetary measures such as tax exemptions or reductions. Among the non-monetary measures ensuring the wide availability of charging stations is important (Ajanovic & Haas, 2016).

Electric Vehicle Charging Infrastructure (EVCI) knows many challenges, such as the need to make use of more smart charging and locally generated energy to release pressures on the electricity grid (Hall & Lutsey, 2017). Most importantly, however, a comprehensive and coherent (public) charge point network is needed which requires a rapid diffusion of EVCI. Firstly, because a strong growth of the EV market share is expected in the upcoming years (Ministry of Economic Affairs, 2016; Schramek, 2018), which can only be accommodated if the charging infrastructure grows along (Ministry of Economic Affairs, 2016). Secondly, the availability of public EVCI is seen as a bottleneck for the further uptake of EVs (Hall & Lutsey, 2017; Markkula, Rautiainen, & Jäventausta, 2013). A statistical link has been found between the availability of public charging infrastructure and EV uptake in countries, indicating that in order to stimulate EV uptake, publicly accessible EVCI needs to be provided on a

wider scale (Hall & Lutsey, 2017). It is needed to reduce "range anxiety", the fear that one will not be able to reach one's destination due to the limited range of the vehicle (Madina, Zamora, & Zabala, 2016). The dilemma here is, that while public EVCI is required to further stimulate the uptake of EVs, it is usually not profitable to build CPs where there are not yet enough EVs that can use them. This problem is usually called the "chicken-or-egg problem" of EVCI, referring to the question what should come first: EVs or EVCI (Markkula et al., 2013)?

In order to accomplish the needed rollout of publicly accessible charging infrastructure, manifold efforts made by different actors will be needed (Hall & Lutsey, 2017).

"The energetic society" and the rise of Local Energy Initiatives

Experiences show that collaborative approaches with many stakeholders engaged have been most successful in promoting the provision of EVCI. Until now, a multitude of predominantly business and governmental stakeholders (e.g. power companies, automakers, private charge point providers and municipalities) has been involved into this process, but civil society actors are hardly ever mentioned in scientific literature or in government programs (Hall & Lutsey, 2017).

This can be seen as surprising, given the fact that in the past years, a political shift has taken place that led to a situation in which many governance goals are not achieved top-down by government-activity, but by a cooperation of state, market and civil society (Douglass & Friedmann, 1998). This can especially be observed in the planning field, where not only in practical governance, but also on a theoretical level a lot of research has been conducted on concepts like "collaborative planning" (Innes, 2010), building "civic capacity" (Healey, 2015) or the role of "vital coalitions" (Horlings, 2010) that are all pointing at planning as a collective endeavor between state, market and civil society.

In line with this political shift, governments around the world increasingly recognize the importance and potential of using the capacity of bottom-up initiatives from within society (Walker & Shannon, 2011). For instance, a dominant framing that came up in the Netherlands in recent years is that of the "energetic society", which points at the notion that governmental policy needs to make use of the initiatives that exist within society, such as community cooperatives (Arnouts, Boonstra, de Jong, Schepernisse, & van der Steen, 2016). This "energy" can indeed be observed throughout Europe in many sectors, for example in the field of renewable energy and sustainable practices. The number of so-called Local Energy Initiatives (LEIs), characterized as organizations that are initiated by civil society actors and aim at the production or provision of renewable energy and related activities, has risen immensely in the past years. In Germany, for example, the number of LEIs grew from 136 in 2008 to 888 in 2013 (Hoppe, Graf, Warbroek, Lammers, & Lepping, 2015). Similar developments can be observed throughout Europe (Arentsen & Bellekom, 2014).

LEIs and community initiatives seem to be accepted by scientists as well as by governments as relevant actors within the energy transition, namely as producers of renewable energy and as actors that enhance the societal acceptance thereof. This is reflected in the various scientific publications on Local Energy Initiatives (e.g. Arentsen & Bellekom, 2014; Hoppe et al., 2015; Oteman, Wiering, & Helderman, 2014; Seyfang & Smith, 2007), but also in policy documents that explicitly mention civic participation and energy cooperatives. An example is the Dutch Proposal for the key points of the Climate Agreement, which contains a whole paragraph designated to the role of active citizen participation (e.g. *Proposal for key points of the Climate Agreement*, 2018).

1.2 Problem Statement: Why LEIs should be taken into account

The (possible) role of LEIs in the provision of EVCI, however, seems to be ignored so far by both scientists and governments. The provision of EVCI is currently predominantly organized by businesses and governmental actors (Hall & Lutsey, 2017), and only in very few cases initiated by LEIs. However, one can find many potential advantages of LEIs being involved in the local energy transition in scientific literature. These advantages are expected to also be valid in cases where LEIs are involved in the local provision of EVCI.

Firstly, Local Energy Initiatives enhance sustainable development on a local level by improving participation possibilities: people's everyday practices are expected to change more effectively through citizen participation (Hoppe et al., 2015) and locally embedded projects (Seyfang & Smith, 2007). This is relevant with regard to EVCI as personal experience with E-mobility can positively influence people´s attitude towards it (Nationale Plattform Elektromobilität, 2018). This is important as the provision of EVCI only makes sense if it is used by residents, meaning that they need to change their everyday practices.

Secondly, the solutions of Local initiatives such as LEIs often prove to have a better local fit due to their local and contextual knowledge (Seyfang & Smith, 2007). Regarding the provision of EVCI, this might mean that if an LEI is involved, constellations and business models might be found that better fit the local needs and circumstances.

This is also connected to the notion that LEIs are seen to have considerable innovative capacity. As "innovative niches" that combine existing technologies and organizational models in new ways, they question the dominant regime and can function as seedbeds for innovation (Arentsen & Bellekom, 2014). They have "comparative power", offering alternatives to the mainstream which pressures the mainstream to reflect on itself (Seyfang & Smith, 2007). The mainstream in the case of the provision of EVCI could either be dominant modes of transportation in the region (e.g. ICE vehicles) or the constellation of actors that are usually involved in the provision of EVCI.

Furthermore, as has been pointed out above, it is important that EVs are charged with sustainably generated electricity (Ajanovic & Haas, 2016). Given the fact that LEIs usually have environmental motives (Arentsen & Bellekom, 2014) and are often already involved in the generation of renewable energy, one could also expect that LEIs will see it as a main ambition to provide sustainable EVCI. The Dutch Ministry of Economic Affairs also sees a potential of LEIs regarding the direct use of locally produced sustainable electricity for charging EVs to relive the electricity-grid (Ministry of Economic Affairs, 2016).

However, LEIs also face many challenges that can hinder their successful stake. Among other constraining factors, LEIs are usually characterized by a limited capacity and cost-effectiveness, have difficulties to spread risks of project failure (Creamer et al., 2018), are usually heavily dependent on the work of volunteers (Wüste & Schmuck, 2012) and on other governmental and market-actors (Creamer et al., 2018). LEIs are usually dependent on a mix of supportive contextual factors (Seyfang & Smith, 2007) and require governmental backing from at least the local government (Hoppe et al., 2015; Horlings, 2010).

Taking into consideration the many potential advantages of an involvement of LEIs in the provision of EVCI, but also the many challenges that can hinder them in doing so, it seems relevant to get a better understanding of the capacities LEIs need to get involved in the local provision of EVCI. Secondly, a better understanding of the roles LEIs can play in the existing EVCI market is needed.

1.3 Research objectives and questions

The objective of this research is to get a better understanding of the role Local Energy Initiatives can play in the provision of EVCI at a local level, given the specific capacities of their own organization and the (local) contextual factors that might influence their possibilities of taking a stake in the provision of EVCI. This relation is to be ascertained by studying four front-runner cases of LEIs being involved in the provision of EVCI with regard to the capacities they can draw on and by identifying the role they took in the provision of EVCI. Based on the patterns found between these factors, lessons learned will be formulated for other LEIs attempting to take a stake in the provision of EVCI.
To achieve this research objective, the following main research question has been formulated:

> ***Given the specific combination of capacities that Local Energy Initiatives (LEIs) have at their disposal in a certain local context, which role can LEIs play in the local provision of Electric Vehicle Charging Infrastructure (EVCI), and what can other LEIs who are attempting to get involved in the provision of EVCI learn from this?***

To be able to answer the main question, several sub questions have been formulated:

1) Which combination of capacities can the studied LEIs draw on?
2) Which other factors helped enabling the LEIs to provide EVCI at the local level?
3) Which role do the LEIs play in the provision of the EVCI?
4) What patterns can be found in the relation between the existing combination of capacities and the role that has eventually been chosen by the LEIs?
5) What potential lessons can other LEIs who are attempting to get involved in the provision of EVCI draw from this?

1.4 Relevance of the research

1.4.1 Societal Relevance

As has been shown in the introduction of this thesis, further developing publicly accessible EVCI will be crucial in the upcoming years due to the expected growth of the EV market share, but also as an instrument to stimulate the desired further uptake of EVs (Hall & Lutsey, 2017; International Energy Agency, 2018; Madina et al., 2016; Ministry of Economic Affairs, 2016; Nationale Plattform Elektromobilität, 2018). Experience from EVCI provision so far has shown that multi-actor and collaborative approaches have been most successful (Hall & Lutsey, 2017). These collaborations on the provision of charging infrastructure have so far predominantly taken place between different government levels and businesses, but civil society actors such as Local Energy Initiatives or other grassroots organizations have only been involved in very few cases. The involvement of LEIs has proven to have had several positive effects with regard to renewable energy projects: Enhancing societal acceptance and social learning through citizen participation (Hoppe et al., 2015), a better local fit of solutions (Seyfang & Smith, 2007) and innovative combinations of existing technologies and organizational models (Arentsen & Bellekom, 2014). These advantages might also be valid for cases in which LEIs are involved in the provision of EVCI. This would be very favorable: Social learning or behavioral change are needed as EVCI can only become economically sustainable if enough EV users make use of them (Markkula et al., 2013). Therefore, residents need to change their habits by making use of e-mobility and the connected charging infrastructure.

Secondly, a better local fit of EVCI might be especially important in rural areas or small towns where e-mobility might be especially needed due to less public transport but where EVCI is at the same time still lagging behind compared to metropolitan areas. Rural areas are expected to need different EVCI solutions than big cities (Strunk, 2018). These concepts need to be found and LEIs might be able to play an important role in this. This is connected to the third advantage, the innovative capacity of LEIs. EVCI still knows many challenges, such as smart charging and the direct use of locally generated renewable energy to release pressure on the electricity grid (Hall & Lutsey, 2017; Ministry of Economic Affairs, 2016). Local solutions developed by LEIs have a potential to help find innovative new concepts as answers to these EVCI-challenges (Ministry of Economic Affairs, 2016).

Therefore, a better and more systematic understanding of the circumstances and factors that have enabled or constrained LEIs in existing cases, but also of the concepts and roles that work for LEIs within the EVCI market, is required. This knowledge can empower LEIs to enhance the provision of EVCI in their region by helping them to identify whether and in which ways the provision of EVCI is feasible for them.

Furthermore, this knowledge can be useful for the increasing number of LEIs is that is currently considering to get involved in the provision of EVCI (e.g. 37 out of 102 German LEIs in 2017) ("Zukunftstrend Elektromobilität," 2019). Learning from pioneer or front-runner cases has already proven to be useful for LEIs (Hoppe et al., 2015). It is therefore expected that also this research, in which pioneering LEIs on the field of EVCI are being studied, will be useful for LEIs. Besides, it seems to be crucial for LEIs to learn from each other, also across borders and within the European context (REScoop, 2018). This research can contribute to this cross-border learning among LEIs, at least between Dutch and German LEIs.

1.4.2 Scientific Relevance

For the scientific relevance of this research, one can point at a knowledge gap regarding the role of LEIs in the provision of EVCI and the circumstances LEIs need for entering the EVCI market. There has

been done a lot of research on different charging modes, business models for EVCI, EVCI market models and different roles that are needed for the provision of EVCI (Madina et al., 2016; Markkula et al., 2013; Robinson, Brase, Griswold, Jackson, & Erickson, 2014; San Román, Momber, Abbad, & Sánchez Miralles, 2011; Sanchez-Miralles, Gomez San Roman, Fernandez, & Calvillo, 2014). A brief review of this research can be found in chapter 2.

Likewise, comprehensive scientific literature can be found on the nature, motives, effects as well as enabling and constraining factors of Local Energy Initiatives, Community Energy and grassroots movements (Arentsen & Bellekom, 2014; Creamer et al., 2018; Hoppe et al., 2015; Oteman et al., 2014; Ruggiero, Martiskainen, & Onkila, 2018; Seyfang & Smith, 2007; G. Walker & Devine-Wright, 2008). However, these two research fields have not been combined yet. Given the societal relevance described above, the combination aimed at in this thesis is expected to produce relevant knowledge: Regarding the enabling and constraining factors for LEIs to get involved in the provision of EVCI, the kind of roles LEIs are able to play within the EVCI market, and the innovativeness of their EVCI concepts.

Besides, Oteman et a. (2014) have shown in their research that there is varying institutional space for the development of LEIs in different countries. They found out that there is very limited space for LEIs in the mostly market-oriented Dutch institutional arrangement, while there is significantly more space for LEIs in the German state-led institutional arrangement that is currently aiming at a decentralized energy transition. Although my research is focusing on local circumstances rather than macro-level circumstances, it can still build on Oteman et al.'s (2014) findings by inquiring whether a similar difference between Dutch and German LEIs' circumstances can also be found with regard to EVCI.

Furthermore, it is crucial for LEIs to find a sound business model. However, there has not been much research done on the financial sustainability of LEIs and their projects. Becker, Kunze, and Vancea (2017) have made a step into this direction by combining the concepts of LEIs and social enterprises. However, they focus on the purposes and ownership-characteristics of social enterprises in the energy sector as well as on their embeddedness in the local community. These aspects cannot function as explaining factors for which role an LEI/social enterprise can play in a new market. By combining a framework of four community capacities that community initiatives can draw on to implement sustainable projects with factors from SE literature, this thesis attempts to help build a conceptual framework that helps to explain the role LEIs can play in a new sector.

1.5 Outline of the thesis

After this introducing chapter, the theoretical background of this thesis, including the conceptual model used, will follow in chapter two. In chapter three, the research design and strategy as well as the strategy for data collection and analysis are elaborated. Chapter four gives a broad overview on EVCI-related policies in both the Netherlands and Germany, as well as on the position of LEIs in both countries.

Chapter five depicts the results of this research. After detailed descriptions of the five studied LEIs, their chosen EVCI models, and their capacities, lessons learned are formulated. In chapter six, the conclusion of this thesis follows, including a reflection on the conceptual model. The thesis is finished with a discussion of the research's limitations and possible future research.

2 Theoretical Framework

2.1 Background on Electric Vehicle Charging Infrastructure (EVCI)

2.1.1 Conceptualization of most important charging modes

EV charging differs from the fueling of Internal Combustion Engines (ICE) in many ways. In the last decades, customers have got used to visiting a gas station for several minutes once in a while, quickly fill their tank and bill with cash or credit. Charging an EV battery, at the current stadium of EVCI development, diverts from this routine. There are different standards, power levels, charging times and billing methods (Markkula et al., 2013). Markkula et al. (2013) summarize the differences between filling an ICE tank and charging an EV from a customer perspective in table 1 below.

Table 1: Differences between ICE tanking and EV charging from a customer perspective (Markkula et al., 2013).

	EV	ICE
Duration of visit	20 min to 10 h	2 – 5 min
Operational range	100-300 km	500 – 1100 km
Price of Energy per 100 km	2 -5 €	8-14 €
Public access	difficult	easy
Home access	easy	not possible

These charging differences also imply that the deployment and provision of EV charging infrastructure is somewhat different than that of gas stations. Compared to gas stations, there are many different solution options for EVCI, including different technologies, billing methods, locations, actor relationships and business models, which leads to a more complex market (Madina et al., 2016; Markkula et al., 2013). To get hold of the different solution options in a systematic way, one can make use of a morphological analysis (figure 1) giving an overview over the many possible options by using different categories each consisting of different attributes (Madina et al., 2016; Markkula et al., 2013). The attributes on the very left have the lowest complexity and service level, whereas the attributes on the right are the most complex ones and imply a high service level. This means that a combination of left-hand side attributes is easy to fulfill but has a low service level and might therefore not be successful in enhancing EV usage. Deploying a combination of attributes on the right hand side, however, is difficult, expensive, and involves many different actors (Markkula et al., 2013).

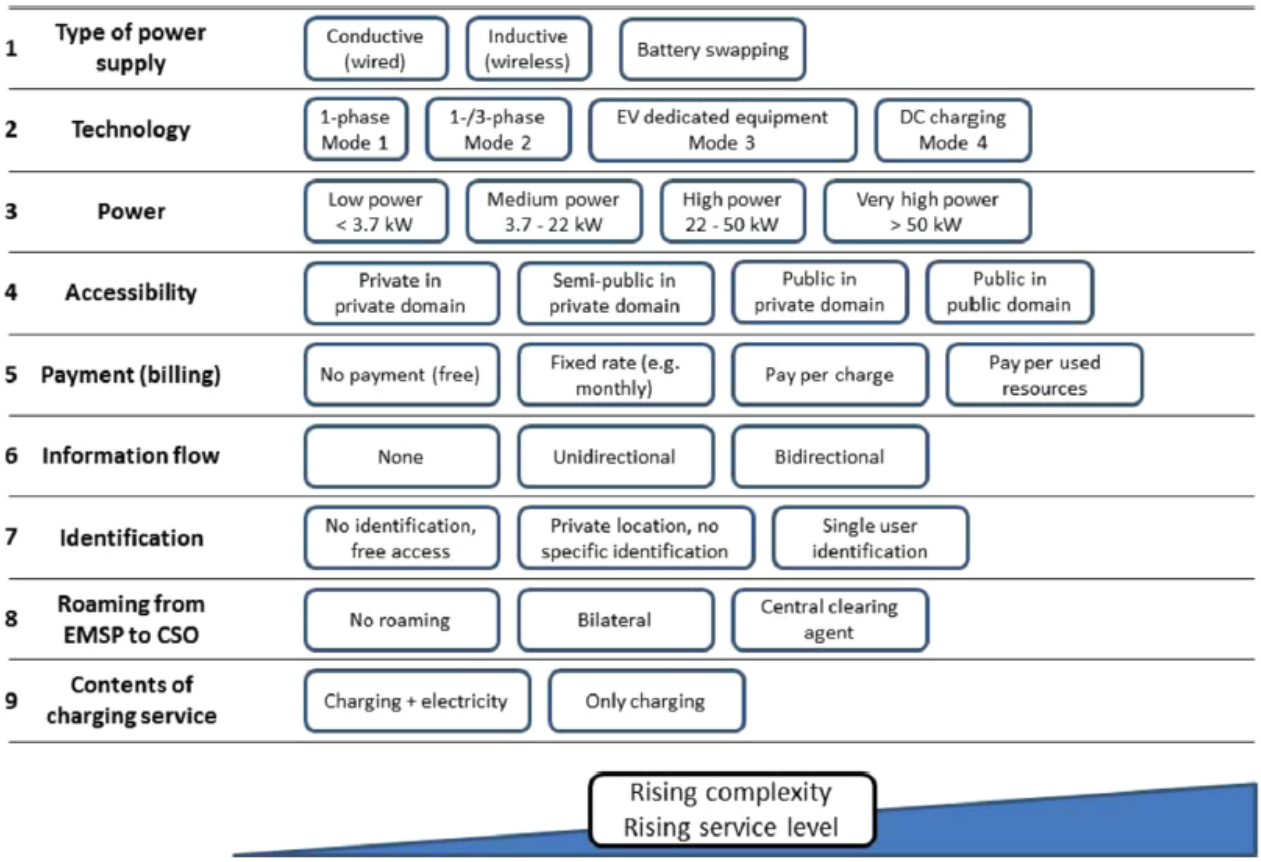


Figure 1: Morphological box for different charging alternatives for EVs (Madina et al., 2016).

Different authors extract different most relevant combinations and thus EVCI models out of the possible options the morphological box offers. There is definitely no lack of proposed EVCI models and business models in the scientific literature (Markkula et al., 2013), however, there is a lack of clear definitions (San Román et al., 2011).

Of the nine categories listed in figure 3, technology, power, and accessibility will be discussed in more detail below. Regarding the other categories, the different possible options are neglected in this paragraph, for the following reasons: All studied cases have implemented conductive power supply (the other two options are currently still very rare on the market). The billing is discussed in paragraph 2.3.4 under “price mark-up model”. The form of information flow is especially important for smart charging options, which are due to the limited scope of this thesis not included into this research. Identification is connected to the chosen billing method. Roaming is covered in paragraph 2.3.3 and finally, the contents of the charging service are charging and electricity in all studied cases.

Technology & Power

The level of charging power determines the charging speed. Generally spoken, three broad categories based on speed are distinguished: Level 1, Level 2 (both alternating current (AC)) and direct current (DC) fast charging (Hall & Lutsey, 2017). An overview of the three categories can be found in Table 2 below.

Table 2: Overview Level 1, Level 2, and DC fast charging (Hall & Lutsey, 2017).

Charging level	Voltage (V)	Typical power (kW)	Setting
Level 1	120 V AC	1.2–1.8 kW	Primarily residential in North America
Level 2	200–240 V AC	3.6–22 kW	Home, workplace, and public
DC fast	400 V DC	50 kW or more	Public, primarily intercity

V = volt; AC = alternating current; DC = direct current; kW = kilowatt

Accessibility

In general, there is a difference between private charging and publicly accessible charging.

Within **private charging**, a general difference between home and workplace charging can be made. Sanchez-Miralles et al. (2014), for example, distinguish office parking spaces and home parking or garages. Madina et al. (2016) only extract one private charging scenario out of the morphological box (figure 3), which they simply call “private home charging”.

Currently, EVs are most of the time charged at home or at the workplace – in about 80% of all cases (Götting, 2018). It is expected that this will trend will stay in place, leaving public charging in the role of rather sporadic use (Madina et al., 2016) because home or workplace charging will stay cheaper as compared to commercial charge points (Götting, 2018). Although private charging will stay important, there will be a shift towards more workplace charging (International Energy Agency, 2018) and charging at a publicly accessible charge point close to home (Götting, 2018). The reason for this is that until now, EV usage has predominantly been a privilege of people owning their own home and thus being able to install their own charging point. However, with an overall increase of EV usage, also an increasing number of people who do not own their own home and do not have access to private parking will make use of EVs (International Energy Agency, 2018). This trend requires the availability of more public charging possibilities in residential areas, including new concepts, such as charge points that are connected to street-lamps in residential areas (Götting, 2018). Concepts like this need to be counted underneath the category of publicly accessible charge points.

Regarding **publicly accessible charging infrastructure**, there is a general difference between public charging points (located on public property) and publicly accessible charging points on private ground. The latter is sometimes also called semi-public charging points and can either be fully accessible or publicly accessible with certain restrictions (e.g. only during the opening hours of a shop or a parking garage where the CP is located) (Hall & Lutsey, 2017). Furthermore, it can be generally distinguished between (mostly level 2) charge points in inner cities or traffic hotspots that are usually located at public or semi-public parking spaces on the one hand, and (DC) fast charging points on the other hand that can usually be found next to highways that enable long distance travel (Madina et al., 2016).

2.1.2 Different roles and agents in the EVCI market

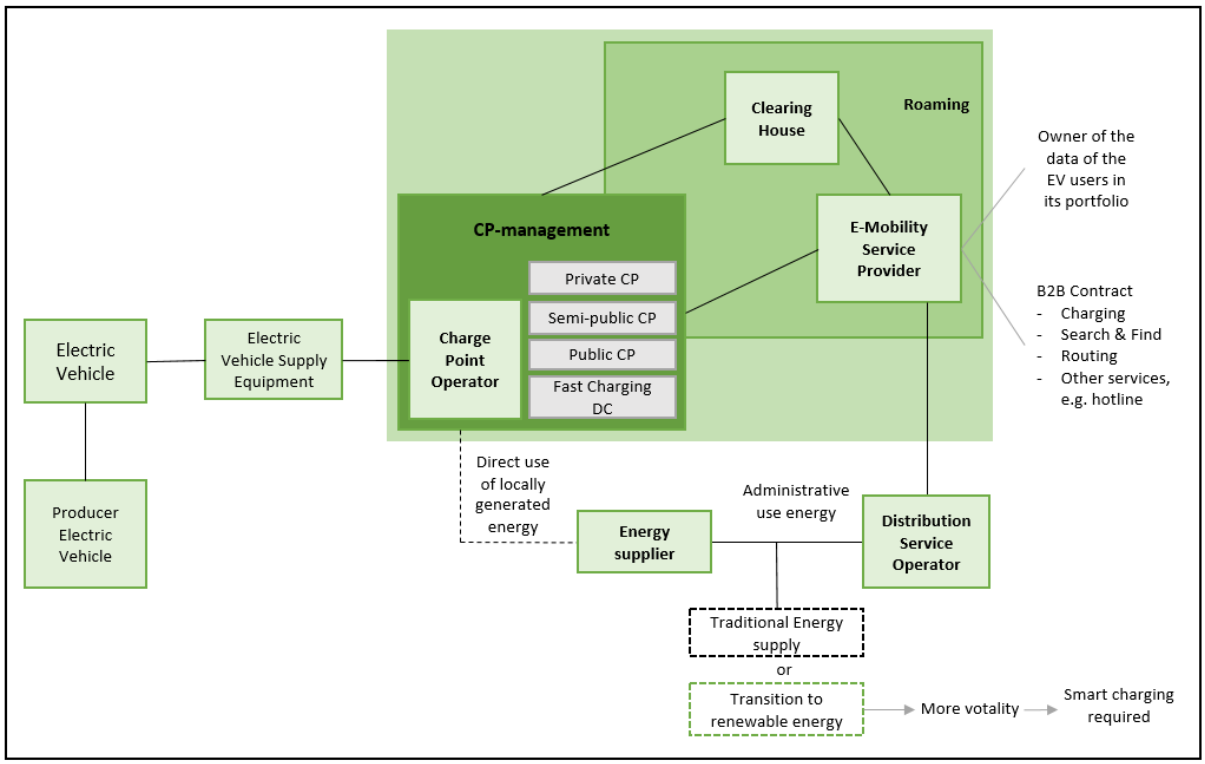


Figure 2: Roles within the EVCI-market (source: own representation).

Different roles are needed to provide Electric Vehicle Charging Infrastructure. All these roles are part of the value chain for EVCI (figure 2). It is preferred to speak about roles rather than about stakeholders or actors as new roles emerging in the EVCI market might either be played by established actors or by new entrants of the market. The tasks will remain defined by the role however, without regard to the specific actor playing that role (Madina et al., 2016). There is extensive literature available regarding the different roles within the market and how they relate to each other in the different charging modes that have been described in the previous paragraph (Madina et al., 2016; San Román et al., 2011; Sanchez-Miralles et al., 2014). Different scholars use slightly different terms to describe the different roles, but the most important ones can be defined as follows:

1) **The EV driver**, which can be defined as EV user in general (Madina et al., 2016) or EV owner (San Román et al., 2011) who charges electricity for their EV at the charging point. In this thesis, it is preferred to use the term EV user or driver as someone charging an EV is not in all cases the owner of the EV, given the fact that a high potential is seen in, for instance, e-Car Sharing models (Ministry of Economic Affairs, 2016).
2) **The Charging Service Operator (CSO)** (Madina et al., 2016) or **Charging Point Manager (CPM)** (Ruggiero et al., 2018) or **Charge Point Operator (CPO**). This role is responsible for providing the physical equipment needed for the charging process (e.g. charging points), but also for the management of the charging session and for monitoring and maintenance (Madina et al., 2016). According to San Román et al. (2011), a CPM can be in different possible situations:
    - a resident who installs an EV charging point at home for private use.
    - An office building owner installing charging points for the use of his employees.
    - A commercial building owner who installs charging points at his parking spaces for the use of his customers or for public use.

- An EV charging point owner who installs several charging points for public use (San Román et al., 2011, p. 6362).

The CSO/CPM/CPO can be the one offering the charging service including the infrastructure and the electricity to the end user. In that case, he buys the required electricity for either his own use or to resell it to other EV users who make use of his charging point (San Román et al., 2011). In other cases, the CSO/CPM/CPO is only the charge point owner, who offers the service of the charge point to the e-mobility service provider (see below).

3) **The e-mobility Service Provider (EMSP)** (Madina et al., 2016) **or EV supplier-aggregator (EVSA)** (San Román et al., 2011). This role offers electro-mobility services to the end user, including charging, search & find services and other services (Madina et al., 2016). The EMSP/EVSA has a business-to-customer relationship to the EV users including all these services. However, this role has also a contract with the CPO´s or charging point owners for the use of the charging points. Nowadays, in many home charging scenario´s, the role of the EVSA/EMSP is not needed as the electricity is directly sold to the EV user by the electricity retailer. For public charging, however, an EMSP/EVSA is needed, as EV users make use of many different charging points (San Román et al., 2011). The EMSP/EVSA and the CSO/CPM can communicate regarding the charging time and amount of charged electricity via interfaces such as the Open Charge Point Interface (ECPI), which is nowadays mostly used in Europe to have a standardized communication tool (Hall & Lutsey, 2017).
4) **The Clearing House (CH)** is a platform or hub via which different CPOs and EMSPs can communicate with each other. This is important as one CP must be accessible with all different charging cards that are available in the market. In the Netherlands, the so called Open Charge Point Interface (OCPI) protocol is used as Clearing House, while in Germany predominantly OCHP and OICP are being used (Everts, 2017).
5) **The Distribution Service Operator (DSO)** who owns and manages the regional medium and low voltage grid. This role thus distributes the electricity from the high voltage grid to the households. This role is only the owner of the grid, but cannot trade or generate energy (San Román et al., 2011).
6) **The Transmission Service Operator (TSO)**, sometimes also named Independent System Operator (ISO) who owns and operates the high voltage grid. This role is responsible for a safely working system for electricity distribution at a regional and national level (San Román et al., 2011).
7) **The Energy Supplier** who generates electricity and sells it to the end user (San Román et al., 2011). The end user can be the EV user in the case of simple home charging or the EMSP/EVSA in most cases of publicly accessible charging points.

It is expected that LEIs might play the role of the Energy Supplier, the EMSP/EVSA or the CPO, or a combination thereof. The roles of DSO and TSO will not be explicitly researched in this thesis, as it is normally fixed who is the grid operator in a certain region in both the Netherlands and Germany.

2.1.3 Business models for Public Charging

Next to different charging modes or charging scenario´s, there are also many different Business model propositions for publicly accessible, commercial charging points. Working Business Models for EVCI become increasingly important: To get EVCI up the ground, many governments have largely funded the provision of EVCI, even in cases where it could not be expected to earn the investment made back. However, as the EV market is constantly growing, the interest in charging infrastructure that becomes

commercially sustainable is growing as well (Hall & Lutsey, 2017). So, while charging modes or scenarios are defined by different combinations of technology, location, and ownership, business models look at how the charging infrastructure can be made cost-effective. Hall and Lutsey (2017) distinguish four different business models for public charging infrastructure:

- Firstly, there is the possibility to **resell electricity with a certain markup** that is needed to earn the costs of the charging infrastructure back. This is comparable to the "mark-up pricing" mechanism Markkula et al. (2013) refer to. However, this only works if the electricity price that needs to be paid by the end user stays underneath fuel costs. This mechanism is therefore only doable in e.g. European markets where fuel costs are high enough as compared to electricity (Hall & Lutsey, 2017).
- Secondly, the costs of the charging infrastructure can also be recovered **by increasing retail sales**. In that case, a shop or retail owner could install a charging point in front of their shop. The assumption is then that the EV user is going shopping while his EV is being charged. The same assumption is being made for charge points along highways (Madina et al., 2016).
- Thirdly, the EVCI business case can be **based on advertisement revenues.**

Relevant elements for creating a cost-effective EVCI-business case are:

- **The occupation of the CP**: As the price mark-p model in which energy is re-sold with a certain margin to the end user, is implemented in almost all cases nowadays, and as end-users are normally charged per charging session, per time or per kWh, the occupation of the CP plays an important role. The more often the CP is used, the more profitable it becomes. Therefore, the location of CPs is very important as well: in visible, well-connected locations CPs are expected to be used more often than in decentral locations (personal communication, N. Buiter, 09-04-2019).
- **Investment costs**, the investment that needs to be done to build the CPs. The question is who will make this investment, who can possibly co-invest, which subsidies can be made use of etc.
- **Operating costs,** the money it takes to run the CPs. These consist of **fixed costs**, such as the grid connection (to be paid to DSO), the insurance and the back-office services (to be paid to EMSP), and of **variable costs**, such as the service costs that need to be paid to the EMSP for the billing service. These are nowadays ca 3-7 cts/kWh in the Netherlands (personal communication, N. Buiter, 09-04-2019).

2.2 Conceptualization of Local Energy Initiatives

In the past years, many grassroots organizations for sustainable development have developed throughout Europe (Seyfang & Smith, 2007). Arentsen and Bellekom (2014, p. 2) see in this an emerging trend of "doing things ourselves" or a trend in which many local entities adopt the slogan "act locally, think globally". Local Energy Initiatives can be seen as one kind of such localized grassroots initiatives that deal with sustainable development "themselves" in the energy sector (Hoppe et al., 2015) (paragraph 2.1.1). Another option is to conceptualize LEIs as Social Enterprises (SEs) (paragraph 2.1.2).

As LEIs form a heterogeneous group of projects and organizational forms (Oteman et al., 2014), many different definitions for such LEIs can be found in the relevant scientific literature (Becker et al., 2017; Hoppe et al., 2015; Oteman et al., 2014). For example, LEIs can be cooperatives, community businesses or social firms (Kahla, 2017). Despite this heterogeneity, there are certain characteristics that are usually mentioned in connection to LEIs.

First of all, the term “community” plays an important role in most definitions of LEIs (Hoppe et al., 2015). This correspondents to the observation made by Arentsen and Bellekom (2014) and Walker and Devine-Wright (2008) that the wish to do something collectively and to work for better local circumstances play an important role with regard to the motives of many grassroots initiatives in the energy sector. Local initiatives in the sustainability field are usually embedded in the local community, that is they react on certain environmental, social and/or economic needs existing within the community (Becker et al., 2017). At the same time, the initiatives draw on the capacities that are available within the community (Middlemiss & Parrish, 2010). Being decentralized, non-governmental initiatives (Oteman et al., 2014) that are embedded into local communities secondly leads to the picture that LEIs are usually initiatives that are set up from within society in a bottom-up manner. However, in some cases, the creation of LEIs is encouraged by local governments (Arentsen & Bellekom, 2014). Thirdly, LEIs are usually small-sized and dependent on volunteers as well as on other actors, such as on state and market actors (Middlemiss & Parrish, 2010). They therefore have a limited capacity and cost-effectiveness (Creamer et al., 2018).

Given these locally rooted and participatory characteristics, LEIs are seen as having the potential to enhance societal acceptance of projects as well as to support behavioral change and the changing of habits towards more sustainable behavior (Hoppe et al., 2015; Seyfang & Smith, 2007). Besides, LEIs usually have a multiplicity of different motives (Peredo & Chrisman, 2006; Seyfang & Smith, 2007), often consisting of a combination of environmental, social and economic motives and a dissatisfaction with government action (Arentsen & Bellekom, 2014). LEIs usually aim at improving the situation of the local community in multiple ways (Walker & Devine-Wright, 2008). Therefore, LEIs are either not-for profit or not-only-for profit organizations.

Consequently, LEIs are often conceptualized by contrasting them to commercial organizations. For example, Walker and Devine-Wright (2008) have mapped community energy initiatives along process and outcome dimensions (figure 3). “Community energy initiatives” tend to be open and participatory process-wise and local and collective outcome-wise, while purely commercial projects (thee utility wind farm in figure 3) are rather closed and institutional process-wise and distant and private outcome-wise (Walker & Devine-Wright, 2008).

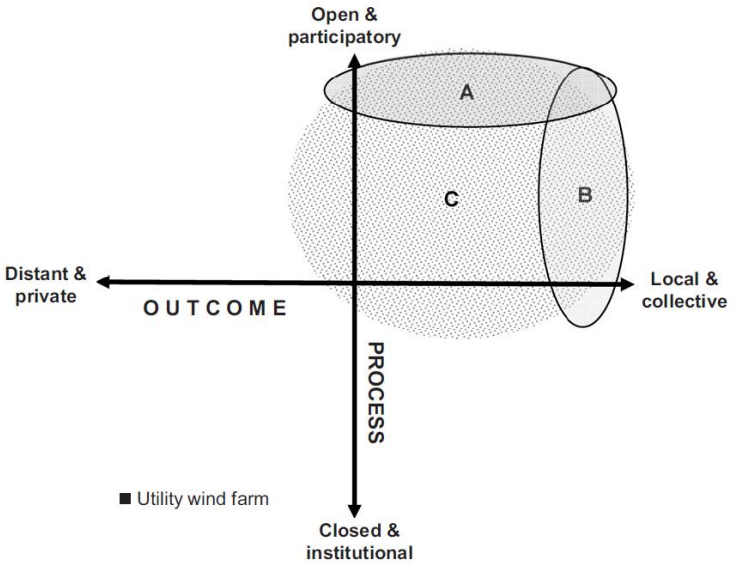


Figure 3: Mapping energy projects based on project process and project outcome (G. Walker & Devine-Wright, 2008). Distinguished in the graph are process-oriented community renewable energy projects (A), outcome-oriented community renewable energy projects, the general realm of community energy projects (C), and a purely commercial wind farm in the bottom left corner that contrasts community energy projects in both process and outcome

Also Seyfang and Smith (2007) make a clear distinction between grassroots innovations (in that case standing for our LEIs) and market based innovation. For grassroots initiatives, social need and ideological motives are the driving force, whereas for market-based projects, profit is the driving force. Furthermore, commercial firms get their income from commercial activity, whereas grassroots initiatives are usually dependent on grant funding and voluntary input (Seyfang & Smith, 2007). Similarly, Arentsen and Bellekom (2014) show that LEIs usually tend to be rather localized, community oriented and autonomous, whereas commercial firms tend to be more centralized, privately oriented and integrated into the market.

2.2.1 LEIs as grassroots innovations

Many scholars characterize grassroots initiatives and LEIs as innovative niches (Arentsen & Bellekom, 2014; Seyfang & Smith, 2007). With this notion, it is pointed at the innovative capacity of LEIs. They combine existing technologies and organizational models in new ways. In that way they question the dominant regime and can function as seedbeds for innovation (Arentsen & Bellekom, 2014). Comparably, Seyfang and Smith (2007) argue that grassroots have "comparative power": As innovative niches, they offer alternatives to the mainstream pressuring it to reflect on itself. Seyfang and Smith (2007) see the innovative capacity of grassroots initiatives, especially with regard to their what they call intrinsic and diffusion benefits. LEIs have intrinsic benefits because they have local and context knowledge which enables them to offer solutions with a better local fit than top-down approaches. Diffusion benefits relate to the above-mentioned comparative power with which innovative niches such as LEIs can pressure the mainstream.

Framing a LEI or other local initiative as an innovative niche implies that one assumes that this niche relates and contrasts in some way to the current dominant regime, meaning the dominant practices in a certain sector. According to Seyfang and Smith (2007, p. 588) a sociotechnical regime refers to the *"complex configurations of artefacts, institutions, and agents reproducing technological practices"*. These socio-technical regimes influence behavior, the scope of individual choices as well as the transformative capacity of a system. Niches are situations within the socio-technical regime in which there is space for alternative or different practices without being fully exposed by the dominant regime. If niches are successful, they can eventually influence the dominant regime. However, there is a difference between "simple niches" that do not aim at changing the regime and "strategic niches" that do seek transformations with a wider scope than just in their local case (Seyfang & Smith, 2007).

2.2.2 LEIs as Social Enterprises

Becker et al. (2017) conceptualize community energy projects as social enterprises (SEs) in the energy sector. They define them as *"collectively owned organisations that combine renewable energy production with more overarching goals of environmental and social transformation, and as specific quest for civic participation"* (Becker et al., 2017, p. 1). Just as for LEIs, there is also quite some definitional confusion around social enterprises (Díaz-Foncea & Marcuello, 2012; Trivedi & Stokols, 2011).

However, one of the most important common points within SE literature is that SEs know both economic as well as social or value oriented dimensions (Díaz-Foncea & Marcuello, 2012): they are usually at least to some extent involved in the market, but the generation of social value and/or an environmental purpose are the core of their venture (Trivedi & Stokols, 2011). Becker et al. (2017) therefore speak of dual value-creation and state that SEs are not necessarily not-for profit, but surely not-only-for-profit.

Because SEs have the aim of mitigating a recognized social or environmental need within society and therefore provide goods and services that are directly related to the needs of the community, they are per definition at least to some extent embedded into the local community (Díaz-Foncea & Marcuello, 2012; Trivedi & Stokols, 2011). They are also to some extent dependent on the social capital of that community (Peredo & Chrisman, 2006).

Lastly, SEs are normally of participatory nature and have democratic ownership structures (Becker et al., 2017; Díaz-Foncea & Marcuello, 2012). There is a multiplicity of legal forms, such as cooperatives, credit unions, community enterprises or social firms (Spear, Cornforth, & Aiken, 2009). The legal form and ownership characteristics are important as they define how social values and participation are included into the SE (Becker et al., 2017).

2.3 Factors enabling or constraining LEIs

A lot of literature on LEIs, community initiatives, and social enterprises deals with factors that can explain the occurrence, opportunities and successes of these organizations (e.g. Bomberg & McEwen, 2012; Middlemiss & Parrish, 2010; Oteman et al., 2014). Such theoretical explanations usually either have an agency-oriented focus or a structure-oriented focus (Oteman et al., 2014). Agency-oriented factors stand for characteristics of the specific organizations or projects. An argument for an agency-oriented focus is that community initiatives are usually dependent on individual characteristics such as local knowledge, leadership capabilities, their members skills and intrinsic motivations. Structure-oriented factors are institutional context factors in which an organization is embedded. This firstly includes local structures and secondly characteristics of whole policy systems or societies on a meso- and macro level (Oteman et al., 2014). As it would blast the scope of this thesis, it will not be dealt with the latter in this thesis. However, to get a general understanding of the different macro-contexts in Germany and the Netherlands, a general outline of circumstances for LEIs and EVCI policies in both countries can be found in chapter 4.

Middlemiss and Parrish (2010), whose framework for understanding the interplay between grassroots initiatives and community capacities is used in this thesis, make use of a Practice Theory approach that views agency as embedded in social structures. This implies that the success of initiatives is affected by characteristics of the initiative itself and the skills of their members (=grassroots agency) in the same way as by the nature of the community in which the initiative is embedded (=community structure) (Middlemiss & Parrish, 2010).

Following a similar approach, in this thesis, the LEIs' characteristics will be studied, supplemented by the local (institutional) context. The reason for choosing this approach is that in most literature on LEIs, grassroots initiatives, and social enterprises the embeddedness of such initiatives in local communities and contexts is being stressed (e.g. Becker et al., 2017; Peredo & Chrisman, 2006; Seyfang & Smith, 2007; Trivedi & Stokols, 2011).

2.3.1 Middlemiss & Parrish´s framework of four community capacities

In their research on the role of grassroots initiatives in building capacity for low-carbon communities, Middlemiss and Parrish (2010) provide a framework for studying the interplay between grassroots action and community capacity. They regard it as useful to connect the capacity for change to the social context in which it occurs for explaining the possible actions of grassroots initiatives. Their framework, which shows four different community capacities that grassroots initiatives can draw on to enhance sustainable development on the local level, can therefore also help to better understand the opportunities and constraints for grassroots initiatives.

At the center of Middlemiss and Parrish´s (2010) framework (figure 4) the community's responsibility for their ecological footprint is located. This responsibility is interconnected to the personal, cultural, organizational and infrastructural capacities of the community. The weaker one or several of these capacities are, the more difficult it is for the community to fulfill their ecological responsibility. The availability of these capacities can thus be seen as enabling factors, whereas their absence or weak peculiarity can be seen as a constraining factor. However, Middlemiss and Parrish (2010, p. 7561) make clear that the framework is also useful in context where *"actors have limited power, resources and ability"*. They therefore argue that the question should not be where grassroots initiative can succeed and where not, but rather in which ways they can succeed given the local context.

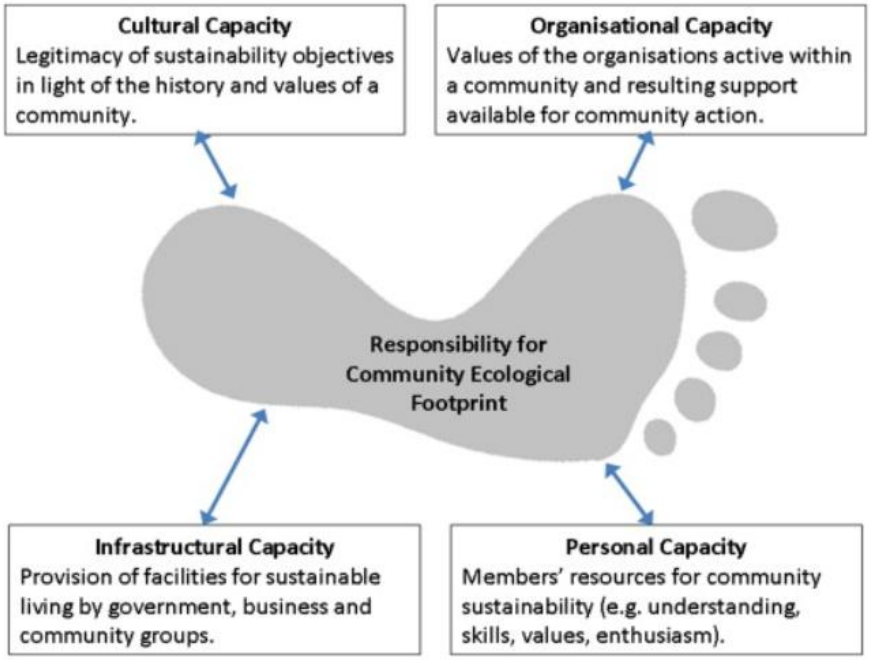


Figure 4: Factors influencing the ability of community based initiatives to make a difference (Middlemiss & Parrish, 2010).

The framework provided by Middlemiss and Parrish (2010) is very useful for identifying local community capacities that LEIs can draw on to implement change. However, although the personal capacity aspect partly identifies such, their framework seems to be insufficient for identifying specific characteristics that LEIs require to enter a new market, such as the EVCI market. For this reason, it has been chosen to enrich Middlemiss and Parrish´s framework by enabling and constraining factors found in other literature on LEIs and on Social Enterprises (SEs). Social Enterprises, in particular, are seen as a useful concept as they are not only aiming at mitigating environmental or social needs, but also operate in competitive markets (Spear et al., 2009). Unfortunately, in existing scientific literature no enabling or constraining factors could be found that are explicitly directed at explaining situations in which an already existing grassroots initiative or SE wants to start a new activity or enter a new sector, such as EVCI. Most of the factors used here are influencing the overall opportunities for grassroots initiatives or SEs. These factors are also regarded as a good starting point for data collection and analysis with regard to capacities that are needed for the provision of EVCI. In the following sub-paragraphs, the four capacities introduced by Middlemiss & Parrish (2010) will be explained as well as the related enabling and constraining factors with which they have been enriched for this research.

2.3.2 Personal Capacities

According to Middlemiss & Parrish (2010), personal capacity points at the resources that individuals within the community as a whole or within the grassroots initiative hold. Such resources can refer to individual´s general understanding of and knowledge about sustainability issues, to their motivation, enthusiasm and willingness to act, but also to their specific skill as professionalism that enables them to act.

Corresponding to this, there are a few more characteristics that LEIs (seen as grassroots or SE) are expected to require in order to be able to successfully implement their projects.

Firstly, the basis for the establishment of a new initiative or activity needs to be a specific **need within the community** (Peredo & Chrisman, 2006). Creamer et al. (2018) indicate that communities need to make sense of community energy so that it meets their needs. Becker et al. (2017) furthermore show that SEs need to pursue both profit and non-profit motivations for local communities. According to Hoppe et al. (2015), the drivers of LEIs therefore need to be rooted in a **mix of motivations**. This can be rather intrinsic motivations and values that the initiative wants to enhance (this is what Bomberg and McEwen (2012) call symbolic mobilization resources), but also the desire to influence policy outcomes. The latter can be seen as a reaction to what is called structural resources, the broad institutional context. Structural resources can be enabling or constraining, whereas symbolic resources usually work in an enabling way (Bomberg & McEwen, 2012). Fitting this argument, many social enterprises become active in a situation where there is not only a recognized social need, but also unsuccessful attempts by the market as well as by the government to address the socio-environmental problem (Trivedi & Stokols, 2011). Horlings (2010) indicates the presence of a **sense of urgency** as a required condition for the success of bottom-up initiatives: the initiators must have identified a problem that needs to be responded to.

However, such a sense of urgency must also fit to the communities and other actors' urgency frames, otherwise there will not be any support or collective action. Therefore, a **shared story line** must be constructed that guides effective action by connecting ideas, people and resources (Horlings, 2010). Comparably, Trivedi and Stokols (2011) note that social enterprises need to frame their identified problem in a new way that increases the public awareness of the problem. For this, they need to create a **vision** that links the problem to a certain **strategy** and certain means and that can thus provoke sustainable system change. Bottom-up initiatives need to take strategic action that can influence the agenda and the decision making in the region (Hoppe et al., 2015).

One of the aspects that comes up in most relevant literature is the role of **entrepreneurship and leadership skills**. Horlings (2010), who uses the concept of "Vital Coalitions" in combination with "Regional Regimes" to better understand what opportunities bottom-up initiatives of citizens and/or businesses (=vital coalitions) have to enhance the overall sustainable development of the region, formulates entrepreneurship and versatile leadership as one of the key conditions for vital coalitions to be successful. So called "leaders of change", which are often embodied in one or a few individuals, are regarded as crucial in creating energy and inspiration. Typical characteristics of such leaders of change are 1) availability of time and inner motivation, 2) an open and flexible attitude which enables them to draw knowledge, resources and networks from beyond the usual circles, 3) the ability to tell convincing stories, 4) the ability to network (in formal and informal contexts and in the public as well as private sector), 5) the ability to create strategic negotiation positions that help them to achieve their goals and 6) the ability to identify and use windows of opportunity.

Comparable to Horling´s (2010) conceptualization, Trivedi and Stokols (2011) stress the important role of social entrepreneurs within social enterprises. Many success factors of SEs are connected to the social entrepreneur, such as his social network, his commitment, previous

management experience, his ability to formulate and integrate a vision and to establish strategic alliances. Furthermore, the reputation and credibility of social entrepreneurs plays an important role, as their success in gathering many resources and in developing networks depends on this. Despite the importance of these entrepreneurs or leaders, Horlings (2010) indicates that it is also a risk for an organization to depend on a small number of "strong" individuals. Comparably, Díaz-Foncea and Marcuello (2012) state that the role of entrepreneurs in SEs needs to be embodied by the collective rather than by an individual.

Another element is that LEIs require the **ability to learn from experience**, such as from earlier projects or other local experiments, in order to achieve their goals. This calls for proper monitoring and critical reflection on the way projects have been implemented so far (Hoppe et al., 2015). It is especially regarded as important to also learn from failures. There must thus be space for experimentation (Seyfang & Smith, 2007). Another possibility is to learn from other well-established model projects (Wüste & Schmuck, 2012).

Trivedi and Stokols (2011) show that the ability of a social enterprise to **mobilize resources** is of high importance. For this, the members own wealth and capacities are crucial, but also their networks in which they can carry forward their mission. With regard to financial resources, all possible options need to be explored, including those of funding or philanthropic sources. Next to this, however, also strategic financial planning is needed in order to sustain their venture. For this, some SEs or non-profit organizations might require business planning assistance (e.g. business analysis, market research).

Spear et al. (2009) indicate that social enterprises often face challenges in **managing their members**. Firstly, it is often difficult to recruit members that have appropriate skills and experiences to serve on boards or in other functions. Secondly, it is a challenge to maintain membership involvement as the organization becomes more professionalized. It is however a true danger to let an initiative be dominated by the professional staff and to lose touch with the members as a sense of community ownership and participation is seen as important for the overall impact of the initiative and its projects (Becker et al., 2017; Peredo & Chrisman, 2006; Spear et al., 2009).

2.3.3 Cultural Capacity

Cultural capacity refers to the legitimacy that sustainability as an objective has within the community and the way sustainability is framed. This is connected to the communities´ history and values (Middlemiss & Parrish, 2010).

Next to this, two other aspects have been found in literature that relate to cultural capacity. First of all, Wüste and Schmuck (2012) show that the **relation of the LEI to the local inhabitants** and the community is important. People and resources can be mobilized by personal contact and skeptics can be convinced. Furthermore, **transparency** before and during the implementation process is important to create trust between the people and the LEI or organization implementing the project. This also relates to the notion of entrepreneurial credibility put forward by Trivedi and Stokols (2011). This is in the case of EVCI probably less important in order to combat resistance against it, but rather to foster participation and to make more people use the charge points.

2.3.4 Organizational Capacity

Organizational capacity is defined as the values formal organizations that are active in the community hold. It is decisive to which extent their values are aligned to sustainability objectives and whether

grassroots initiatives are supported by other actors and organizations in the local context (Middlemiss & Parrish, 2010).

This correspondents well to the regional regime dynamics in the theory of Horlings (2010). **Regional regimes** are the *´informal arrangements by which autonomous or semiautonomous actors function together to make and carry out governing decisions relevant for a specific region'* (Horlings, 2010, p. 22). The agenda, dominant actors, their networks and distributions of resources within the regional regime determine to a certain level how much institutional space there is for vital coalitions, that is bottom-up initiatives. The regional regime is not only constraining but provides a common basis for cooperation and can also be a supportive context for new initiatives. If the agenda and rules of the regime stand very much in contrast to the bottom-up initiative´s agenda, the regime can constrain the initiative. However, in some cases the very motivation for starting an initiative is to act against the current "regime". Horling´s theory therefore points at the possibilities for new alliances and partnerships based on the unique qualities of a region (and her actors). Comparably to this, Hoppe et al. (2015) indicate that it is important for LEIs to get insight into inter-actor configurations or the **dominant coalitions** at the local level. These are influencing the allocation of resources and the decision-making process. LEIs therefore require the capacity to interact with these coalitions and with large institutions (Creamer et al., 2018).

The LEIs' own **networks** are seen as important to get access to resources and knowledge. Seyfang and Smith (2007) indicate that strong networks on a local, regional and national level can enable LEIs to overcome their diffusion challenges, that is the problems they face in growing in scale.

Government backing is seen as crucial for the success of grassroots initiatives or social enterprises. Especially the support of the local government is needed (Wüste & Schmuck, 2012). While some argue that even public leadership, meaning the active initiative of the local government in setting up a (sustainable) initiative, is required (Hoppe et al., 2015), others argue that local governments can also play an important role without taking a lead (Creamer et al., 2018). Local governments can furthermore become a partner of the initiative, for example by co-investing in their project.

2.3.5 Infrastructural Capacity

According to Middlemiss & Parrish (2010), infrastructural capacity is the potential for sustainable practices that exists within a community based on available facilities such as the housing stock, the transport or energy sector, the food system or communication systems. Grassroots initiatives can provide a certain service (in our case for example EVCI) and in this way improve the infrastructural capacity. In order to improve it, they can draw on personal, cultural and organizational capacity.

Next to the aspects outlined by Middlemiss and Parrish (2010), also **(bio)physical circumstances** indicated by Oteman et al. (2014) fit into the concept of infrastructural capacity. As Oteman et al. (2014) study LEIs generating renewable energy, they focus on factors such as wind power, solar hours and hydropower available, which are less significant for the provision of EVCI. However, the availability of sustainably generated energy influences the EVCI-model. Furthermore, Oteman et al. (2014) also point at the level of technological developments and the **access to this technology and the grid**. Another aspect is the **level of urbanization** implying different circumstances regarding spatial planning. For example, distances tend to be longer in rural areas which asks for different infrastructure and also for different EVCI models (Strunk, 2018). Furthermore, the degree of urbanization also influences the local institutional context (Oteman et al., 2014). Large communities (as for example in cities) are also expected to have more complex and fragmented social networks than smaller (rural) communities (Peredo & Chrisman, 2006).

2.4 Conceptual Model

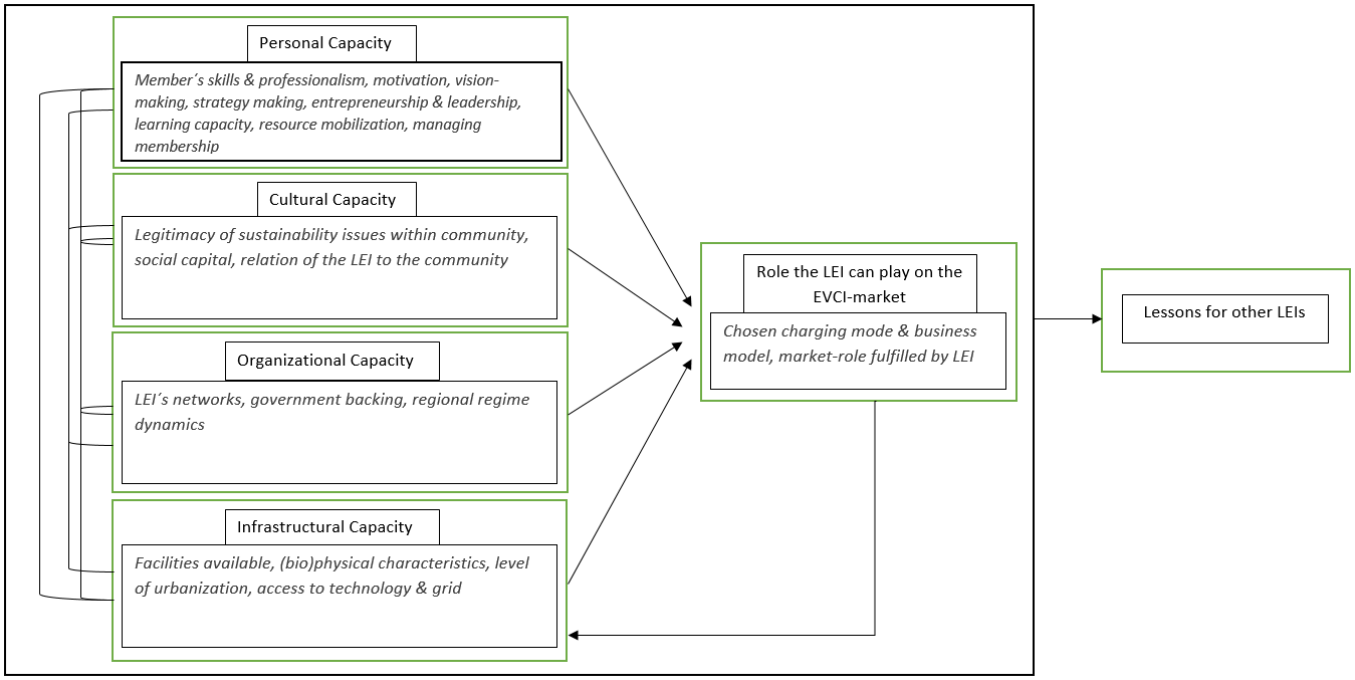


Figure 5: Conceptual Model. (Source: own representation and inspired by Middlemiss and Parrish (2010)).

The conceptual model used in this thesis (figure 5) is based on the framework of four community capacities that enable sustainable change by Middlemiss and Parrish (2010) and enriched by factors found in grassroots and social enterprise literature. The specific combination of different capacities and their peculiarity that an LEI can draw on in a certain local context is expected to influence the role that the LEI can play on the EVCI-market. Generally, the better developed the different capacities, the more possibilities the LEI is expected to have. It is expected to find certain patterns between combinations of available capacities and the respectively chosen role in the EVCI market and EVCI model. The different capacities are interrelated and can be combined to implement change. Implemented change can also mean the improvement of one or several of the available capacities. As the LEIs studied in this thesis are providing EVCI as a service, it is expected that their chosen role in the EVCI market will have feedback to the available infrastructural capacity.

Based on the combination of certain internal and external factors that "lead" to a certain EVCI-concept, other LEIs that attempt to get involved in the provision of EVCI as well can draw lessons and translate them to their own context and characteristics.

3 Methodology

In this chapter, the methodology of the thesis is outlined. First, the research design is described (qualitative explanatory case study) , including the case-selection. The second part of the chapter focuses on the methods of data collection and analysis.

3.1 Research Design and Strategy

A research design is a logical plan for obtaining conclusions based on initial research questions (Yin, 2003). Therefore, it sheds light on the relationships between the research questions, the data sources as well as the data collection- and analysis methods that are needed to answer it (personal communication, H. Ernste, February 2018). Furthermore, a research design informs on possible constraints of the research (Vennix, 2016).

3.1.1 Qualitative Research Strategy

For this research, a qualitative research strategy has been chosen as it allows to gain an in-depth, qualitative understanding of a given phenomenon. Qualitative research is appropriate to use when a complex, detailed understanding of an issue is needed, when there is a desire to empower individuals and when the context of the studied object is crucial to understand the processes at hand (Creswell & Poth, 2018). These circumstances are met in this thesis: Complex combinations of internal as well as contextual factors and of different community capacities are expected to be needed to understand which role LEIs can play in the EVCI market in a given region or context. As has been pointed out by Seyfang and Smith (2007) in their research on grassroots initiatives for sustainable development, qualitative research is needed to get an in-depth understanding of the conditions for the germination of grassroots initiatives, in our case of the successful integration of LEIs in the EVCI market. Furthermore, an important motive of this research was to empower LEIs like *LochemEnergie* who want to enter the EVCI market by helping them to choose an adequate EVCI model, based on the experience of other LEIs. Therefore, it has been chosen to study objects (=the LEIs) in their natural settings, as is typical for qualitative research (Creswell & Poth, 2018). Another characteristic of qualitative research is that multiple perspectives and meanings of participants play a central role (Creswell & Poth, 2018). This is also the case here. Different qualitative responses of stakeholders have been identified based on interpretations from their perspectives. This way, it is hoped to reveal which circumstances were experienced as constraining or enabling and led to the specific EVCI-model chosen.

3.1.2 Explanatory Case Study Approach

Typical for qualitative research is a holistic account (Creswell & Poth, 2018; Vennix, 2016). This means that objects or processes are being studied in their totality and that certain aspects of these objects cannot be selected to be studied separately (Vennix, 2016). In this thesis, it is expected that the totality of both internal and contextual factors of the selected cases need to be studied. To study the cases in their "totality", a combination of different data sources will be used. Due to this data-triangulation, it is hoped to achieve greater construct validity of the outcomes (Vennix, 2016; Yin, 2003). As context factors play an important role, it has been chosen to study five geographically delimited cases.

To specify the research design, an explanatory case study approach has been chosen to elaborate the complex interconnections between different available capacities and the EVCI concept implemented by an LEI in a given locality. Case study research means to study *"a case (or cases) within real-life, contemporary context or setting"* (Creswell & Poth, 2018, p. 96). Therefore, a case study

design fits the research within this thesis trajectory: five examples of the provision of EVCI in which LEIs are involved have been studied within their local real life contexts.

For case studies, it is important that the studied cases are clearly bounded, for example by studying a specific place (Creswell & Poth, 2018). This is the case in this research: the five studied LEIs (see table 3) are bounded geographically as they are defined by a municipality or region. Furthermore, the cases have been chosen instrumentally, as they are selected to best understand the problem, rather than intrinsically to illustrate a unique case. It is a collective case study as more than one case is being studied (Creswell & Poth, 2018). Yin (2003) would call this a holistic multiple-case design because the cases are studied in their "totality" as a single unit of analysis, and as five different cases are studied within their specific contexts. Other scholars would call this design a comparative case study (Yin, 2003). To warrant some external validity, the five cases have been approached, studied and analyzed in a comparable way (=replication logic in multiple-case studies) (Yin, 2003).

3.1.3 Case selection

For this thesis, four "front-runner" cases in Germany and the Netherlands have been studied, meaning LEIs that have already provided publicly accessible EVCI themselves. They have been studied regarding their capacities as well as their chosen role in the provision of EVCI. Furthermore, a fifth case has been investigated that aims at getting involved in the provision of EVCI as well. It has been chosen to study cases in both the Netherlands and Germany because it is expected that not only LEIs from within a country, but also from different countries can learn from each other (REScoop, 2018). This research attempts to contribute to this cross-border learning.

Regarding the number of cases studied, five is rendered to be a good number for two reasons: On the one hand, no more than four or five cases should be studied in a single study as the intent of qualitative research is not to generalize, but rather to study the specific in-depth (Creswell & Poth, 2018). On the other hand, multiple case studies are often preferred over single-case studies as this makes direct replication possible and thus more powerful analytical conclusions (Yin, 2003).

The cases have been selected based on a combination of purposeful sampling, snowball sampling and convenience sampling. (Creswell & Poth, 2018). An outline of why the three cases are rendered relevant/purposeful can be found in table 3. *LochemEnergie* has been chosen because they are currently thinking about getting involved in the provision of EVCI and because they are involved in the Charge & Go project in which also researchers from Nijmegen School of Management are involved. This made cooperation very easy. *Grunneger Power* and *VrijstadEnergie* have been chosen as *LochemEnergie* is already working together with them and is attempting to learn from their best practices. Thus, already existing collaborations were used. Furthermore, I personally knew a member of *BürgerEnergieRheinMain eG*. Via this contact, I learned about *Inselwerke eG* and that they are (one of) the first LEI(s) that have provided EVCI in Germany.

However, the chosen cases were not only convenient to choose, but have predominantly been rendered interesting and useful cases for this study. Furthermore, the cases have been chosen in a way that guarantees some variation. This gives the possibility to make useful comparisons: two front-runner cases in the Netherlands and two in Germany, LEIs that are located in rural areas, in small towns, and in a city, and LEIs that are professionalized to different degrees have been chosen. A summary of the characteristics of the different cases as well as of the reasons for why they have been chosen can be found in table 3 below.

Table 3: Overview chosen LEIs (source: own representation).

	Characteristics	Why chosen?
Grunneger Power	Big & professionalized LEI in the city of Groningen. Projects: Energy Efficiency/advice, renewable energy generation (PV, wind), research & pilots, EVCI	First Dutch LEI to provide EVCI. Already functioning as an example for LochemEnergie.
Inselwerke eG	Medium-sized LEI in rural, touristic region, no good circumstances for cooperative model in local community. Projects: public EVCI, PV generation, energy supply via cooperative supplier, LED street lighting	First German LEI to provide EVCI. Have developed an EVCI concept for rural areas (→ interesting for Lochem?). Have functioned as example for BERMeG and are now building up a nationwide citizen charging network.
VrijstadEnergie	Rather young, medium-sized LEI (2016) in small town. Projects**:** energy efficiency/advice, renewables generation (collective PV, wind), EVCI	Innovative PV-charging plaza concept. Already functioning as an example for LochemEnergie.
BürgerEnergieRheinMain eG	Medium-sized LEI in small town. Projects: Energy efficiency/advice, renewables generation (PV, wind, biogas), energy supply via cooperative supplier, heating, E-CS, EVCI	Personal connections; easily accessible. Comparable to circumstances in Lochem.
LochemEnergie	Rather big and professionalized LEI in a rural municipality. Projects: energy efficiency/advice, energy generation (PV, water), e-CS & e-mobility services, research & pilot projects	Already experienced in stimulating EV-uptake and offering e-mobility services, now attempting to provide EVCI. Connections to Radboud University; easily accessible.

Because the five cases are located in two different countries, they are situated in two different institutional, political and societal contexts. Therefore, the cases need to be studied taking into consideration the different policies on EV and EVCI that exist in Germany and the Netherlands as well as the slightly different development and role of Local Energy Initiatives in the two countries. An overview of the EV/EVCI policies and the role of LEIs in both countries can be found in chapter four.

3.2 Data collection & analysis

A case study design in which an in-depth understanding of several cases is the aim requires the cases to be studied in their natural settings and the researcher to be close to the research objects (Vennix, 2016). Detailed data collection is necessary, drawn from multiple sources of information (Creswell & Poth, 2018). This triangulation of data sources and collection methods can mitigate possible incomplete explanation of a social phenomenon that is only studied based on one data source. Triangulation can thus improve internal and construct validity of the research (Vennix, 2016). Possible sources of information are documents, reports, archival records, direct observations, interviews, audiovisual material, and physical artifacts (Yin, 2003). The following sub-paragraphs will explain which of these secondary and primary data sources have been used in this research.

3.2.1 Secondary data

To get hold of the general policy framework with regard to EVCI in both the Netherlands and Germany, relevant reports, policy documents, and research articles regarding the provision of EVCI in Germany and the Netherlands were screened. A summary can be found in chapter four. Furthermore, relevant documents regarding the (local) institutional circumstances in Lochem, Groningen, and Usedom have been analyzed (see Appendix 1, paragraph 9.11).

3.2.2 Primary data

The most important source of information has been semi-structured in-depth interviews with relevant actors in all cases. For the cases GrunnegerPower, Inselwerke eG, and LochemEnergie, it has been tried to triangulate the data to get a consistent and relatively objective view on the case. Therefore, one or several individuals from within the LEI have been interviewed , but also one or two relevant partners (e.g. an employee of the municipality) that have an external view on the capacities of the LEI (Appendix 1, paragraph 9.1.2). The cases VrijstadEnergie and BürgerEnergieRgeinMain eG have rather been treated as "extra" cases to increase the variety of the studied cases. Due to the limited scope of this thesis, I was not able to collect as much data for these two cases as for the other three. I have thus only interviewed one (leading) member of each LEI. A table of all respondents that have been interviewed for the case studies can be found in Appendix 1 (paragraph 9.1.2). In these interviews, respondents have been interviewed in a deductive as well as inductive manner. Deductive means that the respondents have been posed questions on different aspects of four capacities found in scientific literature as well as on different aspects of EVCI-models they have implemented (sub-questions 1 and 3). For the deductive questioning, an analytical framework consisting of relevant factors and dimensions has been created, which can be found in Appendix 2 (paragraph 9.2). Inductive means that the respondents have also been openly asked whether they noticed any other factors that were important for the successful stake of the LEI in the provision of EVCI (sub-question 2). The interview guides for interviews with LEI-members and municipalities can be found in Appendix 3 (paragraph 9.3.1 and 9.3.2).

Besides the interviews related to the cases, three expert-interviews have been conducted to gain background knowledge on the EVCI-market and development as well as an external view and estimation on the role that LEIs can play in the provision of EVCI:

- The first one has been held with **Allego**, a company providing charge points throughout the Netherlands and developing charging solutions for home-, work- and public use (personal communication, M. van Manen, 01-05-2019). The aim of the interview was to gain a better understanding of the EVCI market and to get an impression of how such a market player conceives the possible role of LEIs in the EVCI market.
- The second interview was conducted with the developer of the **StekkerApp**, a software solution in development, that aims at making EMSP-services more affordable for CPOs, especially for cooperative CPOs. They try to offer custom-fit solutions. For example, the formula for calculating the charging price is flexible, so that all factors that the client wants can be taken into account (e.g. the availability of sun energy). StekkerApp is playing the role of an EMSP, but eventually wants to offer more services by integrating the whole chain from CP to system to EMSP to end-user App. Furthermore, StekkerApp wants to enable more smart charging options, such as dynamic tariffs or Vehicle2Grid on a software level. To really implement this, one is however also dependent on the hardware (personal communication, E. de Bruijn, 18-04-2019).

- The third (rather informal and short) interview was held with **Bart Dik and Yvonne Nieuwpoort**, who are currently giving hands-on support for local SMEs in the municipality of Lochem that want to place a CP in front of their business. They have been outsourced by LochemEnergie and are cooperating with the municipality for a subsidy that is given to the first 20 realized CPs (personal communication, T. Tekelenburg, 30-04-2019).

An overview of the expert-interview respondents can be found in Appendix 1, paragraph 9.1.3.

Furthermore, I have taken the role of a part-time intern for about 2.5 months within LochemEnergie and have thus been a part of the organization. Many informal observations, in which I have taken the role of a participant observer (Creswell & Poth, 2018), have been made to help me better understand the capacities and challenges of LochemEnergie, as well as the interactions between different (local) actors. Furthermore, several relevant events and meetings within LochemEnergie have been attended. A list of these events/meetings can be found in Appendix 1, paragraph 9.1.4.

3.2.3 Data analysis and analytical operationalization

The collected data has been transformed into fully transcribed data sets which have been uploaded to the program Atlas.ti in order to analyze them.

Due to the low external validity of case studies, where only a very limited number of elements is being studied, one should be reluctant to generalize from one case to another or to formulate general governance advices based on one or a few cases (Creswell & Poth, 2018). However, found patterns can be useful to draw lessons for cases in other areas. This is considered to be very important for LEIs (Hoppe et al., 2015). Furthermore, qualitative research does allow analytical generalization (Creswell & Poth, 2018) or pattern elucidation (Vennix, 2016). Based on patterns found in the codes, assertions can be made in order to formulate conclusions (Creswell & Poth, 2018). By using codes or categories, the collected data has been broken down into various parts in a systematic and replicable manner and relationships between these parts could be found (=internal validity). As data analysis in qualitative research should be both deductive and inductive (Creswell & Poth, 2018), analysis has on the one hand been implemented based on a beforehand developed codebook (Appendix 4, paragraph 9.4.1) based on the analytical framework (Appendix 2) (=deductive analysis). However, this codebook will be constantly revised while analyzing with possible new indicators and categories that are found (=inductive analysis).

After the five cases have been analyzed (paragraph 5.1 and Appendix 5) (=Within-case analysis), they will also be compared in order to find similarities and differences (paragraphs 5.2 and 5.3) (cross-case analysis) (Creswell & Poth, 2018). For the cases of *Grunneger Power*, *Inselwerke eG, VrijstadEnergie* and *BERMeG,* it has been looked at the combination of the four capacities as well as at their role in the EVCI market and their chosen EVCI model. For *LochemEnergie,* the combination of the four capacities has been analyzed as well as their ambitions with regard to developing EVCI. For the cross-case analysis, the ATLAS.ti analytical tool of code-document tables has been used. The created document groups (one per case) could in that way be easily set opposed to the peculiarity of the different code groups, which made it easier to compare the different cases.

4 Political and institutional background in the Netherlands and Germany

4.1 EVCI state of affairs, policy and regulation in the Netherlands and Germany

As has been mentioned in the introduction of this thesis, electric mobility and related infrastructure is defined as a major transportation priority by the European Union (EU). The EU has different policy approaches to stimulate EV usage, some of which are specifically directed at the provision of EVCI (Hall & Lutsey, 2017). EU policy regarding EVCI focuses on trans-European corridors, interoperability, open standards and smart charging. EU as well as national funding schemes aiming at the provision of EVCI are usually directed at public-private partnerships. This leads to a situation in which a combination of private charge point providers, power companies, governments and automakers are the usual actors providing EVCI (Hall & Lutsey, 2017). However, next to this general European context, there are significant differences in the degree of EV usage, of publicly accessible EVCI and the policy approaches to support an increase in EV usage and EVCI between different member states. For this reason, the state of affairs regarding EVCI and the connected policy approaches in the Netherlands and in Germany are outlined in this paragraph. Furthermore, the most important policies and subsidies for renewable energies in the both countries are explained, as these are crucial for the implementation of cooperative EVCI, given the fact that many LEIs connect the generation of renewable energy to EVCI.

4.1.1 The Netherlands

The Netherlands are regarded as one of the global leaders in e-mobility and EVCI for several years already. Many Dutch cities have a dense network of charge points and in 2016, the Netherlands had, compared on an international scale, the highest number of public charge points per million inhabitants. A reason for this high number of charge points might be that the Netherlands started early to adopt national policy programs aiming at increasing the provision of EVCI. In the first phase of the Dutch EVCI policy, grid operators and bigger cities started to provide charge points. Then, the national government focused on developing the current market model for EVCI. In 2014, the National Knowledge Platform on Charging Infrastructure (Nationale Kennisplatform Laadinfrastructuur, NKL) was set up to bundle and stimulate innovation in the sector. In the phase between 2015 and 2018, it has been started to focus on cost reduction and rollout of EVCI, using the Green Deal on publicly accessible charging infrastructure as an instrument (Green Deal, n.d.; Ministry of Economic Affairs, 2016). For the period between 2017 and 2020, a reduced energy tax tariff for public CPs has been introduced to improve the business case of public CPs (Eerste Kamer der Staten-Generaal, 2016).

The so called “Lather of Charging” (*Ladder van laden*) is used for deciding whether or not a CP should be placed: An EV-driver is expected to charge at home or at his working place. If this is not possible, the second priority goes to semi-public CPs (e.g. provided by a local business). Only if these both options are not available, the government is obliged to offer the possibility of public charging in a certain location. Besides, the general principle applied is that the number of charge points should follow the number of available EVs (Ministry of Economic Affairs, 2016). In case citizens do not have the possibility to charge their EV on their own property or work place, they can request public CPs close to their home or work place (Hall & Lutsey, 2017). This procedure via a central website, that every municipality can use, makes the process until a CP can be placed quicker and more cost-efficient (Nationaal Kennisplatform Laadinfrastructuur, 2018).

Important actors on the Dutch EVCI market are market parties such as Tesla and Fastned for rapid charge points and companies outside the EV sector that realize charge points on their sites. Companies such as Allego are providing EVCI in many small municipalities throughout the country (Ministry of Economic

Affairs, 2016). Furthermore, ElaadNL, which is a knowledge and innovation center consisting of six power network operators, has played a significant role in the provision of EVCI (Hall & Lutsey, 2017).

Municipalities play an important role in the provision of public EVCI (Hall & Lutsey, 2017), as they need to give a permit for placing the CP. Furthermore, municipalities often need to provide parking lots and signs making the CP visible (NKL Kennisloket Gemeenten, n.d.-d). Municipalities can choose from three different development models for public EVCI, depending on the ambitions, budget and local circumstances. The first option is the permit model (also named "open market model"), in which every party that wants to, can request a permit for placing a CP. The municipality can set up certain requirements, based on which it can decide whether or not to give a permit. The provision of CPs is thus based on request, the municipality is only regulating (NKL Kennisloket Gemeenten, n.d.-a). Secondly, there is the concession model, in which one or several parties are given the right to provide CPs in the public space for a certain period. In this model, several municipalities can work together, can influence the charging tariff and set up certain requirements. The provision of CPs is still based on request (NKL Kennisloket Gemeenten, n.d.-b). Thirdly, there is the order model, in which the municipality actively orders CPs. With this, the municipality becomes the Charge Point Operator itself, therefore takes the risks itself and plays a more steering role (NKL Kennisloket Gemeenten, n.d.-c).

Relevant Dutch renewable energy subsidies

Next to the policy directly aiming at E-mobility and EVCI, there are several policy instruments that are directed at the generation of renewable energy. Dutch LEIs can make use of these subsidies to help finance their EVCI-projects by connecting renewables generation to their own EVCI.

Firstly, there is the subsidy "Stimulering Duurzame Energieproductie" (SDE) ("Stimulation Sustainable energy production") that companies and non-profit organizations can make use of. It is an exploitation subsidy for the categories biomass, geothermal energy, water, wind, and solar. (Rijksdienst voor Ondernemend Nederland, n.d.).

Secondly, there is the "arrangement lowered tariff for collective generation", often called the postcode-rose arrangement. Small scale consumers (e.g. small firms or private households) get a reduction on their energy tax if they collectively invest in the generation of renewable energy. The requirement is that participants have to live in close proximity to the plant, in a so-called postcode rose area, and that they need to form a cooperative together. The generated energy can be sold to energy suppliers via the cooperative, while the participants/investors get a reduction on their personal energy tax. The background of this arrangement is that beforehand, only citizens that were able to generate renewable energy on their own property could make use of a reduction of the energy tax. This situation was discriminating against those that do not own a suitable property (HIER Opgewekt, 2017).

4.1.2 Germany

Germany is regarded as one of the major national EV markets on a global scale. However, the number of charge points in relation to the population is much lower than in the Netherlands. A reason for this might be that the national government did not widely support the provision of publicly accessible charging infrastructure until recently (Hall & Lutsey, 2017). Nation-wide policy aiming at the stimulation of EVs was launched in 2009 with the National E-mobility Development plan (Altenburg et al., 2015), which did address EVCI, but did not support a nation-wide stimulation of the provision of EVCI as limited its efforts to 200 projects in eight model regions (Hall & Lutsey, 2017). In 2010, the National Platform for Electric Mobility (Nationale Plattform Elektromobilität, NPE) was launched. It consists of representatives from industry, science, politics and trade unions and aims at collectively

speeding up the development of electric mobility and coordinate technology development in Germany (Nationale Plattform Elektromobilität, n.d.). This general political support for electric mobility in Germany should be seen in the context of the broader agenda to accomplish the *Energiewende* (the energy transition towards low carbon and renewable energy sources) which has a lot public and political momentum in Germany (Altenburg et al., 2015).

Within the NPE, one working group focuses on "Charging Infrastructure & Power Grid Integration". However, the provision of EVCI outside of the 2009 assigned model regions remained without support of the national government until 2017, when a new nationwide program to promote EVCI was launched (Bundesministerium für Verkehr und digitale Infrastruktur, 2017; Hall & Lutsey, 2017). Following this program, in the period between 2017 and 2020, € 300 million are made available for the provision of publicly accessible EVCI. With this sum, 5,000 DC fast charge points and 10,000 AC charge points are to be built throughout Germany. With this money, the national government specifically supports municipalities and fleet operators in providing EVCI on a local level (Nationale Plattform Elektromobilität, 2018).

Relevant German renewable energy subsidies

An important renewable energy policy in Germany is the "renewable energies law" (Erneuerbare-Energien-Gesetz, EEG). The EEG aims at increasing the share of renewable energy in the German energy mix to 80% in 2050. It has been revised for several times since entering into force in 2000. Thanks to the EEG, electricity from renewable sources is favored for feeding into the grid and generators thereof receive a compensation (this is thus also a possibility for households or LEIs). Furthermore, the investment costs of renewable energy plants are subsidized. In order to fill the gap between the price for which the renewable energy can be sold on the market and its production costs, an EEG-contribution as part of the total energy tax has to be paid by all energy consumers (except for a few industries consuming exceptionally much energy) (Bundesministerium für Wirtschaft und Energie, 2019). However, in 2014, the compensation that generators of renewable electricity receive for feeding it into the grid has been drastically reduced to adjust it to the market prices (Elias Vollstädt [c.con Management Consulting GmbH], 2016). In the eyes of many renewable pioneers and LEIs, this compensation was reduced unproportionally compared to the slowly decreasing investment costs for e.g. solar panels. It therefore became more difficult and less appealing to finance renewable projects (personal communication, A. Fröb, 11-04-2019).

4.2 LEIs in the Netherlands and Germany

As LEIs from both the Netherlands and Germany will be analyzed, it is important for this thesis is to have some background knowledge on the role of LEIs in both countries, their organizational forms, and the institutional and political context they are situated in.

4.2.1 LEIs in the Netherlands

Oteman et al. (2014) characterize two forms of LEIs in the Netherlands: Classic wind cooperatives that already started to develop in the 1980s with a background in anti-nuclear and pro-environmental movements, and "new style" LEIs which are usually promoting renewable energy in residential areas and can be found in both rural and urban contexts. In this thesis, three of the second kind have been studied. When Oteman et al. (2014, p. 9) published their article in 2014, they stated that LEIs are a *"young phenomenon, which is rapidly developing"* and that many of these initiatives are still in the developing or starting phase. Now, in 2019, one can surely confirm this statement. In 2018, already

484 energy cooperatives were registered, 85 more than in 2017 (Schwencke, 2018). In the years between 2013 and 2018, the number of LEIs has risen significantly every year, while already existing ones have "matured" and expanded their activities. In 2018, 70% of all LEIs in the Netherlands were active on the field of energy savings, 75% were working on solar and 20% on wind energy projects. At least 22 LEIs were active on the field of sustainable mobility. Many of them are organizing car sharing services, but some are also investing in charging infrastructure, are investigating possibilities for the connection of locally generated energy with EVCI, and the first energy storage projects have been developed (Schwencke, 2018).

For bigger projects, many LEIs are working together or are cooperating with municipalities or commercial developers. Therefore, many different kinds of partnerships, ownership constructions and financing schemes can be found (Schwencke, 2018).

Furthermore, there are several Dutch umbrella organizations for LEIs, where LEIs can exchange knowledge and find support. The umbrella cooperatives ODE Decentraal (Lobbying for LEIs), REscoopNL (support in project implementation), Econobis (ICT and administration products for LEIs), Hoom (support in energy efficiency projects) and HIEROpgewekt (general knowledgeplatform for LEIs) all come together in the umbrella organization "Energie Samen" (= energy together) (Energie Samen, n.d.).

Oteman et al. (2014) who use institutional arrangements theory to explain the occurrence and position of LEIs in different country contexts, typify the Dutch institutional arrangement as being close to a market oriented ideal type. In such a context, economic incentives are prioritized and there is usually little room for small-scale or non-profit projects as larger market parties are preferred. It is thus difficult for community initiatives to acquire necessary resources and knowledge. Some Dutch LEIs get financial support from municipalities, but this is not the rule. Therefore, many are dependent on local fundraising and are forced to start with rather small activities. Generally spoken, community initiatives get limited institutional support in the form of rules, subsidies and governmental support (Oteman et al., 2014).

4.2.2 LEIs in Germany

In Germany, the most dominant kind of LEIs are *Energiegenossenschaften* (citizen energy cooperatives; e.g. *Inselwerke eG* and *BERMeG*) (Hoppe et al., 2015; Kahla, 2017). Regarding their organizational form, they are officially "listed cooperatives" (eingetragene Genossenschaften, eGs). In 2016, there were 1024 *Energiegenossenschaften* registered in Germany. Until 2014, a rapid increase of the number of LEIs could be observed on an annual basis. Since then, the number of newly registered LEIs per year has decreased, but the overall number is still increasing (Kahla, 2017)**.** LEIs can be found both in urban and rural areas, although there seems to be slightly more attention to sustainability in cities (Oteman et al., 2014).

In general, the tradition of energy cooperatives in Germany already exists much longer than in the Netherlands. Local, decentral energy cooperatives (back then based on fossil fuels) where set up starting in the early 20th century to assure electricity provision throughout the whole country, including remote areas. (Oteman et al., 2014). Nowadays, LEIs in Germany need to be studied within the broader political and social context of the German *Energiewende* (energy transformation from a fossil-fuels and nuclear-based energy sector to a more sustainable energy sector largely based on renewable energies) (Hoppe et al., 2015; Kahla, 2017; Oteman et al., 2014). The *Energiewende* was initiated in the 1980s, leading to a strong connection between energy policies and climate/environmental policies. The *Energiewende* is also connected to a reorientation in policy making: Renewable energy provision needs

to be approached in a more decentralized and democratic manner, and a shift from supply to demand side management is required. In the context of decentralized renewable energy provision, LEIs are considered as important actors by the government (Oteman et al., 2014).

Through their bottom-up governance model, *Energiegenossenschaften* come the closest to the ideal of a citizen-energy transition promoted by the government. They are organized in strong networks on the regional and provincial level, but also on the national level. Furthermore, there is *Bürgerwerke eG*, an umbrella organization for local energy cooperatives throughout Germany. Due to their strong networks, *Energiegenossengschaften* have a high communicative presence (Kahla, 2017). Most German LEIs are active in the generation of renewable energy, whereof most are involved in photovoltaics, followed by wind and bioenergy. A very small number of LEIs is involved in hydropower, solar heat, and the provision of local heat grids. In the past years, a few LEIs have also gotten involved in the sustainable mobility sector, for example by working on E-mobility and car sharing concepts or by combining solar energy, e-mobility and car sharing (Kahla, 2017). In total, around 40% of all renewable energy generated in Germany is generated by private households and cooperatives. LEIs thus play an important role in the renewable energy sector in Germany (Hoppe et al., 2015).

Oteman et al. (2014) typify the institutional arrangement in Germany as close to the state-oriented ideal-type, in which community initiatives can both be enabled and constrained. State steering can support certain types of initiatives that are institutionally supported through for example funding. Other kinds of initiatives that do not fit into the "scheme" of the state can be constrained. This can lead to a low variety of community initiatives. In the case of *Energiegenossenschaften*, they are clearly supported by the German government in the context of the *Energiewende,* prioritizing decentrally generated renewable energy.

5 Findings

In this chapter, the results of the qualitative data analysis based on conducted interviews and studied policy documents will be discussed. Paragraph 5.1 gives a general introduction of every LEI, describes their implemented/planned EVCI model, and their motivations to provide EVCI themselves. Paragraph 5.2 describes the personal, cultural, organizational, and infrastructural capacities of the five studied LEIs. Paragraph 5.3 focuses on the cross-case analysis: found patterns between the available (combination of) LEIs and their implemented EVCI-model. Based on these patterns 'lessons learned' have been formulated. All quotes used in this chapter were originally stated in Dutch or German, but were translated to English by me for the purpose of this thesis.

5.1 The studied LEIs & their chosen EVCI-models

The third sub-question formulated in the first chapter of this thesis is: *"Which role do the LEIs play in the provision of the EVCI and in the EVCI market?"*. This question will be answered in this paragraph by giving a case-by-case description of the implemented (or in LochemEnergie´s case planned) EVCI-model, the related technical aspects, the chosen business model, and the distribution of the different market roles. Before explaining the EVCI-model, a general introduction to each LEI is given.

5.1.1 Grunneger Power

GrunnegerPower (GP) is a big and highly professionalized energy cooperative that is active in the city of Groningen (ca. 230.000 inhabitants) and its surroundings. They started in 2007/2008 as a small working group and grew to become a cooperative energy company, which is nowadays called "Energy van ons". Energie van ons is by now independent from but affiliated with the cooperative association with its ca. 1000 members that is called GrunnegerPower. The cooperative aims at boosting the energy transition by implementing innovative and impactful projects in and around Groningen. GP's projects are implemented by a core team of eleven paid employees. Furthermore, GP is organized according to Holacracy criteria, a form of self-management with clear responsibilities and autonomy. GP also has different daughter firms, e.g. one for a solar park, one for EVCI and one for administration.

GrunnegerPower is implementing projects aiming at energy efficiency in households and companies (giving free advice), they are generating their own renewable energy (collective PV roofs/parks), have exploited their own CPs, have their first e-CS car, are taking part in research, and pilot projects, and have already co-authored municipal policies.

GrunnegerPower sees itself as a not profit-driven pioneer that can serve as an example for initiatives throughout the country and that is boosting projects that market parties do not dare to invest in yet (personal communication, N. Buiter, 10-05-2019).

GrunnegerPower´s motivations to provide EVCI

In order to start thinking about providing EVCI themselves, two what I call **"immediate causes"** were important in the case of GrunnegerPower: Firstly, a member that had set up his own electric taxi company asked GP to realize a taxi-CP at the central station for his company. Secondly, 10 old 1x11 kW CPs, owned by a different CPO (EVnet), needed to be either taken over by another party (the municipality did not want to do this themselves) or would have been demolished. The municipality of Groningen asked GrunnigerPower whether they would be willing to take over these CPs under very good circumstances.

Next to these very practical immediate causes, GP also had more intrinsic motivations for providing EVCI themselves: They wanted to help boost the transport transition, solve the local chicken-

egg problem and get prepared for future charging demand. GP therefore made use of the offer they were given instead of reacting to a clear local demand: *"We did know that the charge points did not have a good utilization degree. So, it was a strategic decision of GrunnegerPower, because we expect that the share of EVs will increase in future."* (personal communication, N. Buiter, 10-05-2019). Furthermore, GP wanted to steer the way EVCI is being implemented in Groningen: Firstly, they wanted to offer more affordable prices than other market parties do to make e-mobility more appealing to a larger group of people. Secondly, GP wanted to make sure that EVs will be charged sustainably, as they do not really trust CPOs claiming to do this: *"Because… Allego cooperates with Vandebron, but well, they also just buy guarantees of origin on the market. Well, are these really green?"* (personal communication, N. Buiter, 10-05-2019).

Lastly, providing EVCI next to generating electricity and having EV-customers as members seemed to be a logical step: *"We already have the chain of generating energy to energy usage. (…). And this chain is extended, the digital extension cord kind of, that is a charging point with an electric vehicle."* (personal communication, N. Buiter, 10-05-2019).

GrunnegerPower´s chosen EVCI-model

GrunnegerPower took over 10 CPs from EVnet that were upgraded by the former Charge Point Operator (CPO) from 7 to 11 kW before the take-over. GP only had to pay so-called „migration costs", the costs for a small technical upgrade so that the CPs were able to communicate to the new E-mobility service provider (EMSP) that GP had chosen to work with. There were no other investment costs to be paid. The investment for the taxi-CP (2x22 kW) in front of the central station has been done by GP itself. Both types of CPs are situated on public (municipal) ground, meaning that next to the CP, one, respectively two parking spots are reserved for charging EVs. Billing is organized mainly with charging cards via Elbizz.com, the EMSP GrunnegerPower is cooperating with. GP does not have a white label charging card with their own logo on it yet, but is attempting to get one.

The business model is based on a price mark-up model, in which the energy that is needed for charging is sold with a certain mark-up to the end-consumer (paragraph 2.3.4). The customer is billed per kWh, and the GP-members are paying a lower tariff than other chargers. Regarding the operational costs, there are fixed and variable costs. Fixed costs have to be paid for the maintenance of the grid to the DSO (distribution service operator), for the back-office service, and for insurance. By lowering the variable costs, one can improve the business case. The variable costs are a) the above-mentioned service costs of the EMSP (Elbizz.com) for billing, these are normally between 3 and 7 ct/kWh, and b) the energy tax on the bought energy. GP has managed to not pay any energy tax for their CPs by making the CPs „participant" of a Post code rose project (paragraph 4.1.1). Renewable energy is thus used administratively. For an overview of GrunnegerPower's EVCI-concept, see figure 6 below.

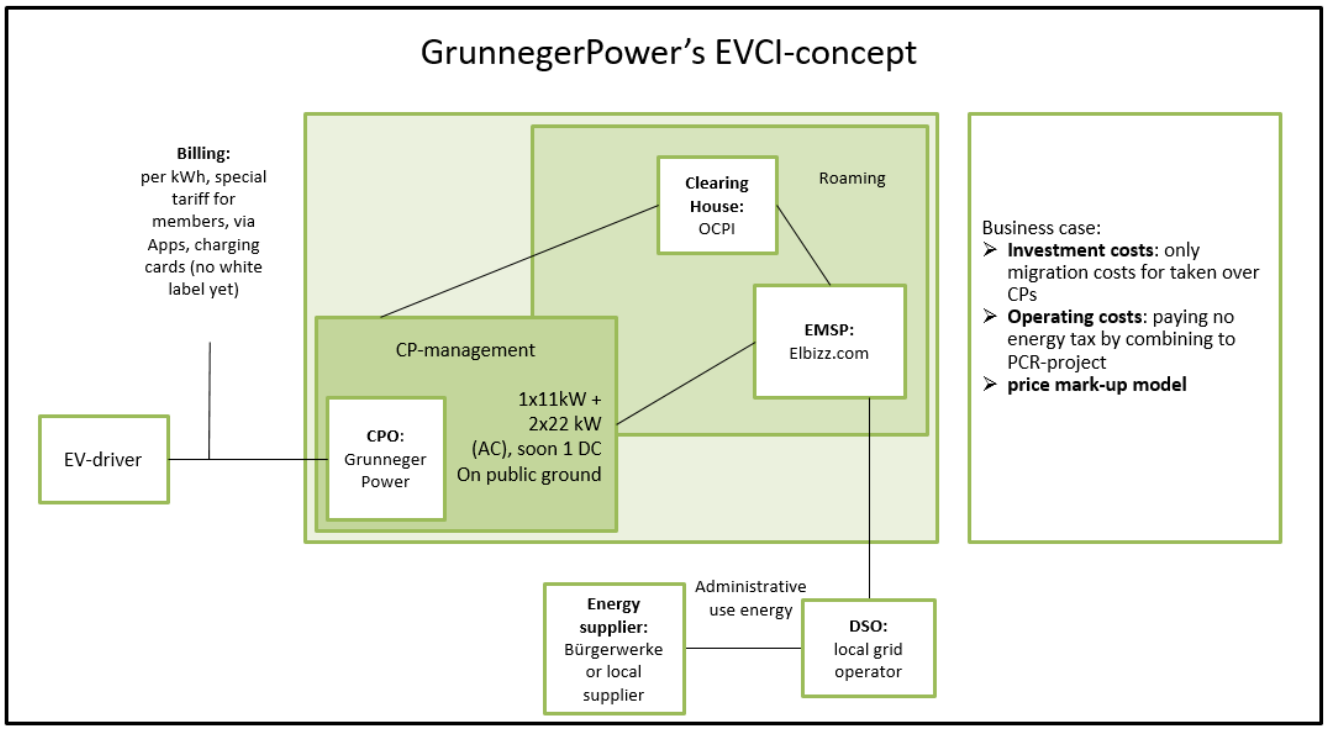


Figure 6: Schematic overview GrunnegerPower's Electric Vehicle Charging Infrastructure Concept (source: own representation).

5.1.2 Inselwerke eG

Inselwerke eG is an energy cooperative based on the German part of the Island of Usedom in the Baltic Sea. Usedom is a rural area that is significantly shaped by tourism (Regierung Mecklenburg-Vorpommern, n.d.) and affected by a sharp population decline (Staatskanzlei Mecklenburg-Vorpommern, 2011). Inselwerke eG exists since 2013 and is aiming at combining projects that boost sustainability and the energy transition, with the overall development of the region. They are a not-for-profit organization that is implementing projects to increase energy efficiency (LED street lighting for municipalities), to generate renewable energy (PV), and they have built up a network of publicly accessible CPs on Usedom and the neighboring mainland ("Usedomer Ladenetz"). Meanwhile, Inselwerke eG have extended their action radius to the whole Province of Mecklenburg-Vorpommern as well as to the neighboring province of Brandenburg. With their Usedomer Ladenetz, they have developed an EVCI-concept fitting rural areas. They want to extend it to the wider region and plan to build up a nation-wide "citizen charging grid" (Bürgerladenetz) in cooperation with the umbrella organization of german LEIs, Bürgerwerke.

Inselwerke´s motivations to provide EVCI

For Inselwerke eG, the immediate cause for getting involved in EVCI were changing macro-political circumstances: The German "renewable Energy Law" (Erneuerbare-Energien-Gesetz (EEG), see paragraph 4.1.2) was reformed in 2014, leading to a situation in which *"classical LEI-projects"* such as PV and heating became more difficult to finance. *"This has pushed us towards an innovation"* (personal communication, R. Tettenborn, 17-04-2019) – Inselwerke eG decided to enter the EVCI-market. However, they also had a number of intrinsic motivations: *"The motivation was predominantly that we saw: it is stagnating in the transport transition and we need to tackle that in a way now by providing infrastructure. To make people actually buy EVs, infrastructure must be available."* (personal communication, R. Tettenborn, 17-04-2019). Inselwerke eG found it important to stimulate the uptake

of EVs by providing EVCI in a situation where there were not many EV-drivers in their region yet. Another important motivation was the will to not let big energy companies such as RWE or EnBw control the EVCI-market. Instead, citizens should be involved and have a say in the pricing. Furthermore, the use of renewable energy and local fit solutions were important ambitions for Inselwerke eG (personal communication, R. Tettenbeorn, 17-04-2019).

Lastly, a few members of Inselwerke already owned EVs and had learned the hard way that there were not enough charge points available in the area. This personal demand and the idea that Inselwerke-charging points might increase the visibility of the cooperative within the community played a role as well (personal communication, R. Tettenborn, 17-04-2019).

Inselwerke´s EVCI-model

As Inselwerke´s foremost motive was to reduce range anxiety and to build up a far reaching EVCI-network, they chose for AC charging points, which are much more affordable than DC CPs. They realized single and double type 2 charging points at 12 locations on and around Usedom – always in cooperation with so called „Standortpartner“ (location partners). These can either be local small or medium enterprises (SMEs) such as hotels, restaurants or EV rentals, or municipalities. Therefore, some CPs are situated on public ground, whereas others are located on private ground. Inselwerke eG always tried to find custom fit solutions, fitting the specific partner´s needs. In most cases, Inselwerke are the CPO of the CPs but in some cases, the location partners have taken them over and have thus become CPO themselves (personal communication, R. Tettenborn, 17-04-2019).

At two locations, locally generated renewable energy is directly being used. Inselwerke eG have realized two charging plazas underneath a PV-roof: One in cooperation with a municipality, where the CPs are supplied with the on-site generated electricity if available, and otherwise with electricity from the grid. If there is no EV charging, but PV-electricity available, the generated electricity goes to the grid. The second PV-carport has been realized in cooperation with a local restaurant and cultural institution. If there is no charging demand here, the generated PV-electricity is used in the household.

Furthermore, all realized CPs are smart-charging ready in that sense that they are technically able to only charge when there is locally generated energy available. The software and back-office solutions are still missing for this, but Inselwerke have the ambition to realize this (at least for their own members) in future.

Charging and billing works via their own white label charging cards, all other charging cards that are available on the market, via an QR-code, and via Apps. Inselwerke are cooperating with the roaming supplier/clearing house (paragraph 2.3.3) Hubject to make sure that their CPs are accessible for all charging card holders in Europe. However, Inselwerke play the role of the EMSP themselves, meaning that they are managing the back-office, the billing and a hotline for emergencies all by themselves. They do this for their own CPs, but also for those of other LEIs within the „Bürgerladenetz“.

Regarding the business model, the investment costs were divided between the province of Mecklenburg-Vorpommern, Inselwerke eG, and the location partner. The province funded 40% of the CPs through the „climate protection subsidy“ (Landes Förderinstitut Mecklenburg-Vorpommern, 2019). The location partners could decide to either contribute to the investment costs or to pay a monthly contribution. The operating costs were funded through this contribution of the location partner and the selling of electricity. It is thus made use of a price mark-up business model (paragraph 2.3.4). Charging sessions are billed per kWh and per charging session (“start tariff”). Inselwerke-members pay a lower tariff than other clients. Furthermore, the idea is that the location partners can increase their retail sales, gain new customers and use the CP for marketing-purposes. The energy

supplier can be chosen by the locational partners, but Inselwerke advise them in this. For the earlier realized CPs, it is cooperated with a local green energy supplier, for the later ones, Inselwerke sell their own electricity via the cooperative couple Bürgerwerke. For a comprehensive overview of Inselwerke's EVCI-model, see figure 7 below.

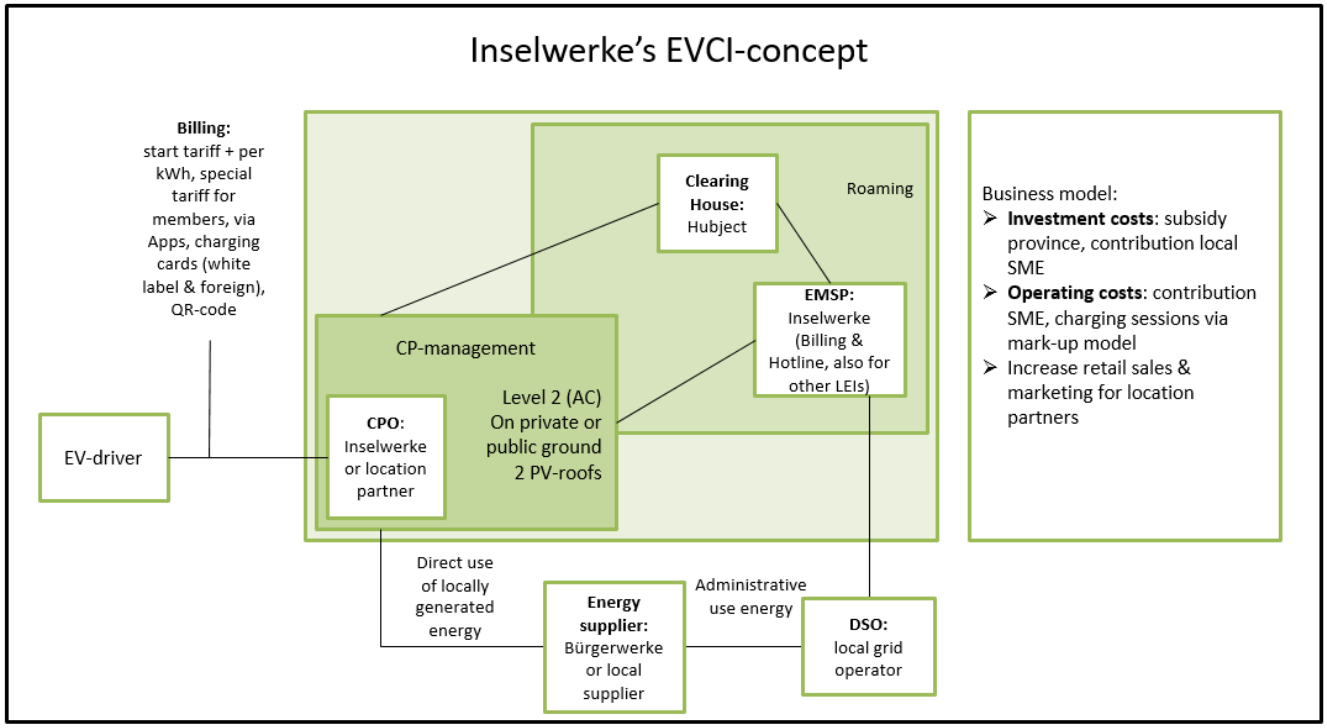


Figure 7: Schematic overview Inselwerke's Electric Vehicle Charging Infrastructure concept (source: own representation).

5.1.3 VrijstadEnergie

VrijstadEnergie (VE) is a young energy cooperative (founded in 2016 , having more than 100 members by now), based in the small town of Culemborg (ca. 28,500 inhabitants). Their action radius is mainly Culemborg and the somewhat wider region "Rivierenland". Their main motive is to boost the energy transition and to help achieve the municipality's sustainability and climate target (which is to be energy neutral by 2040). They do this by implementing projects that increase energy efficiency, mostly on a neighborhood level, by generating renewable energy themselves (PV, wind), by selling this renewable electricity to consumers via their own energy label "Betuwe Stroom", and by providing EVCI. Additionally, the independent, but affiliated cooperation "Coöperatie Auto" is planning to set up an e-CS fleet.

VE is heavily dependent on volunteers, but they do have a paid coordinator and project manager. This is important, because that way, someone can fully focus on the current projects (personal communication, A. Schamhart, 13-05-2019).

VrijstadEnergie´s motivations to provide EVCI

The immediate cause for getting involved in the provision of EVCI was that VE was planning a freestanding PV-roof, for which it was very difficult to get a closing business case, as one also had to build a construction for underneath the panels. The idea arose to make the project cost-effective by combining it with CPs. The foremost motivation was thus a self-serving one: getting a good business model out of the triangle of electricity generation, EV-usage and EVCI. Selling own electricity to CPs

pays better than delivering it to the grid. At the same time, a lower charging tariff can be achieved for VE-members or a future e-CS fleet.

Next to this, there were also more intrinsic motives like wanting to boost the energy transition and preparing for future demand *("the big boom that is going to come"* (personal communication, A. Schamhart, 13-05-2019)). Besides, there was actual demand in the local community: more and more people were requesting charge points. As the municipality has not set up any criteria for the placement of CPs yet, VE was afraid that the EVCI situation would become chaotic. They therefore decided to start providing CPs themselves (personal communication, A. Schamhart, 13-05-2019).

VrijstadEnergie´s EVCI-model

As mentioned, two charging plazas have been realized, located next to a school, respectively outside of a car-free neighborhood. These clustered parking locations were chosen deliberatively. The small plaza has two 2x22 kW CPs, the bigger one has three, but can be extended in future. The bigger one is located underneath a PV-roof and thus uses the locally generated electricity directly, if available. The smaller one only uses renewable electricity administratively, which is supplied by the own white label "Betuwe Stroom".

Both charging plazas are located on municipal ground. Because the municipality was not willing to provide many parking spots exclusively for EV-drivers, VE came up with an innovative parking concept: The CPs are placed with more space between each other so that every CP can be accessed from 6-8 parking spots. VE also found a solution for the problem of EVs that are still connected to the CP although they are already fully charged ("sticky chargers"). Once an EV is fully charged, other EV-users can decouple the EV from the CP so that they can charge themselves. This option was already technically available in the CP but had not been used before in the Netherlands.

Billing is possible via an own white label charging card, all other charging cards on the market, and via an app. VrijstadEnergie cooperates with several EMSPs: For the small plaza, VE cooperates with NewMotion, for the new one with E-fluxx. However, for their own members with white-label charging cards, they now cooperate with StekkerApp, a back office that has been developed for them (and potentially for other LEIs) to make their EVCI-concepts more cost-effective. This enables them to offer their members a lower charging tariff and also a differentiated day- and night tariff (between 9 and 15 o´clock, when there is more solar energy available, charging is cheaper). Charging sessions are billed per kWh. In future, they also aim at offering completely dynamic tariffs, according to the current energy availability and price.

Regarding the business model, the investment costs have been divided between the province (which funded 20% of the PV-carport), a regional investment fund (which subsidized the CPs), the municipality, and VE itself. The part taken over by VE itself was funded by recruiting new members that then pay a certain contribution for new projects. The costs for the Plug-holders where lowered by making use of 3D printing. The operating costs could be minimized by making use of the SDE-subsidy (paragraph 4.1.1), by having to pay a lower EMSP service tariff to StekkerApp and by selling their own energy. For a schematic overview of VrijstadEnergie's EVCI-concept, see figure 8 below.

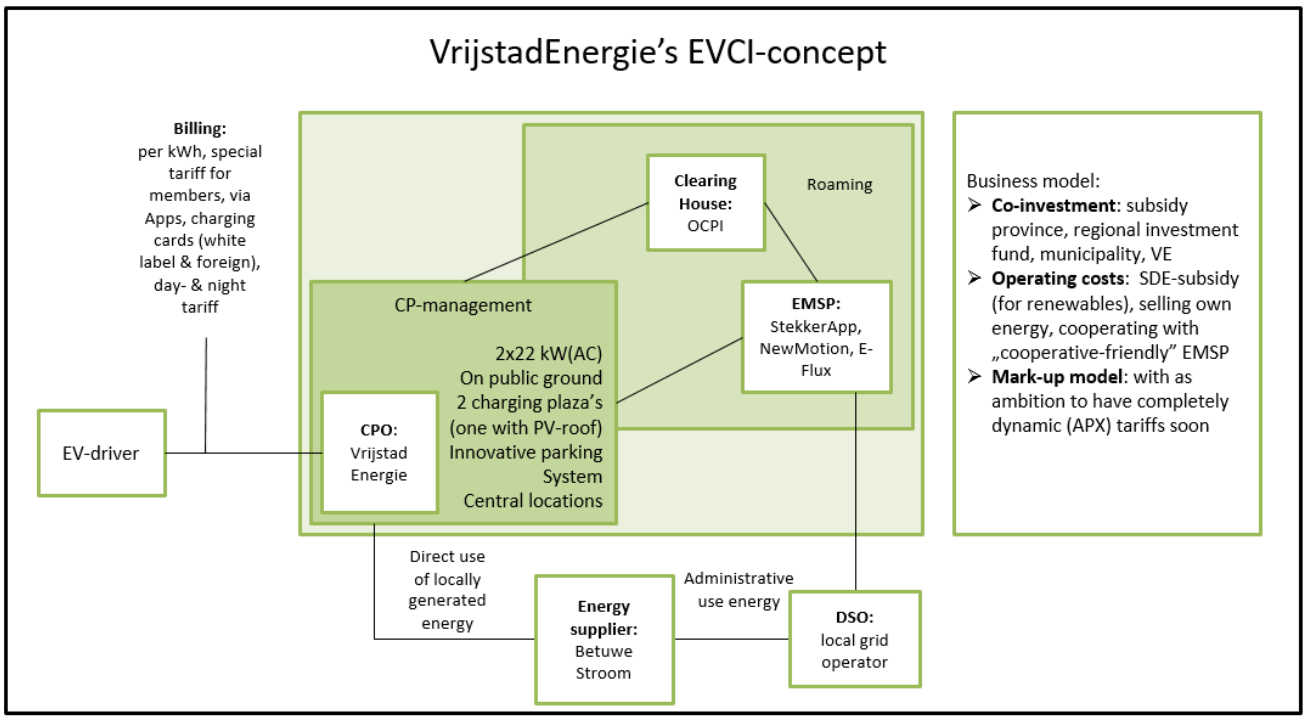


Figure 8: Schematic overview VrijstadEnergie's Electric Vehicel Charging Infrastructure Concept (source: own representation).

5.1.4 BürgerEnergieRheinMain eG

The energy cooperative BürgerEnergieRheinMain eG (BERMeG) was founded in 2012, has since gained around 180 members and has invested about 1 million into sustainable projects. They are based in the small town of Mörfelden-Walldorf (ca. 34,000 inhabitants), which is located in the metropolitan area around Frankfurt/Main. Until now, BERMeG is predominantly active in Mörfelden-Walldorf, but they are aiming at extending their action radius to other municipalities in the region.

They are realizing projects that are aimed at increasing energy efficiency, at the generation of electricity based on renewable sources and at replacing fossil energy sources by renewable ones. BERMeG has realized several PV roofs/parks, has co-invested in a windmill together with a neighboring cooperative, gives individual advice on energy efficiency in households, and has realized a small district heating system in cooperation with the municipality. Furthermore, they have realized 18 CPs throughout the municipality of Mörfelden-Walldorf and they cooperatively own 5% of the local electricity grid (personal communication, A. Fröb, 11-04-2019). Important principles for BERMeG are local re-investment, local involvement and participation of citizens, independence, as well as cooperation with other (predominantly local) organizations, institutions and entrepreneurs (BürgerEnergieRheinMain eG, n.d.).

BERMeG is 100% based on voluntary work, but they aim at employing their first employees in near future. However, they first need more fixed income sources to be able to do so (personal communication, A. Fröb, 11-04-2019).

BERMeG´s motivations to provide EVCI

The immediate cause for BERMeG to get involved in the provision of EVCI was that the municipality of Mörfelden-Walldorf took part in a pilot-project financed by the province of Hessia: in two small hessian towns e-CS business cases should be tested. For this purpose, the start-up Mobileee would provide an

e-CS fleet. The only problem was that there was no EVCI available in Mörfelden-Walldorf and it was unclear who could provide it. The municipality had stated that they would not be willing to exploit EVCI themselves. In the same period, BERMeG heard of Bürgerwerke´s plans to build up a citizen´s charging network in cooperation with the front-runner Inselwerke eG. The combination of getting support and from Bürgerwerke/Inselwerke and of getting financial support via the Hessian pilot-project convinced BERMeG to provide EVCI.

Other more intrinsic motives were to boost the energy transition and to give local citizens the possibility to take sustainable choices, also in the transport sector, and even before they realize themselves that switching to e-mobility is important. Furthermore, BERMeG wanted to make sure that the EVCI in Mörfelden-Walldorf would become as sustainable as possible, supplied by 100% renewable electricity instead of by the German energy-mix (personal communication, A. Fröb, 11-04-2019).

BERMeG´s EVCI-model

BERMeG realized nine 2x22 kW charging points that are all located on public ground. Next to each CP, two municipal parking spots reserved for charging EVs. One of the two parking spots per CP is the base of one e-CS car. At most CPs, locally generated renewable energy is only used administratively (BERMeG is supplying their own electricity via the cooperative umbrella organization Bürgerwerke). Above one CP, a small PV-roof has been realized, where the on-site generated energy is used directly, if available. All CP-locations have been chosen based on the criteria of visibility and consecutiveness to increase the chances of a high utilization.

Billing is possible with a BERMeG charging card, all other charging cards that are available on the market, and via an QR-code. Billing is organized via Inselwerke eG who function as EMSP: they receive all invoices of charging sessions and are paid by the end-user. Furthermore, Inselwerke eG take care of the back-office and offer an emergency hotline (personal communication, A. Fröb, 11-04-2019).

The investment costs have been divided as follows: the province of Hessia funded 40% of the investment costs, the e-CS start-up Mobileee and paid the municipality paid a building cost subsidy. The remaining 20% were financed by BERMeG itself, which could be realized through the contributions of members and newly recruited members, that all pay a minimum of € 1,600 for the funding of projects. Members get paid an interest rate of 3% throughout the term of the project. The operating costs are distributed as follows: BERMeG has to pay a service tariff to Inselwerke (billing, back-office, hotline), but receives a service tariff by Mobileee and receives the charging tariffs of EV-drivers. The business model is thus based on a mark-up model (paragraph 2.3.3) in which charging sessions are charged per kWh plus a start tariff of 2 € per session. BERMeG-members, e-CS clients, and municipal staff pay a lower tariff. From next year on, when the e-CS pilot is over, not all e-CS cars will stay profitable so that a part of the service tariffs BERMeG receives will drop out. However, the CPs will probably stay cost-effective as they are by now also sufficiently utilized by non-e-CS clients. For an overview of BERMeG's EVCI-concept, see figure 9 below.

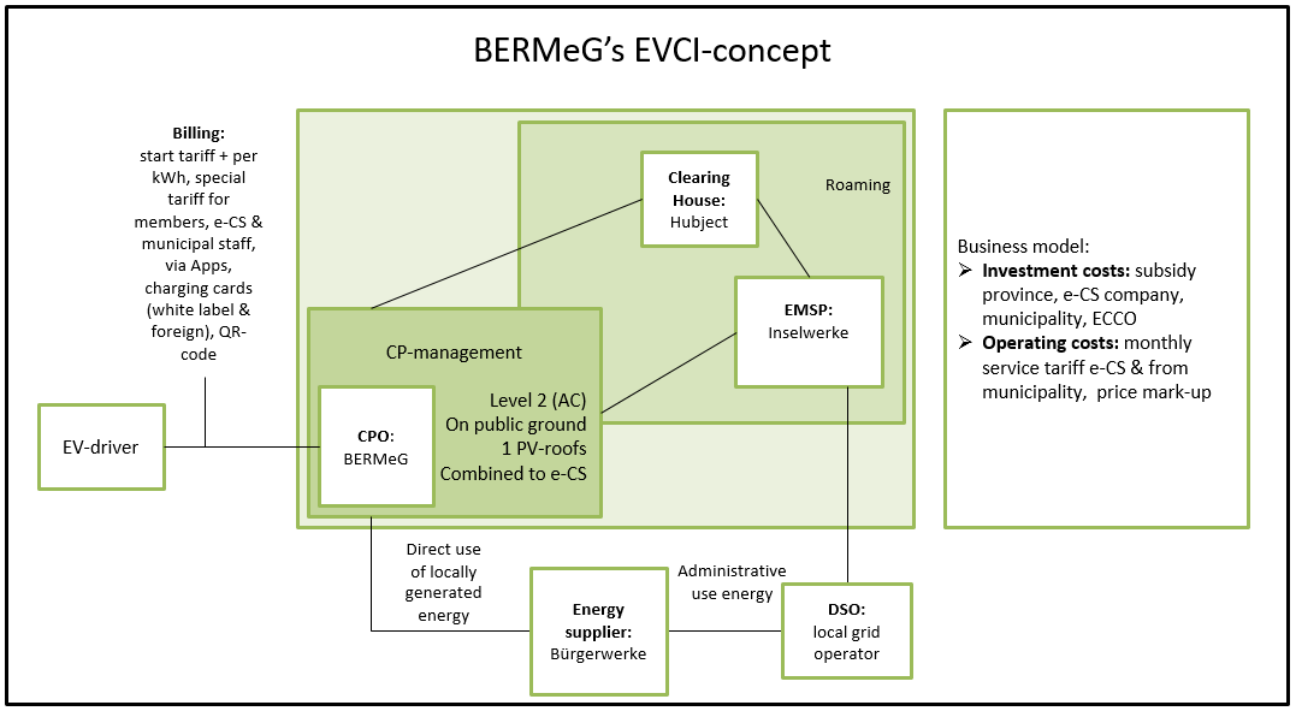


Figure 9: Schematic overview BürgerEnergieRheinMain's Electric Vehicle Charging Infrastructure Concept (source: own representation).

5.1.5 LochemEnergie

LochemEnergie (LE) is an energy cooperative based in the municipality of Lochem, a rural municipality consisting of one town and several small villages. LE was founded in 2011 and has since then gained about 1000 members and has invested ca. one million euros into sustainable projects. LochemEnergie has already taken several steps in a process of professionalization by employing four paid employees (2,2 FTE). However, they stay a cooperative that is dependent on the work of volunteers and financially dependent on both the exploitation of their products and services, and grants.

Their general motive is to boost sustainability and the energy transition at the local level by implementing projects *"from, for and by Lochemmers"* (personal communication, M. Scheepens, 15-04-2019). They work on three branches: saving energy and resources, generating renewable energy themselves, and smart (collective) purchase (personal communication, P. Stolte, 17-05-2019). The first branch includes projects and services focusing on energy efficiency; e.g. offering free advice on saving energy in households or businesses. Within the second branch, LochemEnergie has realized several PV-parks and a hydropower turbine, and they are now planning the second hydropower turbine and the first windpark together with neighboring cooperatives. LochemEnergie also supplies energy to end consumers via a white label contract with the energy company "Greenchoice". Within the third branch, LochemEnergie organizes collective purchase actions of e.g. solar panels to make these more affordable for the citizens of Lochem. Next to these three branches, LochemEnergie has set up an e-Carsharing fleet, offers chauffeured rides in their EVs ("e-trip"), has participated in a smart grid pilot project, and has developed a strategic EVCI-plan for the municipality of Lochem.

LochemEnergie sees itself as an innovative, pioneering trendsetter: *"But what really characterizes us is that we are front-runners. So, we try out things that are later also implemented by others, but we always walk in front a bit. And we do this with our research projects, with governments,*

with universities and grid operators. That has been the strength of LE, that we were always visible with nice projects." (personal communication, T. Tekelenburg, 30-04-2019).

LE also defines itself as considerably different from market and governmental actors. As a cooperative, they are not profit-driven, meaning that they do not only invest in something (like EVCI) once they know it will be profitable, but rather based on the motivation to stimulate change even before something is profitable. Furthermore, LochemEnergie wants to be a *"third party*" within society advocating for a different organization of society (personal communication, M. Scheepens, 15-04-2019).

LochemEnergie´s motivations to get involved into the provision of EVCI

"Immediate causes" in the case of LE were that they got inspired by the cooperative *GrunnegerPower*, who had already exploited CPs themselves and let LE realize that this is actually achievable for cooperatives. Secondly, a similar situation as in Groningen appeared: eight old 1x11 kW CPs by EVnet need to be either taken over by another party or will be demolished. Just as GP, LochemEnergie might take over these CPs under very good conditions.

However, also LE has important intrinsic motivations for providing EVCI. They want to boost the transport transition by stimulating the uptake of EVs. Part of this is solving the local "chicken-egg problem" by providing publicly accessible CPs in a situation where there is not yet much actual demand of EV-drivers in Lochem. In the rural municipality, where not many people are dependent on public charging facilities, the utilization degree of CPs is not expected to be very high. Therefore, in the eyes of LE, companies such as Allego do not build enough CPs in Lochem. LE is unsatisfied with this situation. They therefore want to get control over the development and quality of EVCI in Lochem: *"Getting the market in our hands. So not wanting to be dependent from other´s charging points, not wanting to be dependent on other´s electricity… that you could say: we want to manage the whole package well for our members."* (personal communication, T. Tekelenburg, 30-04-2019). Furthermore, they want to arrange for affordable charging tariffs as they see the threat that companies might demand *"giga-tariffs"* at the best CP locations, which will discourage people to step over to EVs (personal communication, M. Scheepens, 15-04-2019). They think that citizens should have a say in this and are convinced that they can offer fairer prices and local re-investment of yields as they are not a profit-driven organization. Moreover, LochemEnergie wants to make sure that their EVCI will be truly sustainable, by supplying it with locally generated renewable energy instead of with „green energy" that has been imported from abroad. LE also wants to arrange for CPs being up to date regarding technical requirements and that they are well-dispersed throughout the municipality.

A self-serving motive to provide EVCI is that LE expects EVCI to be a good business case for them, as it can connect their other activities with each other: the generation of renewable energy (supply) with their e-CS fleet (demand). With this „triangle" they would have an increased turnover of their own energy and could charge their own e-CS fleet for a lower tariff (personal communication, T. Tekelenburg, 30-04-2019). Last but not least, they expect that providing public EVCI in Lochem with the LE-logo on it could increase their visibility within the local community: *"with this, we could get a face."* (personal communication, M. Scheepens, 15-04-2019).

LochemEnergie´s plans and possibilities for the provision of EVCI

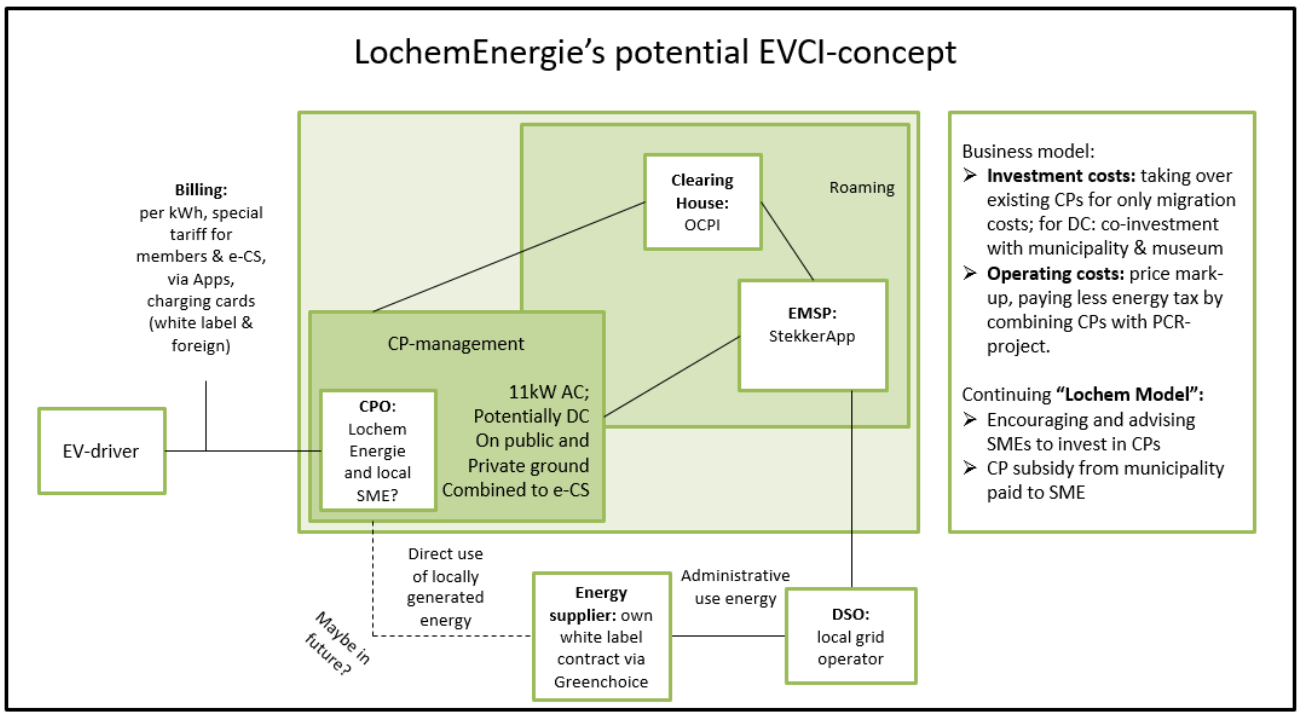
LE is currently already boosting the provision of publicly accessible EVCI by encouraging and advising local SMEs to realize a CP on their property. Not LE, but the SMEs are thus the CPOs. This is the implementation of the strategic EVCI plan LE has written for the municipality a few years ago, called the "Lochem Model", aiming at increasing the numbers of CPs in Lochem and creating a concept that

has a good local fit to the rural circumstances. The business model works as follows: SMEs are encouraged to invest in a CP with the argumentation that they can use it for marketing-purposes and that consumers that are charging their EV might stay longer in their restaurant or shop. The SMEs get a subsidy from LE (which is actually funded by the municipality) to soften the investment costs.

In (near) future however, LE might take over the mentioned 8 1x11 kW CPs, which are all located on municipal ground. These could be taken over only for "migration costs", meaning that the investment costs would be very low. LE might even demand to take over upgraded CPs (more kW, smart charging ready as requirements) so that they would not even have to pay the technical upgrade of the CPs. Regarding the operating costs, LE might improve the business case of the until now unprofitable CP in two ways: firstly, they can increase the occupation of the CPs by locating an e-CS car at every CP and they could decrease the energy price, by supplying the CPs with their own energy. Secondly, they could make use of fiscal advantages: The CPs could become "participant" of a PCR-project, meaning that they would need to pay less energy tax. It would thus be made use of locally generated renewable energy administratively. Furthermore, the operational costs would be carried by the usual price mark-up model in which charging sessions are charged per kWh. The margin between costs and the selling price can be reduced by using the PCR and by cooperating with an EMSP that demands low service costs, e.g. the StekkerApp. By selling one´s own energy via the existing white-label contract, one can reduce the energy costs and earn something at the same time.

Billing would be possible via one App, integrating charging, paying and reserving e-CS cars. In future, LE would also want to implement smart charging in the way of balanced charging and dynamic tariffs.

Another possibility is to realize a fast charging point in co-investment with the municipality and a local museum in front of which it is supposed to be realized. LochemEnergie would then become the CPO, but would keep implementing the Lochem Model, connecting EVCI to other services or enterprises. For an overview of the possibilities LochemEnergie has, see figure 10 below.



Figuur 10: Overview LochemEnergie's potential Electric Vehicle Charging Infrastructure Concept (source: own representation).

5.2 The capacities of the studied LEIs

The first two sub-questions formulated in the first chapter of this thesis are: *"Which combination of personal, cultural, organizational and infrastructural capacities can the studied LEIs draw on?"* and *"Which other factors helped enabling the LEIs to provide EVCI at the local level?"*. These two questions will be answered in this paragraph, in the form of a cross-case-analysis. Tables 4-7 give an overview of the combinations of capacities per Local Energy Initiatives. For more detailed descriptions of the capacities of each LEI, see appendix 5 (paragraph 9.5.5).

5.2.1 Personal Capacities

Personal Capacities stand for resources that individuals within the community or LEI have, as well as the organization´s resources as such. They can refer to knowledge, motivations, willingness to act and specific skills within the LEI (Middlemiss & Parrish, 2010). Personal capacities have been operationalized based on the motivations to provide EVCI within the organization, their shared storylines with relevant partners, their members' skills, their capacities to manage their members, entrepreneurship for EVCI within the organization and their learning capacities (figure 5). An overview of the capacities per case can be found in table 4 below.

Table 4: Overview Personal Capacities per case (source: own representation).

Personal capacities	Grunneger Power	Inselwerke eG	VrijstadEnergie	BürgerEnergieRheinMain eG	LochemEnergie
Shared Storyline	*With municipality*: Sustainability objectives of municipality (boost transport transition, chicken-egg problem), affordable charging tariffs, participative character	*With municipality:* Green image, strengthening touristic sector, municipality´s sustainability objectives *With local SMEs:* Green image, marketing, acquiring new guests, boost energy transition	*With governments:* Participatory character, sustainability goals municipality	*With municipality:* Green image, municipality´s sustainability goals, participative character	*With municipality*: sustainability objectives municipality, services for the public, local & participative character, local renewable energy for EVCI *With local SME*: green image/marketing, custom-fit solutions
Member´s skills	Interdisciplinary team (accountancy, project management, marketing, etc.), High administrative capacity (11 fte, own energy company) A lot of learning-by-doing	Interdisciplinary team (engineering, regional development, economics), Personal interest in EVCI, learning-by-doing, professional appearance, insistence	Interdisciplinary team (administration, finance, project management, economics, marketing/PR)	Interdisciplinary team (marketing, finance, ICT, engineering, volunteer management), sufficient realism	Interdisciplinary team, many professional backgrounds (administration, finance, communication, jurisdiction, engineering, subsidy advice), Realism, specific ECVI- knowledge "attached"

Membership management	Less dependent on active members due to paid employees, but challenge between core values & professionalization		Always enough motivated volunteers due to eco-neighborhood	Recruiting active members difficult, but have someone in board who is focusing on this (professionally)	Constant stock of active members, but difficult to recruit at the right time
Entrepreneur-ship	Predominantly individual entrepreneurship, furthermore not much focus on e-mobility within GP	Individual entrepreneurship of 2 board-members, but also collective (board, supervisory board)	Collective entrepreneurship by the board & the project manager	Collective entrepreneurship by board & supervisory board	individual & collective entrepreneurship (elektrip working group, board)
Learning Capacity	*Earlier projects:* project planning, juridical procedure, financial planning, internal organization) *Other projects*: not regarding EVCI, but related concepts (such as e-CS)	*Earlier projects:* negotiation of prices, functioning as team, strengths & weaknesses. *Other projects*: not, as they were the EVCI-pioneers in the German cooperative world	*Earlier projects:* procedures, network, PV-related knowledge	*Earlier projects:* cooperation with big actors, negotiating prices, business cases, developing own financing concept *Other projects:* inspiration, knowledge, experience & administrational capacity by Inselwerke & Bürgerwerke	*Earlier projects*: PCR, lobbying, neighborhood projects, networks, people´s behavior *Other projects:* inspiration & knowledge exchange EVCI (GP & VE)
Professionalization	High (11 fte), daughter companies.	Reduced the "voluntary factor" to be able to offer hotline etc., and will soon employ the next employee	Starting (still very dependent on volunteers, but have one paid project manager & coordinator)	Low; no payed employees yet, but professionalization plans for future	Relatively high (2,2 fte)

As I have already described the LEIs' motives in paragraph 5.1, I will only briefly summarize the most common motives here. All studied LEIs have a **mix of motivations**, which fits the research of Hoppe et al. (2015), including intrinsic (environmental) motivations, self-serving motivations and "immediate causes". Most LEIs realize EVCI in a situation where there is not yet much direct need for public EVCI. This might contradict the statement of Peredo and Chrisman (2006) that Social Enterprises' actions are usually motivated by a specific need within the community. However, the studied LEIs act with a future need in mind: *"We are actually acting as boosters making people aware that problems are approaching them, problems that they are not yet really experiencing."* (personal communication, M. Scheepens, 15-04-2019). They want to control the quality and development of EVCI in their municipality, especially the sustainability thereof (= use of locally generated renewable energy) and the price-structure, instead of leaving the control to market parties they do not fully trust. This fits Bomberg and McEwen (2012´s) notion of structural resources very well.

Secondly, all studied LEIs have some self-serving motivations to provide EVCI. Most important self-serving motives were: increasing the LEI´s visibility on the streets, and creating a potentially good business case by combining one´s own projects (such as generation of renewable energy and e-CS) through EVCI. The motivation is to have control over *"the whole chain (…) from the generation of energy to its use"* (personal communication, N. Buiter, 10-05-2019).

What has been less expected beforehand, was that **"immediate causes"** were of utter importance, thus possibilities that came up and made it possible for the LEIs to get involved in EVCI. Without these immediate causes, they would not have started to exploit CPs at this point of time: *"Otherwise, we would have probably just done PV projects, and wouldn´t have had the capacity and energy to occupy ourselves with e-mobility"* (personal communication, R. Tettenborn, 17-04-2019).

All studied LEIs had built up certain **shared storylines** (Horlings, 2010) with which they aligned their vision with those of relevant other actors (municipalities and local businesses).These shared storylines were useful to convince partners to cooperate and thus to mobilize resources.

The most convincing shared storylines for municipalities were LEIs helping the municipality to implement their emission targets (all cases), *"steering the price-development"* of charging sessions (personal communication, C. Munneke, 10-05-2019) (Groningen), and the overall development of the region, especially in rural and touristic areas (personal communication, S. Pflock, 23-05-2019) (cases Usedom and Lochem). As *"Most municipalities and governments nowadays have an interest in being able to say that they have supported citizens-participation"* (personal communication, A. Fröb, 11-04-2019), the participatory character of the LEIs was an important argument for municipalities in most cases. Only for Inselwerke eG this was not the case, as their cooperative and participatory character is rather unknown in the region and was therefore viewed with skepticism (personal communication, R. Tettenborn, 17-04-2019).

For local businesses, important shared storylines were creating a green image of their enterprise, increasing retail sales, acquiring new customers and getting offered custom fit solutions by the LEI, that they would not get offered by big companies (personal communication, S. Wollenberg, 06-05-2019 & R. Tettenborn, 17-04-2019). However, intrinsic environmental motives on the side of the SMEs were important as well: the cost-benefit relation between high investment costs and long-term benefits is otherwise not convincing enough yet (personal communication, B. Dik & Y. Nieuwpoort, 23-05-2019; S. Wollenberg, 06-05-2019).

The **knowledge and skills of LEI´s members** proved to be important for the LEIs' functioning and their possibilities for implementing projects as well (Middlemiss & Parrish, 2010). Especially having an interdisciplinary team including a lot of professional experience from different backgrounds proved to be crucial (see table 4). That way, the studied LEIs could build up relevant knowledge helping them to plan and implement projects well and thus also to provide EVCI. This is also noticed by external parties: *"they have a lot of knowledge in many different fields"* (personal communication, M. Mobach, 03-05-2019). Specific EVCI knowledge, however, has in most cases developed via learning-by-doing or is *"attached"* to the LEI by cooperating with people from within the "cooperative world" (personal communication, M. Scheepens, 15-04-2019, R. Tettenborn, 17-04-2019). Furthermore, a professional appearance, insistence and integrity were important soft skills for building trust with location partners and municipalities (personal communication, R. Tettenborn, 17-04-2019; S. Pflock, 23-05-2019). Lastly, for both LochemEnergie and BürgerEnergieRheinMain, it was important to have "*a good balance between exiting projects and (financial) realism"* and thus a balance between idealism and realism (personal communication, P. Stolte, 18-04-2019).

Regarding **managing membership**, mostly the challenge of recruiting sufficient active and skilled members was mentioned, which matches Spear et al. (2009) findings. The interviewed LEIs realize that this is a challenge and important to their functioning, but do not encounter any pressing problems on this field yet. However, they argue that it is difficult to recruit members with certain skills at the right time, as LEIs normally cannot open a vacancy for a paid function (personal communication, M. Scheepens, 15-04-2019). GrunnegerPower, on the other hand, having 11 paid employees now, has become less dependent on active members. However, the professionalization of the organization brings about new challenges (table 4).

As expected based on the theories of Horlings (2010) and Trivedi and Stokols (2011), **entrepreneurship** (in this case focusing on e-mobility/EVCI) within the LEI was important to create energy and inspiration and to push the project further. In most studied LEIs a combination of individual and collective entrepreneurship can be found.

Individual entrepreneurship means that there are one or a few individuals that predominantly push forward the EVCI-project, "*the enthusiast(s) who harvests all projects"* (personal communication, M. Mobach, 03-05-2019). These individuals tend to have many good personal contacts within the community that help them to build trust and find alleys for implementing their projects (personal communication, R. Tettenborn, 17-04-2019), are successful in recruiting new active members, in using windows of opportunity, in mobilizing resources and in influencing and shaping (municipal) policy (personal communication, L. Otto & P. Stolte, 02-05 & 18-04-2019).

Collective entrepreneurship is needed as the individual entrepreneurs often have energetic ideas, but need others to implement them, as reflected in the following quote about an individual entrepreneur: *"There are often many loose ends left. That is okay and that is his power, but then you need someone else that can combine all these loose ends."* (personal communication, M. Mobach, 03-05-2019). Furthermore, it is important that the idea of providing EVCI is supported by a larger group of people within the LEI, e.g. by a working group focusing on the topic (case LochemEnergie) or by the whole board and supervisory board who help finding solutions and implementing the project (personal communication, R. Tettenborn, 17-04-2019; A. Fröb, 11-04-2019).

Only in the case of GrunnegerPower there does not seems to be much collective entrepreneurship for EVCI and e-mobility within the LEI. Although it is clearly stated that *"this is not a one man show"*, it became clear that the focus of GP as a whole and thus of most employees does not lay at e-mobility at the moment. Except for N. Buiter, no one seems to push the EVCI-project forward, which is why he is planning to set up his own cooperative for the realization of "cooperative EVCI" now (personal communication, N. Buiter, 10-05-2019.

Furthermore, relating to what Hoppe et al. (2015) call **"learning capacity"**, learning from earlier implemented projects showed to be very helpful. From these, LEIs developed skills and capacities, that were necessary for their EVCI projects (see table 4) and LEIs learned how to properly function as an organization or team (see GrunnegerPower and Inselwerke in table 4). Inselwerke also state: *"We got to know our strengths and our weaknesses"* (personal communication, R. Tettenborn, 17-04-2019). Moreover, LEIs had already built up fruitful networks during earlier projects and learned how to cooperate and deal with large institutions, such as energy providers or grid providers (see e.g. LochemEnergie and BERMeG in table 4).

However, the LEIs differ from each other regarding the extent to which they have learned from other cases, as proposed by Wüste and Schmuck (2012). GrunnegerPower and Inselwerke, who both

pioneered within the cooperative world of their country, could not from other cases regarding the provision of EVCI, because they were the first ones within their networks. They rather advised and supported other LEIs later on how to provide EVCI (personal communication, N. Buiter, 10-05-2019). This can be clearly seen in the cases BERMeG and LochemEnergie, who got inspired by exactly these front-runners and learned from their experiences (personal communication, R. Tettenborn, 17-04-2019; A. Fröb, 11-04-2019).

5.2.2 Cultural Capacities

Cultural Capacity refers to the legitimacy that sustainability objectives have in the local community (Middlemiss & Parrish, 2010). In this thesis, it is furthermore looked at the relation the LEI has to the local community. An overview of these cultural capacities per case can be found in table 5 below.

Table 5: Overview Cultural Capacities per case (source: own representation).

Cultural capacities	GrunnegerPower	Inselwerke eG	VrijstadENergie	BERMeG	LochemEnergie
Legitimacy Sustainability	Average, More legitimacy through GP?	General public versus members & partners ("the ones taking responsibility"). Attitude ≠ Behavior. General societal trend helps (→ environmental awareness).	LEI in "ecobubble" of an eco-neighborhood. Outside of that: average legitimacy	Attitude ≠ Behavior. Average legitimacy	Conservatives & responsible, not much urgency felt, but general awareness
Relation to Community	First skepticism, but growing trust through successful projects. Acceptance of projects. Many don´t fully understand the cooperative idea. More visibility through EVCI.	Much skepticism and unwillingness (not used to cooperative model), but slowly growing trust due to successful projects. Extension of action radius due to difficult relationship. Personal contact important for location partners.	Growing trust & visibility through realized projects. Support & many motivated citizens in "ecobubble".	Generally good (trust, acceptance of projects). Growing visibility through EVCI. LEI closer/more embedded in community than other actors	Generally good (trust, visibility, enough motivated people), but some see them as elitist. Many don´t fully understand the cooperative idea. Need to actively built trust.

It was generally difficult for most respondents to make a statement about the **legitimacy of sustainability objectives in the local community**. Most of them did not have any concrete data at hand and thus estimated the legitimacy of sustainability as average. Attitude-wise, a clear difference can be felt between the LEI's members and the rest of the population: *"It is really only the front-runners that occupy themselves with this kind of topics. Culemborg as such is not such a front-runner. But somewhere you need to find the fools that are just doing it!"* (personal communication, A. Schamhart, 13-05-2019). The quoted LEI in Culemborg is located in a real *"ecobubble*", an ecologically planned neighborhood, where there are a lot of people that want to get active in the environmental field. Furthermore, the general societal trend is leading to a situation in which environmental awareness becomes more "common sense" (Personal communication, A. Fröb, 11-04-2019) and in which E-mobility is more and more accepted. However, being aware of something or accepting something does not mean that people actually start changing their behavior: *"There are many different things that*

condition each other and lead to an increasing acceptance of E-mobility. Nowadays, there are not only EVs that have a range of 60km anymore, but also much more advanced vehicle types. And the idea of sustainability, also energy transition etc., more and more people have that in the back of their heads, but not so much the idea of acting accordingly." (personal communication, R. Tettenborn, 17-04-2019). The activities of most LEIs thus seem to have a parallel impact to the general societal development (personal communication, N. Buiter, 10-05-2019). Generally, it can be summarized that in none of the studied cases a lack of legitimacy of sustainability issues within the population has hindered a LEI´s project, as there were always some people that did want to participate.

With regard to **the relation of the different LEIs to the local communities**, most LEIs have experienced skepticism or were not taken seriously by the general public in the beginning *"because you don´t have any track records, no proven projects"* (personal communication, N. Buiter, 10-05-2019). However, the more projects a LEI has successfully implemented, the more people realize that they are a serious organization. After having left the very early founding phase, most LEIs seem to be generally trusted and accepted: *"By now, we are thanks to the realized projects and research projects more or less established as an organization"* (personal communication, N. Buiter, 10-05-2019).

Only in Usedom, where people are not used to the cooperative model, Inselwerke still experience strikingly much skepticism and unwillingness within the community (personal communication, R. Tettenborn, 17-04-2019). An extra portion of time and insistence, as well as successful projects and an increased visibility through public EVCI helped to build trust anyway: *"Now, in the 5th or 6th year since our foundation, people are observing us neutrally and see: Inselwerke are still there! And this creates some kind of trust."* (personal communication, R. Tettenborn, 17-04-2019). Next to actively building trust, Inselwerke have also extended their action radius towards regions around Usedom where it is easier to draw on trust and motivation from within society.

One aspect that especially came up in the case of LochemEnergie, is that most inhabitants do not fully understand the cooperative idea behind LE yet: *"I think, that if you ask most people on the streets: 'what is LochemEnergie?', that most of them will say: 'that is that club with solar panels, these people that want to do sustainable things', but I think that they do not notice the cooperative idea in it."* (personal communication, M. Scheepens, 15-04-2019).

5.2.3 Organizational Capacities

Organizational capacities are the values that formal organizations within the community hold as well as the extent to which LEIs are supported by these organizations (Middlemiss & Parrish, 2010). In this thesis, organizational capacities shave been operationalized based on the following aspects: extent of government backing, regional regime dynamic (which are dominant coalitions in a certain region and their related agenda´s and resources (Horlings, 2010)), and the LEI´s networks (figure 5). Find an overview over the organizational capacities of the five cases below in table 6.

Table 6: Overview Organizational Capacities per case (source: own representation).

Organizational Capacities	GrunnegerPower	Inselwerke eG	VrijstadEnergie	BERMeG	LochemEnergie
Government backing	General good will (municipality as client, financial support, parking spots/locations,	Mixed/Difficult (skepticism towards cooperative model, long process to convince them, but	Generally good (municipality as client, financial support, public leadership)	Generally good (financial support, making available locations).	Generally good (municipality as client, financial support), but not automatically.

	mutual dependence), but not automatically. Public leadership. Trust due to professionalism.	public leaders in some municipalities). Some municipalities as clients (advice).	& personal contacts to municipality.	Municipality sees win-win situation.	Trust, but changing relationship due to professionalization.
Regional Regime Dynamics	Skepticism/not taken seriously in founding phase/outsider position → now important player. "Holy parking". Sustainability & e-mobility on the agenda (life quality, air quality, climate) *EVCI-policy*: well developed, concession, aims at tariff, volume & dispersal, concession.	Dominant coalitions: municipalities want to work together with known actors. "holy parking". Generally open to e-mobility & sustainability objectives *EVCI-policy*: no clear strategy yet, no location criteria	Sustainability on the agenda. "Holy Parking"	Sustainability on Agenda	Not taken seriously by many market parties. Open-market model perceived as dominant coalition. Sustainability & e-mobility on the agenda *EVCI-policy*: location criteria (a.o. radius around CP), but no clear strategy, Lochem Model, open-market model, juridical barrier to take over CPs
Networks	Local: municipality & members Cooperative: dispersing their concept, inspiration & knowledge regarding related concepts (e.g. e-CS).	Local & personal: finding location partners, building trust Personal: access to professional/sustainability networks Cooperative: to disperse their concept → Bürgerladenetz	Local: with alderman Personal: StekkerApp Cooperative: VECG for fundraising, inspiration & knowledge exchange with GP (EVCI) & LE (e-CS)	*Local network* with municipality and department of underground engineering especially helpful. Member working for municipality. *Cooperative network* crucial: Inselwerke & Bürgerwerke → Bürgerladenetz	*Local:* municipality (Member working for municipality), SMEs Regional: province, Cleantech region *Cooperative:* inspiration & knowledge about EVCI (GP & VE), VEGC, possibility to share costs with other LEIs in their region

With regard to **government backing**, most studied LEIs experience a general good will of the municipality, thanks to the shared storylines described above and because municipalities trust the LEIs due to their skills, professionalism and realized projects. Municipalities support LEIs in different ways, normally through financial support, by being clients of projects that the LEI can implement, or by making public parking spaces available, which is crucial for realizing public EVCI. The latter can be easy in the one municipality (see e.g. BERMeG in table 6), but complicated in another one (e.g. Culemborg in table 6). This is connected to the regional regime dynamics discussed below. In some cases, employees of the municipality also acted as "public entrepreneurs" (according to Hoppe et al. (2015)). GrunnegerPower has for example actively been asked by a municipal employee if they want to take over available CPs (personal communication, C. Munneke, 10-05-2019).

However, even where LEIs experience general trust and support of the municipality, this support is normally not given automatically. While municipalities might want to support bottom-up initiatives, they also want to make clear that these are not unrightfully favored over other possible actors – there is no room for nepotism within the municipality (personal communication, C. Munneke, 10-05-2019). Secondly, municipalities know that LEIs are dependent on volunteers and have limited capacities. Therefore, they want grounded arguments that the LEI will actually be able to implement a certain project (personal communication, M. Scheepens, 15-04-2019).

An exception with regard to the extent of government backing is again Inselwerke eG, where most municipalities were very skeptical regarding Inselwerke's cooperative organization form and preferred to talk *"to people they already knew"* (personal communication, R. Tettenborn, 17-04-2019). However, in several municipalities, there were individual employees (= "public leaders") that liked what the cooperative was doing, advocated for them within their municipality, and made a cooperation possible.

Within what Horlings (2010) calls **regional regime dynamics**, especially the municipalities, but also market parties play a role in the studied cases. Generally, sustainability objectives and e-mobility as an aspect thereof are on the agendas of all municipalities, although the major motives are varying among them (also compare to "shared storylines" above and "level of urbanization" below). Most LEIs encounter the problem that they were either not taken seriously in their founding phase (they started as outsider as opposed to the "dominant regime"), or even still feel that they are not taken seriously. After some time, many LEIs have become important local actors. For example, GrunnegerPower by now feels that *"the role of GP in Groningen has almost become indispensable"* (personal communication, N. Buiter, 10 May 2019). In the case of Usedom, the limited governmental backing is connected to regional regime dynamics in which the cooperative model is rather unknown and energy cooperatives are thus in an outsider position.

However, not all market parties and governments understand that LEIs want to be a relevant third party within society, and therefore do not think that cooperatives will stay relevant on the long run: *"Lately, the alderman said: 'I hope that your work will not be needed anymore in a few years from now. Because then, everything will be done'. Then I think, he hasn´t understood us correctly yet. Because that´s not the idea, we want to go on! But I think that many people see us like this."* (personal communication, M. Scheepens, 15-04-2019). Within LochemEnergie, the threat is perceived that if they do not manage to position themselves as a long-term relevant actor in society, their role might be taken over by market parties soon.

Another aspect connected to regional regime dynamics is the **EVCI-policy** in the different municipalities, varying from far developed in Groningen to not yet existent on the island of Usedom. The policies give a legal framework to the LEIs' EVCI-actions, create certain dominant coalitions, and can be perceived as enabling or restricting by the LEIs.

In the cases of GrunnegerPower and LochemEnergie the municipal EVCI-policy is developed quite well. Here, the open-market model, respectively the concession-model (paragraph 4.1.1), in which the municipalities work together with the company Allego, can be perceived as dominant coalitions. *"They call it open market model, which is strange, because it is actually very closed",* states LochemEnergie (personal communication, T. Tekelenburg, 30-04-2019). Also, CPs built by the two LEIs need to deviate technically from the technical specifications that were agreed on in the open market-contract with Allego (personal communication, N. Buiter, 10-05-2019). Besides, the municipalities of Lochem and Groningen have set up criteria for the locations, placement, and outer appearance of CPs.

Especially in Lochem, this is perceived as restricting, because in a radius of 300m around an Allego-CP, no other CPs are allowed to be placed, to make sure that the existing CP stays occupied sufficiently. Although many existing CPs are old/not up-to-date, no new ones can be placed on their good locations (personal communication, T. Tekelenburg, 30-04-2019).

On the contrary, in Usedom and Culemborg, no policy to steer the development of EVCI exists yet, which is being perceived as restricting as well. Without any location criteria, Inselwerke had to propose locations for CPs in a trial-and-error manner and could in the end only get a less central location where the parking pressure is not so high (personal communication, F. Haney, 13-05-2019). In Culemborg, VrijstadEnergie perceived the threat that the EVCI situation in the municipality might become chaotic due to randomly placed CPs (personal communication, A. Schamhart, 13-05-2019).

As expected based on Seyfang & Smith's (2007) research, it was crucial for all studied LEIs to have strong **networks.**

Local and personal networks help them to practically implement their projects, for example by finding location partners through personal contacts (personal communication, S. Wollenberg, 06-05-2019). Furthermore, good connections to the municipality play an important role (personal communication, A. Fröb, 11-04-2019). In the cases of BERMeG and LochemEnergie it seemed to be useful that members work for the municipality. Personal networks can also be crucial for getting access to professional/sustainability networks on in which one's concept or idea can be spread: *"That you know someone here and there, and that energy manager there has once worked together with that regional manager, who is responsible for sustainable development in that region."* (personal communication, R. Tettenborn, 17-04-2019).

Cooperative networks were important to either learn from other's experiences or to spread the word about one's own concept. For some LEIs, the experience, know-how and practical support of other LEIs were an important prerequisite for being able to implement EVCI (see e.g. BERMeG in table 6) (personal communication, A. Fröb, 11-04-2019). Some LEIs also only got the inspiration to provide EVCI due to other cooperatives. To make this cooperation possible, cooperative umbrella organizations were crucial. For example, BERMeG only got to know Inselwerke via the umbrella organization "Bürgerwerke". Similarly, EVCI-pioneers such as GrunnegerPower report that they have been spreading the word about their concept on conferences of the Dutch umbrella organization HIERopgewekt (personal communication, N. Buiter, 10-05-2019). This also shows the character of the "cooperative world", in which everyone is happy to exchange knowledge and help each other: *"We like to help our brothers and sisters in the energy transition movement. They are no competitors to us"* (personal communication, N. Buiter, 10-05-2019). However, also the first implementers could learn something about related concepts such as e-CS within the cooperative network (personal communication, N. Buiter, 10-05-2019). Besides, within umbrella organizations, there is a lot of relevant other knowledge that LEIs can make use of, such as financial and subsidy advice (personal communication, A. Schamhart, 13-05-2019).

Furthermore, cooperation with other LEIs might be useful to position oneself within society, to share costs, and to implement strong projects: *"If we want to implement on a local level charging points, and solar parks, and wind, and…, we cannot do this all by ourselves on the local level. We need something else, we really want to gain a position in this field, as a community"* (personal communication, P. Stolte, 18-04-2019).

5.2.4 Infrastructural Capacities

Infrastructural capacities refer to available facilities in a given community that can enhance or obstruct sustainable practices (here the provision of publicly accessible EVCI) (Middlemiss & Parrish, 2010). Next to facilities such as parking spaces or grid connections, the level of urbanization has also been studied (figure 5). For an overview of these capacities per case, see table 7.

Table 7: Overview Infrastructural Capacities per case (source: own representation).

Infrastructural Capacities	GrunnegerPower	Inselwerke eG	VrijstadEnergie	BERMeG	LochemEnergie
Facilities	Existing CPs (that could be taken over) Public parking spots	Public parking spots in some municipalities	Difficult to "get" public parking spots → "innovative parking concept" Car free neighborhood → clustered parking facilities	Public parking spots Existing grid connections	Existing CPs (opportunity to take over, but also obstacle because of radius-criterion). Obstructing public parking policy/ "holy parking"
Urbanization	Urgency felt due to air pollution, congestion, dependency of many people on public parking & charging Far developed EVCI-policy	Rurality: no one else has invested in EVCI on Usedom yet due to a lack of demand.	Level of urbanization regarded as unimportant	Level of urbanization regarded as unimportant	Less urgency for transport transformation felt due to rurality. Less utilization degree of CPs. Many market parties don´t dare to invest. ➔ "Lochem Model"

Regarding **existing facilities**, especially the availability of public parking spots proved to be crucial. These are not only needed for CPs on public ground, but sometimes also for publicly available CPs on private ground. If there is no publicly accessible parking spot on private ground available, the CP can be placed on private ground, but the parking spots needs to be on the neighboring public ground. This was the case at S. Wollenberg´s case (Inselwerke). Getting such public parking spots was easy in some cases (e.g. BERMeg), most LEIs however encountered challenges here. Many municipalities find it difficult to prioritize parking spots for EVs in the needed locations, as the parking pressure in these central locations is normally already quite high (personal communication, C. Munneke, 10-05-2019; M. Mobach, 03-05-2019). This reluctance is what I call "holy parking" in table 6. In the case of VrijstadEnergie, these circumstances stimulated the development of an innovative parking concept (paragraphs 5.1.3 and 5.3.2).

Other important facilities were already existing CPs, which were enabling for GrunnegerPower and LochemEnergie, as they could take them over. Already existing CPs can however also be perceived as restricting (e.g. in the case of LochemEnergie, paragraphs 5.2.3 and 5.1.5). Lastly, in the case of BERMeg, already existing grid connections at two locations where CPs were to be built were a crucial factor as money could be saved by not having to lay new connections (personal communication, A. Fröb, 11-04-2019).

Furthermore, the **level of urbanization** had an important influence on the local circumstances for developing EVCI: in a rather big city as Groningen, with limited space and air quality problems, the municipality sees it as urgent to stimulate the uptake of EVs and therefore to build up public EVCI. The municipal EVCI-policy is therefore far developed. There is also sufficient demand as many people are dependent on public parking and charging (personal communication, C. Munneke, 10-05-2019).

This is different in rather rural regions such as Usedom or Lochem. On the island of Usedom, the low level of urbanization led to a situation in which Inselwerke were and still are the only party taking action to develop EVCI. The situation is similar in Lochem: While the municipality realizes that providing public EVCI is important, most citizens do not feel much urgency to step over to e-mobility or the need to have public EVCI available. As compared to bigger cities, there is no congestion, no noise and little air pollution. Furthermore, the distances between the different villages of Lochem are much longer than within a city, which might lead to more "range anxiety" (personal communication, M. Mobach, 03-05-2019). In these rural areas, municipalities and market parties do not dare to invest in EVCI yet due to the low EV share and the expected low utilization degree (personal communication, R. Tettenborn, 17-04-2019). In Lochem, this has led to the "Lochem Model", in which it is tried to connect the development of EVCI to other (social) services (personal communication, M. Mobach, 03-05-2019 & T. Tekelenburg, 30-04-2019). Only in the small, yet urbanized towns of Culemborg and Mörfelden-Walldorf, the level of urbanization is rendered unimportant (personal communication, A. Schamhart, 13-05-2019 & A. Fröb, 11-04-2019).

Another aspect, that was originally not part of the conceptual model (figure 5), is the **general development e-mobility**. On the one hand, EVCI technologies are developing rapidly at is unclear how they will develop exactly. Municipalities therefore do not want to decide for one EVCI-actor or one type of CPs on the long run to prevent a lock-in (personal communication, C. Munneke, 10-03-2019; M. Mobach, 03-05-2019). This means that municipalities will not automatically choose an LEI, but on the other hand, LEIs also have the chance to start a cooperation with the municipality even if the municipality already has an "EVCI-partner". For local enterprises, the unsecure development of EVCU means that they are glad if they can invest in EVCI while the LEI is taking the responsibility (personal communication, S. Wollenberg, 06-05-2019).

Secondly, the role of e-mobility within society and politics is developing as well. E-mobility is seen as increasingly important, is accepted more widely, and the number of policies and funding possibilities for e-mobility and EVCI projects are increasing. This increases the possibilities of LEIs to provide EVCI (personal communication, R. Tettenborn, 17-04-2019; A. Fröb, 11-04-2019).

5.3 Lessons learned and some found patterns

In this paragraph I attempt to explain the relation between existing combinations of capacities and the role LEIs can play in the provision of EVCI (sub-question 4). First, the capacities that seem to be needed in order to provide EVCI will be summarized. After that, some best practices for cooperative EVCI-models, given certain local circumstances, will be summarized. Based on this, recommendations for LochemEnergie follow in paragraph 5.3.3 (sub-question 5). Lastly, external views on LEIs and their role in providing EVCI are depicted and compared to the LEIs' own view.

5.3.1 Needed capacities for providing EVCI

The four studied front-runner LEIs clearly show variability in the reached degree of professionalization and the availability of the four different capacities. However, they were all able to implement their own EVCI project, fitting their local circumstances. In that sense, the notion of Middlemiss and Parrish (2010) seems to be proven true: it is less about the question whether a community organization can implement sustainable projects (here EVCI-projects) based on their specific capacities, but rather about the question in which ways they can implement a such.

In paragraph 5.2 it became clear however, that there are certain capabilities that all studied front-runner cases do have. It is therefore expected that LEIs attempting to start providing EVCI, should at least have the following commonly found capacities:

- **Shared storylines with potential partners:** Aligning one´s own visions with regard to EVCI to the ones of partners that are needed for the implementation of the project. Through such shared storylines, relevant partners will realize that the LEI is the right party to cooperate with, which will enable the LEI to mobilize resources. Relevant actors have proven to be municipalities and local enterprises in the first instance (for the most relevant shared storylines see paragraph 5.2.1).
- **"EVCI-entrepreneurs" within the LEI:** one or a few individuals within the organization that boost the EVCI project within the organization by motivating members, but also outside of the LEI by lobbying for it. Besides individual entrepreneurship, there should also be some collective entrepreneurship within the LEI, meaning that there should be enough attention for the EVCI-project within the LEI and that it should be supported by the members and the board of the LEI.
- **Previous successes on the record:** Already having implemented other projects (e.g. on the field of energy efficiency or the generation of renewable energy) means that the LEI has already gained experiences, got to know procedures, could build up networks and has learned how to function well as an organization. Furthermore, showing that own has already successfully implemented certain projects creates trust within the community and among relevant partners.
- **An interdisciplinary team with skills that are needed for proper project management:** An LEI does not necessarily need to have a lot of specific EVCI-related knowledge, this can also be acquired learning-by-doing or from within their network. However, having an interdisciplinary team in which at least the basic professions of e.g. administration/accountancy, engineering, economics and PR/marketing are represented, seems to be crucial.
- **Government backing:** In order to implement an EVCI-project, an LEI should at least experience some governmental backing. Municipal backing is especially required for realizing EVCI on public ground as the municipality is responsible for public ground. Due to governmental backing, LEIs are also perceived as more trustworthy by other actors (personal communication,

M. van Manen, 01-05-2019). Government backing is also crucial for the needed financial support. However, subsidies often come from higher governmental levels. Implementing an EVCI projects without much municipal support is thus possible (see case Inselwerke) if one focuses on publicly accessible CPs on private ground.

- **A strong local/personal & cooperative network**: Personal and local networks are required for finding local alleys and for the practical implementation of the project. Through the cooperative network one can either learn from other´s experiences or disperse one´s own concept.

5.3.2 Best practices for cooperative EVCI

In paragraph 5.1, four already implemented cooperative EVCI-concepts are described. Taking them together, what can other LEIs learn from these concepts? In this paragraph, appearing trends and related concrete best practices from the four cases will be illustrated, ordered according to the three aspects EVCI model, business model, and the allocation of market roles.

EVCI-models

Three important dimension, where a CPO has to choose between different options, are the accessibility of the CP(s), their charging level, and the billing mechanism (figure 3). With regard to the **accessibility**, the degree of urbanization of the location as well as the extent of government backing the LEI experiences play an important role. If the relation to the municipality is generally good in an urban area (as for example in the cases of GrunnegerPower or BERMeG), EVCI on public ground seems to be a good idea, as it should then be doable to receive public parking spaces from the municipality. Also, the charging demand is expected to be higher than in a rural municipality. If there is relatively little governmental backing in a rural municipality, it might be advisable to not waste one's energies for convincing municipalities that do not want to cooperate, but to rather focus on other possible partners such as local SME (see case Inselwerke). In a rural municipality where the governmental support is good (like in Lochem), public EVCI might be an option. However, it seems to be advisable to keep cooperating with local SMEs and to connect the development of EVCI to other (social) services, due to the often low demand for public EVCI in rural areas. One best practice with regard to EVCI on public ground is the innovative parking concept of VrijstadEnergie (paragraph 5.1.3) which helps to deal with a municipality's reluctance to prioritize EVs for public parking spots.

Furthermore, the location of the CPs is important: they should be located at central, well connected and visible locations within the municipality, so that they are used sufficiently (personal communication, A. Fröb, 11-04-2019; C. Munneke, 10-05-2019). Good possibilities are clustered parking facilities, such as P+R or parking lots close to shopping mall (personal communication, A. Schamhart, 13-05-2019).

Regarding the **charging level**, AC seems to be the better option if several CPs or a whole network is to be built with a limited budget (personal communication, R. Tettenborn, 17-04-2019). DC charge points only seem to be a good idea if high co-investment or subsidies can be acquired (this was the case for GrunnegerPower´s DC charge point). Furthermore, it depends on the legal circumstances in the municipality, which CPs can be placed (e.g. if there is a certain concession in a Dutch municipality). Lastly, LEIs should make sure that their CPs are smart charging ready to be prepared for the future (personal communication, E. de Bruijn, 18-04-2019).

Regarding **billing**, it is advisable to encourage the use of the LEI´s own white label charging cards among members, as they can minimalize their costs and thus might lower the tariff by choosing

an affordable EMSP. The charging tariffs of other EMSPs (and thus other cards) cannot be influenced (personal communication, E. de Bruijn, 18-04-2019).

Business models

It should be clearly stated that none of the studied cooperative EVCI-projects are profitable yet, most of them are not even cost-effective. In order to become cost-effective, a normal AC charge point needs a utilization degree of an equivalent of two well used e-car sharing cars (ca. 6,000 kWh per year) if charging sessions cost 35ct/kWh (which is the current average market price in the Netherlands) (see figure 11) (personal communication, T. Tekkelenburg, 11-06-2019). In the studied cases, the decision to exploit CPs was thus an idealistic or strategic one, having in mind the future development of e-mobility and aiming at acquiring ground positions for EVCI.

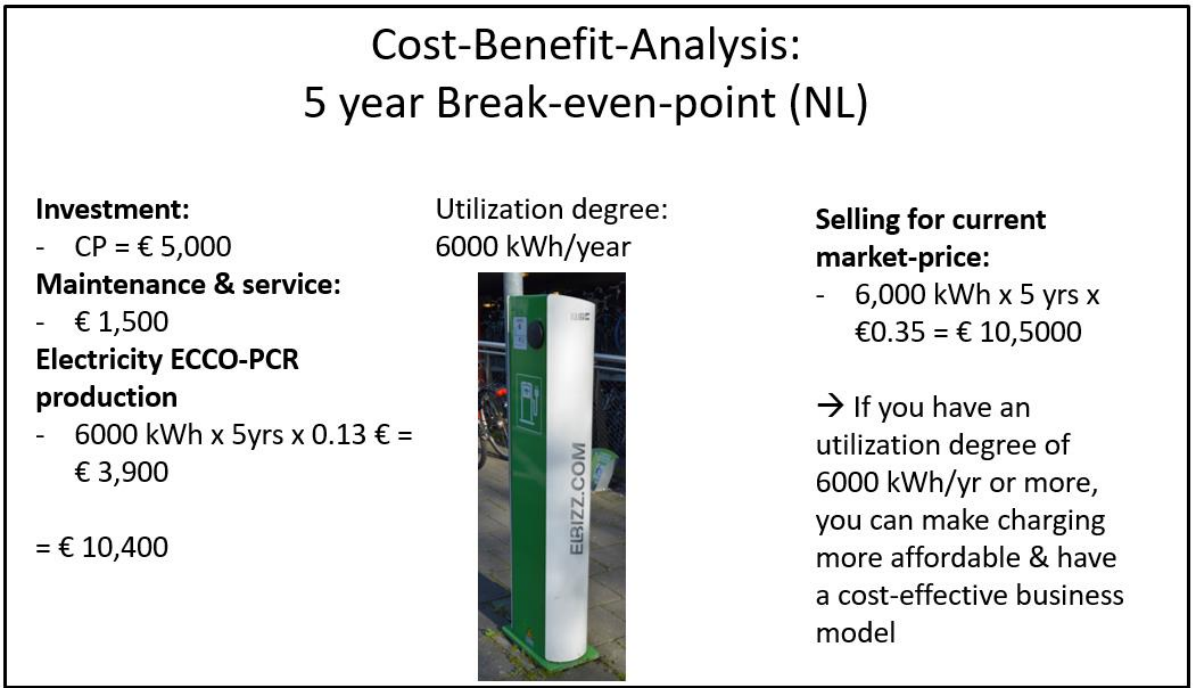


Figure 11: Cost-Benefit Analysis of an AC-charging point in the Netherlands, over an 5-years term (source: own representation, based on personal communication with T. Tekelenburg, 11-06-2019).

However, LEIs have possibilities to soften the investment- as well as operating costs. For the **investment costs**, existing CPs can be taken over, if available, so that only migration costs must be paid. Otherwise, co-investors and subsidies must be found. Often, municipalities are willing to co-invest, but usually higher governmental levels such as provinces have more resources, e.g. in the form of subsidies for sustainable development projects. Other possible co-investors can be local enterprises or a car-sharing company that uses the CPs for their fleet.

Regarding the **operating costs**, a good strategy can be to increase the utilization degree of the CPs, e.g. by connecting it to an e-CS fleet. Furthermore, it is advisable to use own locally generated renewable energy to supply the CPs (administratively or directly). Not only does that imply earnings for the LEI, it also makes it possible to use fiscal advantages or subsidies for renewable energy (e.g. PCR and SDE in the Netherlands, EEG in Germany).

A best practice with regard to the direct use of renewable energy is to build a charging plaza (with several CPs) underneath a PV-carport (see cases VrijstadEnergie and Inselwerke). However, when

connecting EVCI to a renewable energy project, one should keep in mind that this is connected to higher total investment costs.

Allocation of market roles

LEIs can take the role of the CPO, if having the capacities listed in paragraph 5.3.1. Otherwise, they can boost others, such as local SMEs, to invest in CPs. LEIs can also become the energy supplier of their own or other´s CPs (e.g. of Allego). As Inselwerke show, LEIs can also become EMSP themselves. As this requires a rather high administrative capacity, it might be a good option for most LEIs to outsource these services.

Regarding other roles, it seems to be advisable to make use of one´s cooperative (-friendly) network, in order to support the cooperative world and to save costs. Energy can be supplied via an own white label contract, or via an umbrella organization such as Bürgerwerke in Germany. Costs for EMSP services can be reduced by cooperating with cooperative EMPS such as StekkerApp or Inselwerke.

5.3.3 Recommendations for LochemEnergie

A more practical aim of this research was to give an advice to LochemEnergie regarding their possibilities for providing EVCI.

Comparing the capacities I have observed within LochemEnergie with those of the other four studied LEIs, I do not see any short comings that might hinder them in exploiting EVCI themselves. They have all capacities that are seen as necessary minimum in order be able to exploit EVCI (paragraph 5.3.1). There are several potential shared storylines that could connect LE´s visions with those of the municipality, LochemEnergie has skilled active members equipped with all necessary general project planning skills (e.g. financial, administrative and PR), they have good connections to the municipality and can learn and receive support from their well-developed cooperative network. Furthermore, LochemEnergie has already gained experience by offering related e-mobility services (e-CS, e-trip, strategic EVCI plan Lochem) and has, as compared to other LEIs, above-average collective “entrepreneurship”, or differently put, focus on E-mobility within their organization as they have the working group “elektrip”, consisting of six active members. On the one hand, this working group seems to be sufficiently occupied with all the projects they are already implementing, but on the other hand, there seems to be more collective entrepreneurship for EVCI than for example within GrunnegerPower. Furthermore, LochemEnergie might be less professionalized than GrunnegerPower, but seems to be further professionalized than most other studied LEIs.

However, although LochemEnergie has sufficient capacities according to my estimation, LochemEnergie has to decide itself whether it has enough self-confidence and whether it feels that it has enough backing of their members regarding their EVCI-plans. It should be kept in mind that it is not realistic to realize a profitable business model on the short run. Although generating profit is not the main motive of LochemEnergie, they might want to opt for boosting EVCI in more indirect ways, e.g. through their already existing “charge point action” or by becoming an energy supplier of other´s CPs.

If LochemEnergie decides to provide EVCI themselves, the circumstances seem to be good for making the investment- and operating costs bearable: EVnet charge points may be taken over so that LE would only need to pay the migration costs. With their own e-CS fleet, LochemEnergie might be able to increase the utilization degree of these CPs, and by choosing a cooperative(-friendly) EMSP such as StekkerApp they might decrease their operating costs. LochemEnergie should also get a white label

charging card and should encourage the use thereof, to be able to control the EMSP costs for the majority of the charging sessions. Furthermore, LochemEnergie should make use of their own generated renewable energy. It seems to be reasonable to start using it administratively, as a PV-charging plaza might still be too big for Lochem at the moment (not enough demand). In future, this might be a possibility as well.

Furthermore, realizing EVCI on public ground seems doable, due to the possibility to take over already existing EVnet charge points due to the generally strong municipal backing. Although there are legal barriers left regarding the take-over of CPs within the municipality of Lochem (personal communication, M. Mobach, 03-05-2019), LochemEnergie can learn from GrunnegerPower how they organized the take-over. As Lochem is a rural municipality, it seems reasonable to also continue the "Lochem Model" and thus to keep connecting EVCI with other services and enterprises.

5.3.4 External view on LEIs and their role in providing EVCI

Next to interviewing LEIs themselves, I interviewed municipalities, location partners, and experts on the field of e-mobility, who all have an external perspective on LEIs and their role in providing EVCI. In this paragraph I describe to which extend these external perspectives overlap with, but also differ from the view LEIs themselves have on their role in providing EVCI.

Generally, LEIs are perceived as trustworthy partners as they are seen as *"the good people from this world"*: They do not only do things for their own benefit but based on intrinsic motivations (personal communication, M. van Manen, 01-05-2019).

Municipalities predominantly see the role of LEIs in giving participation possibilities, in enhancing behavioral change within the community (which accords to the notion of Seyfang and Smith (2007)) and in offering affordable charging tariffs. M. Mobach from the municipality of Lochem formulates it like this: *"They [LochemEnergie] sit more in the sphere of influence, because they do it for their members. And the citizens. And they are an organization that starts acting very practically, with energy coaches, the energy centre, … their local networks, their ability to connect people… this all makes them a wonderful partner for us as government to help realize our ambitions."* (personal communication, M. Mobach, 03-05-2019).

A dominant external perspective on the role LEIs play in the provision of EVCI is that they take over this task where market parties are not willing or daring to do it (personal communication, B. Dik &Y. Nieuwpoort, 23-05-2019). Sustainable projects that are not cost-effective or profitable yet need people who do it out of idealism, and this is what makes LEIs relevant societal actors (personal communication, M. van Manen, 01-05-2019). This also accords to the findings from the studied LEIs, where most LEIs either started providing EVCI because there was no other party doing it yet (Inselwerke, BERMeG) or took over not profitable CPs that a market party did not want to keep (GrunnegerPower and potentially LochemEnergie).

This is a relevant role on the short term, but it corresponds to the worries of LochemEnergie that LEIs might lose their relevance in future if they do not position themselves well within society. External actors also see the possibility that EVCI built up by LEIs might be taken over by market parties in future (personal communication, B. Dik &Y. Nieuwpoort, 23-05-2019; S. Wollenberg, 06-05-2019). According to B. Dik & Y. Nieuwpoort, however, it is still advisable for LEIs to invest in EVCI now, and to get the ground positions, as there is still freedom of choice and one can in that way help shape the development of EVCI now. In case the role of LEIs will be taken over by the market, they at least still get money for their CPs (personal communication B. Dik & Y. Nieuwpoort, 23-05-2019).

According to E. de Bruijn from StekkerApp and S. Wollenberg, the role of LEIs predominantly lays in offering local fit solution. StekkerApp aims at improving the possibilities of LEIs in providing EVCI by bundling know-how and capacity and offering them a useful, custom-fit service for a fair price. It is important to prevent every LEI that wants to provide EVCI from creating their own billing mechanism, administration etc. (personal communication, E. de Bruijn, 18-04-2019). This accords to the findings from this research in which several LEIs were only able to provide EVCI as they could use the existing systems of others (e.g. BERMeG using Inselwerke´s EMSP-service).

Only Allego is critical about LEIs providing EVCI. In their eyes, LEIs should focus on their core tasks, which is the generation of renewable energy. It seems much more important to them that idealistic people use their capacities for renewable energies (the share of which is still very low in the Netherlands) instead of something that is being done by the market anyway (in Allego's opinion). Furthermore, Allego thinks that it is inefficient if LEIs *"invent the wheel anew"* by setting up their own EVCI-models. Allego therefore sees the role of LEIs in EVCI as energy suppliers of locally generated renewable energy (to relieve the grid). Allego therefore already cooperates with LEIs that are the local energy suppliers of their CPs. Furthermore, Allego sees the value of LEIs for increasing the utilization degree of CPs with the help of e-CS fleets (personal communication, M. van Manen, 01-05-2019).

6 Conclusions & Recommendations

To formulate a conclusion and an answer to the main research question, brief answers to the formulated sub-questions will be given first.

"Which combination of capacities can the studied LEIs draw on?"

Although the studied front-runner LEIs varied regarding their degree of professionalization and their available capacities, they all had certain capacities in common, especially with regard to personal and organizational capacities. Regarding personal capacities, all four front-runner cases had a mix of motivations to provide EVCI, including intrinsic as well as self-serving motives. Besides, they had built up strong shared storylines with relevant partners that helped them to mobilize resources. Individual as well as collective "EVCI-entrepreneurs" within the LEIs pushed forward the EVCI-project. Moreover, they had already successfully implemented several earlier projects, from which they could learn and which helped them to build trust. Important were also interdisciplinary teams equipping the LEIs with sufficient skills to implement proper project planning. Government backing was relevant for financial support, the availability of public parking spots, and for gaining a sufficient level of trust and legitimacy. The front-runner cases also made use of their well-developed local, personal and cooperative networks, that helped them to practically implement their project, learn from other's experiences, or spread the word about their own EVCI concept.

"Which other factors helped enabling the LEIs to provide EVCI at the local level?"

Aspects that were not expected to be encountered based on the initial conceptual model (see figure 5) were so-called "immediate causes" that complemented the LEIs' intrinsic and self-serving motivations. Without these immediate causes, most LEIs would not have started providing EVCI at the point of time they did. Furthermore, the EVCI-policy of the municipalities was influencing the possibilities LEIs had for providing EVCI. Both well developed and not existing municipal EVCI-policy could be perceived as constraining. Last but not least, the general development of E-mobility played a role. The rapid development of EVCI-technology and unsecure future thereof leads to insecurities on the one hand, while the generally growing societal and political acceptance of E-mobility leads to more possibilities for LEIs on the other hand.

"Which role do the LEIs play in the provision of the EVCI?"

This research shows that Local Energy Initiatives can play several roles in the local or even regional and national provision of Electric Vehicle Charging Infrastructure, including exploiting charging points themselves and advising or encouraging others to provide EVCI. If a Local Energy Initiative appears to have sufficiently developed capacities to exploit EVCI itself, there are several options, but also clear best practices on how LEIs can approach the provision of EVCI. Regarding the market roles, LEIs can become Charge Point Operators (CPO), energy suppliers, E-mobility Service Providers (EMSP), or a combination thereof. However, as becoming an EMSP oneself requires high administrative capacities and a certain degree of professionalization, it might be advisable for most LEIs to outsource the EMSP-services, preferably within their cooperative (-friendly) network.

Although none of the studied EVCI-models are profitable yet, LEIs have possibilities to make the investment- as well as operating costs bearable. They can increase the utilization degree of charge points, for example by connecting it to e-Car Sharing. Moreover, they can make use of their own generated renewable energy to save costs and to make use of fiscal advantages. Lastly, they can cooperate with others within their cooperative (-friendly) network to reduce costs.

"What patterns can be found in the relation between the existing combination of capacities and the role that has eventually been chosen by the LEIs?"

Connected to the available organizational and infrastructural capacities, realizing EVCI on public ground only seems advisable if enough municipal support is given, as this is needed for the necessary public parking spots. In rural areas, where the general number of EV-users is not yet very high and where many of these EV-users are not dependent on publicly accessible charging facilities, it is advisable to combine the provision of publicly accessible charging with other (social) services or local enterprises to make the use of it more attractive. With this last finding I can reflect on the societal relevance of this research that has been formulated in paragraph 1.3.1: Local fit solutions designed by LEIs can indeed play an important role in rural regions.

"What potential lessons can other LEIs who are attempting to get involved in the provision of EVCI draw from this?"

Other LEIs can thus learn from front-runner cases regarding their strategies to reduce investment and operating costs or the capacities they need to be able to provide EVCI. In fact, LEIs already do within their "cooperative world" in which everyone gladly helps each other. However, EVCI is a risky business case for now and every LEI must decide for themselves, based on their available capacities, whether they see it as worth it to enter a new market.

Posing the initially formulated research question again:

> ***"Given the specific combination of capacities that Local Energy Initiatives (LEIs) have at their disposal in a certain local context, which role can Local Energy Initiatives (LEIs) play in the local provision of Electric Vehicle Charging Infrastructure (EVCI), and what can other LEIs who are attempting to get involved in the provision of EVCI learn from this?",***

one can conclude that LEIs have several possibilities for getting involved in the provision of EVCI. They predominantly play an important role in boosting or accelerating the dispersal of publicly accessible EVCI, especially in places where profit-oriented market parties are not willing or daring to invest in public charging points. Furthermore, cooperative EVCI aims at providing truly sustainable and affordable charging infrastructure. This matches the notion of Seyfang and Smith (2007) that for grassroots initiatives, ideological motives and social needs are the driving force, not profit. The studied LEIs did not take the decision to provide EVCI based on already existent demand, but took a partly strategic, partly idealistic decision, based on the expectation of future demand and on the conviction that the (local) transport transition needs a boost right now. Given this notion, the question remains whether the role of LEIs in the provision of EVCI will only develop on the short or medium run, until the transport transition is in full swing, or whether LEIs will also be important EVCI providers on the long run.

As has been expected based on the framework of Middlemiss and Parrish (2010), the peculiarity of an organization´s personal, cultural, organizational and infrastructural capacities all have an influence on the possibilities that LEI had with regard to the provision of EVCI. Especially personal and organizational capacities proved to be crucial. The among front-runner cases commonly existing capacities (see paragraph 5.3.1) are regarded as necessary for Local Energy Initiatives that want to exploit EVCI themselves. If these capabilities are not available, it might be a better option to either boost and advise others on how to exploit EVCI or to provide locally generated renewable electricity to other´s charge points, instead of taking the whole risk on one´s own shoulders.

However, one thing seems to be sure, and that is that LEIs will not give up quickly, given their intrinsic motivations boost the energy transition.

6.1 Reflection on the Conceptual Model

As already mentioned above, the conceptual model (figure 5) has generally been useful and all four capacities formulated by Middlemiss and Parrish (2010) proved to have an impact on the role the LEI can play in providing EVCI. Also most related aspects from SE and grassroots literature were of use. The general assumption that the EVCI-concepts that LEIs were able to implement based on their specific capacities were used to improve the infrastructural capacities of the region (see feedback arrow towards infrastructural capacity) could be confirmed as well. For some LEIs (e.g. Inselwerke), regional development was even a major motivation. However, although it can be concluded that a higher peculiarity of the different capacities leads to more possibilities for realizing EVCI, it was difficult to find clear patterns between the certain combinations of capacities a LEI has and their specifically chosen EVCI-concept. The only aspects where patterns were found were "level of urbanization" and "government backing" (paragraph 5.3.2).

Having said this, I want to use this paragraph to reflect on the relevance of the different aspects of the conceptual model. One has been merged with another aspect (highlighted red in figure 8 below), while others have been added (highlighted green in figure 8).

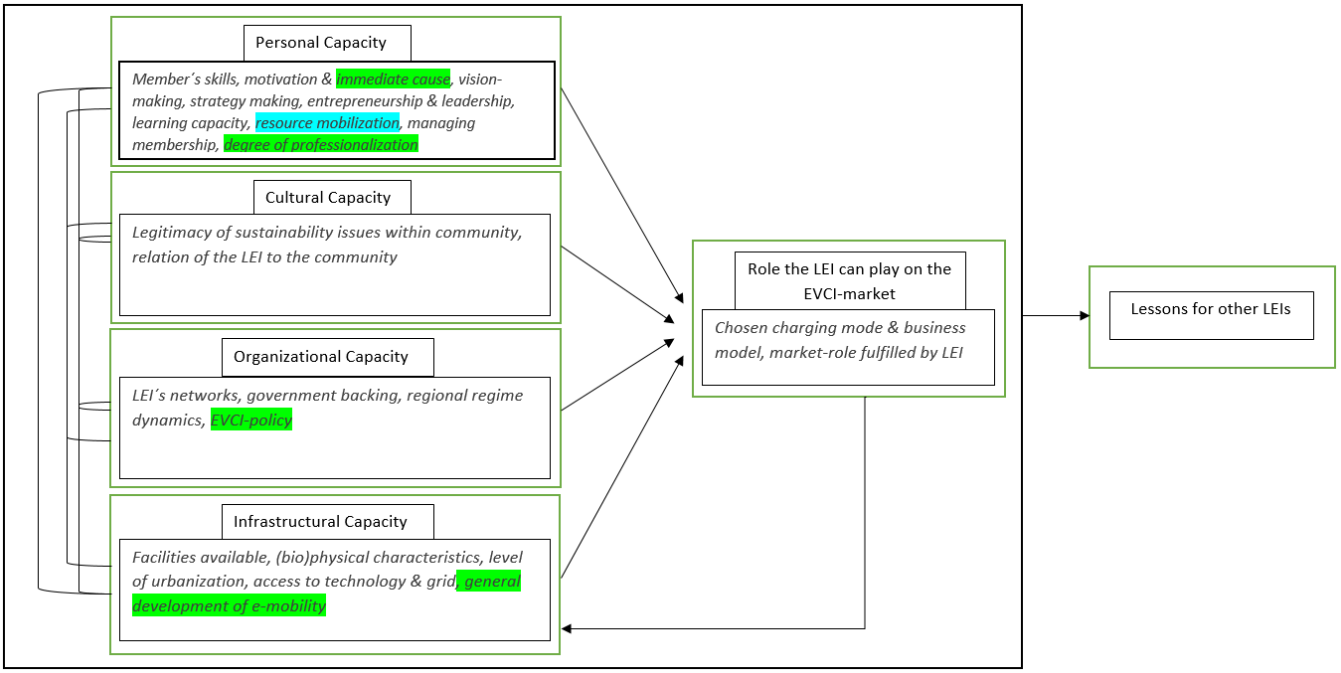


Figure 12: Adjusted Conceptual Model (source: own representation).

With regard to the aspects I studied as part of **personal capacities**, most of them appeared to be relevant in the same manner as described in scientific literature: shared storylines (Horlings, 2010), individual as well as collective entrepreneurship (Horlings, 2010; Trivedi & Stokols, 2011), member's skills (Middlemiss & Parrish, 2010), the LEI's learning capacity, and their membership management (Spear et al., 2009).

It also proved to be true that LEIs are driven by a mix of both structural and intrinsic motivations Bomberg and McEwen (2012), to which this research might add a few self-serving motives. However, regarding motivations, it was less the case that LEIs react to a concrete need within the community, as proposed by Peredo and Chrisman (2006). They were rather driven by a need that the majority of the population is not yet aware of. Furthermore, next to the mentioned mix of motivations, a clear and practical "immediate cause" existed in all cases, without which none of the LEIs would have

started to provide EVCI at the point of time they did. Such an immediate cause thus seems to be crucial, but this might change in future in case cooperative EVCI becomes more normal.

Besides, it became clear that the level of professionalization that an LEI has reached is an important topic for all studied LEIs. As the four studied LEIs that have already exploited EVCI themselves have very different levels of professionalization (e.g. from zero paid employees to 11), it does not seem to be a decisive factor for being able to provide EVCI. However, the level of professionalization came up in every interview I held, as it influences the extent to which an LEI is dependent on volunteers, to which market parties trust them and as the process of professionalization brings a bout many challenges for a LEI (internally and externally).

Lastly, the aspect of resource mobilization, proposed by Trivedi & Stokols (2011), proved to be crucial for every LEI, but during my research it turned out that this aspect can be seen as a sub-aspect of "member's skills".

With regard to **cultural capacities**, the legitimacy of sustainability objectives within the community as proposed by Middlemiss & Parrish (2010), seems to be relevant, however, it turned out to be predominantly important to have at least an "ecobubble" in which people are motivated to work on sustainability issues. The wider public is less relevant to the success of the niche (=the LEI) itself. The aspect "relation to the community" turned out to be closely connected to personal capacities of the LEI, e.g. the relation was usually more trustful if the LEI had already implemented several successful projects.

For **organizational capacities**, especially government backing turned out to be crucial, as proposed by Hoppe et al. (2015) and Wüste and Schmuck (2012). It also seemed to be closely related to regime dynamics as the municipality turned out to be the most important actor in the local "regimes". Accordingly, also the aspect of municipal EVCI/policy has been added, which functions as a legal framework for the LEI's and other actors' possibilities with regard to the provision of EVCI.

Regarding **infrastructural capacities**, available facilities proved to be important, but no (bio)physical circumstances other than the level of urbanization could be found. The level of urbanization is crucial as it leads to different approaches to providing EVCI. Furthermore, the aspect "general development of e-mobility" can be added, both the technological development and the general public's attitude towards it. E-mobility develops rapidly, which makes it difficult to decide which technological options should be chosen and leads to some insecurity for some actors. However, e-mobility becomes more and more accepted within society, which might support EVCI projects in future.

For measuring or investigating the **role an LEI is playing in the provision of EVCI**, it turned out to be useful to study the aspects of the (technical) EVCI model, the business model, and the allocation of the market roles. Last but not least, it also proved to be true that the different capacities are strongly interrelated with each other, e.g. the personal capacities of a LEI and the extent to which the local population is trusting them or the extent to which they experience government backing.

All in all, one can thus say that this research validated Middelmiss & Parrish's (2010) framework of community capacities for the concrete group of Local Energy Initiatives within the larger group of community initiatives. Their framework has also been extended by several sub-aspects from SE- and grassroots literature, making it more detailed. Furthermore, a few new sub-aspects have been found that also fit within the capacities formulated by Middlemiss & Parrish (2010), namely immediate causes", the degree of professionalization, the municipal EVCI-policy, and the general development of E-mobility. With regard to the comparison of Dutch and German LEIs, Oteman et al.'s (2014) findings that LEIs in Germany have more institutional space than in the Netherlands (with regard to the macro-level institutional arrangements) could not be validated for the provision of EVCI. There rather seem to be slightly more possibilities in the Netherlands, as EVCI-policy is already further developed here.

7 Discussion & Reflection

In this last chapter, I will first reflect on the limitations of this research. Based on this, I will make a few recommendations for possible future research on the same topic.

7.1 Limitations of the Research

7.1.1 Data collection and analysis

This research knows some limitations, partly due to the way the data has been collected and analyzed. Firstly, in all cases, except for LochmEnergie, only one person per Local Energy Initiative has been interviewed. To get a more complete and truthful impression of an LEI, it would have been better to interview several (active) members per organization. This became clear after having interviewed four active members of LochemEnergie which all had a slightly different focus and perspective on their organization and its capacities. This way, the different respondents complemented each other well, which led to a more nuanced picture of LochemEnergie and its capacities. For the other LEIs, it was unfortunately not possible to interview several members due to the limited time frame of this research. However, the data gathered in the interview with the one active member per organization could be in triangulated with the data that was gathered in the interviews with the related municipalities or location partners as well as with the data collected at other LEIs. For the cases VrijstadEnergie and BERMEeG, triangulation with data gathered in interviews with e.g. the municipality was not possible, as for these two "extra" cases only one interview has been held with one member of the LEI. For these two cases, it has therefore been gained a much less nuanced impression on the organization's capacities. However, as certain patterns could be found in the cross case analysis (e.g. paragraph 5.3.1), the gathered data of these extra cases could to some extent be triangulated with the data collected in other cases.

Moreover, the data collection based on interviews was planned to be predominantly deductive, but should also include inductive aspects/questions (paragraph 3.2.2). Looking back, it turned out to be less inductive than planned. One open question regarding the most important factors that enabled the LEI to provide EVCI has been posed, but besides this, the data collection as well as analysis was tightly bound to the concepts from the theoretical framework. This is of course needed, but I feel that I might have overlooked some other relevant factors as I have been very focused on the concepts of my conceptual model and have connected all newly found aspects to one of the already existing concepts.

Furthermore, looking back, it could have been useful to ask more specifically for the utilization degrees and cost-effectiveness of the cooperative charging points. In my conclusion, I would have liked to be able to offer more concrete results regarding such "hard numbers".

Lastly, the usage of policy documents could have been implemented more systematically. The data from policy documents has now predominantly been used as background information rather than actual data that was leading for my results. Additionally, not for all cases relevant policy documents could be required.

During the data analysis in Atlas.ti, I had difficulties to reduce the number of codes. I ended up with a total amount of ca. 360 codes (whereof about 50 were meta-data related codes), while a maximum of 300 different codes advised in the Atlas.ti user manual. I might have stayed too close to the raw data. The amount of different codes also made it more difficult to see clear patterns later on and might have contributed to the situation that I have produced somewhat too detailed result-descriptions. However, I was still able to extract useful results and conclusions from the data, so that I think that the data analysis can still be regarded as reasonable.

7.1.2 Scope of the research

This research is an explanatory case study research that tried to discover relations between the capacities of Local Energy Initiatives and the roles they can play in the provision of publicly accessible EVCI. In this way, the research also explored what roles LEIs can play with regard to EVCI in general. This exploration is of course not exhausting, given that fact that only five LEIs in two European countries have been studied. However, as Electric Vehicle Charging Infrastructure is a very complex and fast developing technological field and market, the scope of this thesis has also been limited regarding the aspects of EVCI that have been studied.

- Everyone within the EVCI-market is currently talking about, testing and developing **smart charging options**. Smart charging is a container term pointing at many different intelligent charging functions that can e.g. help balancing out electricity demand and supply regarding charging. This will become more and more important in the upcoming years, as an increasing share of renewable energy within the energy mix will lead to more fluctuations in supply, while the electricity demand will increase (Hall & Lutsey, 2017; Ministry of Economic Affairs, 2016). As my interviews proved, LEIs have this in mind as well and e.g. take part in smart-charging pilots and try to get their EVCI smart charging ready. As they are locally generating renewable energy, they might even help solve the problem of the gap between energy supply and demand (Ministry of Economic Affairs, 2016). However, due to the limited scope of this thesis, I was not able to commit a substantial part of this research on this important aspect of EVCI.
- In paragraph 1.3.2 on the scientific relevance of this research, I wrote that it can contribute to the understanding of the financial sustainability of LEIs and the role that they can play when entering a new market. While the latter has been achieved to some extent, the former has not been achieved. This research turned out to be more focused on LEIs' characteristics and capacities than on their financial sustainability.

7.2 Possible Future Research

It proved to be very useful to conduct a qualitative research on this for LEIs new and complex field in order to get an in-depth understanding of the possibilities LEIs have and the capacities they need. However, building on this in depth knowledge, it might be useful to set up a broader, quantitative research taking into account more front-runner LEIs in more countries (or many LEIs in one country) to be able to find clearer patterns between available capacities and implemented EVCI-concepts. Taking into account LEIs in more countries could also be very valuable for the "cooperative world". Although energy cooperatives have already set up networks on a European level, they are mostly geared to the experiences of LEIs from their own country. This makes sense, as legal circumstances and subsidies differ between countries. Regarding technical or organizational aspects of EVCI, LEIs could however also learn from each other on a more European level.

Furthermore, as EVCI markets and technologies are developing rapidly and as the first LEIs started providing EVCI just recently, it cannot be stated yet whether LEIs will stay a relevant EVCI-provider on the long run and whether their business models will become cost-effective in near future. To gain knowledge on these aspects, a similar research would be needed to be conducted in a few years from now again. Another possibility might be a longitudinal research design, following LEIs that provide EVCI for several years.

Lastly, as it has not been achieved to study this aspect within this research, a research focusing on the degree of financial sustainability that an LEI needs in order to enter a new market (such as the EVCI market), would be useful.

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9 Appendix

9.1 Appendix 1: List of Policy Documents & Respondents

9.1.1: List of local policy documents

Table 8: Analyzed local policy documents.

Case	Documents
GrunnegerPower	Charging Infrastructure Vision – Policy Approach Groningen (Concept Version) (2019)
Inselwerke eG	Decree on the technical requirements and the safe interoperable development and exploitation of publicly accessible charging points (2016)
	Information sheet for the "climate protection subsidy" for non-profit organizations (2019)
	Development of a nationwide cooperative charging point network for e-mobility (PowerPoint Presentation, 2017)
LochemEnergie	Policy guideline Electric Vehicle Charging Infrastructure municipality of Lochem (2014)
	Evaluation report and proposal start project: implementation plan charging points (2018)

9.1.2 Interviews connected to studied cases

Table 9: List of respondents connected to the studied cases.

No.	Who	Organization	Case	Date
1	Marianne Scheepens	LochemEnergie Member, responsible for communication & member of the elektrip working group	LochemEnergie	15.04.2019
2	Paul Stolte	LochemEnergie Member, responsible for business cases & subsidy advise	LochemEnergie	18.04.2019
3	Tonnie Tekelenburg	LochemEnergie Member and paid employee, member elektrip working group	LochemEnergie	30.04.2019
4	Loet Otto	LochemEnergie Member elektrip working group	LochemEnergie	02.04.2019
5	Mark Mobach & Manon Jansen	Gemeente Lochem Afdeling Duurzaamheid/ Afdeling Verkeer	LochemEnergie	03.05.2019
6	René Tettenborn	Inselwerke eG Board Member	Inselwerke eG	17.04.2019

7	Steven Wollenberg	Bluegreen Usedom Local business partner Inselwerke	Inselwerke eG	06.05.2019
8	Stefanie Pflock	Kulturverwaltung Trassenheide	Inselwerke eG	23.05.2019
9	Norbert Buiter	De Groene Fiscalist, Grunneger Power	GrunnegerPower	10.05.2019
10	Chris Munekke, Petra Meelker, Heleen Ensing	Gemeente Groningen Beleidsmaker energie en duurzame mobiliteit/ Intern Sustainable Mobility/ Policy employee parking policy	GrunnegerPower	10.05.2019
11	Arjen Schamhart	VrijstadEnergie Projectmanager	VrijstadEnergie	13.05.2019
12	Andreas Fröb	BürgerEnergieRheinMain eG Board Member	BürgerEnergieRheinMain eG	11-04-2019

9.1.3: Expert interviews

Table 10: List of respondents expert interviews.

No.	Respondent	Organization/Role	Date
13	Martijn van Manen	Allego	01-05-2019
14	Erik de Bruijn	Stekker App Developer	18-04-2019
15	Bart Dik & Yvonne Nieuwpoort	Supporting local SME in Lochem to develop EVCI	23-05-2019

9.1.4 Other events participated

Table 11: List of events participated.

No.	Event	Description	Date
1	Workshop on cooperative EVCI	Given by Norbert Buiter (GrunnegerPower & De groene Fiscalist). Explaining different EVCI concepts and business models, that have been applied by GP and VE. Focal point is the business model based on connecting EVCI with PCR projects.	09-04-2019
2	Charge & Go meeting	Meeting of all participants of the Charge & Go project, which is funded by the European Fund for Regional Development (EFRD). Participating actors are among others LochemEnergie, Allego and Radboud University.	16-04-2019

3	Regular meetings of the elektrip working group	In these regular meetings, all developments and things to do regarding all projects of LE that are connected to e-mobility are discussed.	18-04-2019, 02-05-2019
4	General Assembly (ALV) LochemEnergie		15-05-2019

9.2 Appendix 2: Analytical framework for deductive interviewing & coding

Table 12: Analytical framework for deductive interviewing and coding.

Capacity	**Dimensions**	**Indicators**
Personal Capacity	Members skills and professionalism	Knowledge about charging infrastructure (technological, back-end etc.) …
	Sense of Urgency & Motivation	Motivation to get involved in EVCI Identified need within community?
	Shared storyline/ vision-making	Other local actors convinced?
	Entrepreneurship & leadership	Individual entrepreneurs or collective entrepreneurship? Transformational leader? Ability to create strategic negotiation situations Ability to make use of windows of opportunity Inner motivation Open and flexible attitude Ability to tell convincing stories
	Learning capacity	Lessons learned from earlier projects Lessons learned from other cases Proper monitoring Critical reflection on own implementation
	Resource mobilization	Fundraising skills Strategic financial planning
	Managing Membership	Enough “professional” members Sense of community ownership
Cultural capacity	Legitimacy of sustainability issues within the community	Acceptance of LEI´s projects Environmental awareness

		Election outcomes
	Relation of the LEI to the community	Transparency Personal contact
	Government backing	Public leadership? Co-investment Passive support
Organizational capacity	LEIs networks	Networks on local level Networks on regional/national level Networks with other LEIs
	Regional regime dynamics	Dominant coalitions Agenda
Infrastructural capacity	Facilities available in the community	Access to technology & grid
	Biophysical characteristics	Level of urbanization
Role of LEI in EVCI market	Chosen charging mode	Charging level Public or publicly accessible on private ground? Connection to car sharing Direct use of renewable energy? Smart charging?
	Chosen business model	Mark-up Increasing retail sales Advertisement revenues Integrated into customer prepositions Retailer-to-charge point Retailer-to-EV
	Market-role fulfilled by the LEI	Energy supplier Charging station operator e-mobility service provider Combination Future ambitions

9.3 Appendix 3: Interviewguides

9.3.1 For Local Energy Initiatives

Respondent: **Local Energy Initiatives (add name of LEI, name & function)**
Interviewer: **Hannah Fröb**

Date, time

Thank you very much for your time and willingness to hold this interview with me!

My name is Hannah Fröb and I´m a Bachelor student Human Geography, Spatial Planning and Environment at Radboud University Nijmegen. I am currently writing my Bachelor thesis on the role of Local Energy Initiatives in the provision of electric vehicle charging infrastructure (EVCI) at the local

level. The **objective of this research** is to get a better understanding of the role Local Energy Initiatives can play in the provision of EVCI at a local level given the specific characteristics of their own organization and the (local) contextual factors that might influence their possibilities of taking a stake in the provision of EVCI. I want to find patterns between the different capacities a LEI can draw on and the charging-infrastructure model that has been chosen. I hope that in the end, I will be able to formulate some "Lessons Learned" for other LEIs who attempt to get involved in the provision of EVCI as well.

So, the **aim of this interview** is to get a better understanding of your LEI´s capacities and the local circumstances for your project. Furthermore, I want to get a better understanding of the charging infrastructure model and business model you have chosen and the specific role you are now playing in the market.

The **data** obtained in this interview will only be used for this thesis and will be dealt with confidentially. The complete interview will only be accessible to me and my supervisor, the analyzed results will be published in my thesis on the thesis repository of my University. Is that okay for you?

I want to **transcribe** the whole interview for the means of a better analysis and we would therefore kindly ask you whether you would mind me **recording** the whole interview?
…… Okay, thank you.
I estimate that the **interview will take about an hour**. Is that okay for you?

Your participation in this research is really important and helpful, but should you have any reasons for wanting to stop the interview, you of course always have the possibility to do so or to ask questions.

Do you have any practical or general questions left for now?

Okay, great, then let's start with the first question.

Cluster 1: Respondent´s role within organization

- What is your background and role in your organization?

- Can you shortly introduce your organization?

Cluster 2: Open question (for Grunneger Power & Inselwerke)

- According to your personal assessment, what do you think were the most important factors that enabled your organization to start with the provision of EVCI?

Cluster 3a: Role in EVCI Market (for Grunneger Power & Inselwerke)

- Which exact **charging infrastructure model** did you choose and why?
    - Charging level? (kW, AC or DC?)
    - Public or publicly accessible on private ground (=semi-public)?
    - Direct use of locally generated renewable energy?
    - Smart charging?
    - Who are the owners of the charging points? Is the owner also the one supplying services for maintenance, operation and billing transactions?
    - What is the market-concession model in your municipality?

- What is the **business-model** of your charging points?
  Resell with mark-up, increasing retail sales, advertisement revenues, subsidies/funding, other?

- How is the **payment of charging sessions organized**?

- Which **role** does your organization play in the **EVCI market**?
    - **Charge point operator (CPO)?** (The one offering the physical infrastructure (=CPs) and/or the service of maintenance, operation and billing transactions to the end user)
    - **E-Mobility Service provider (EMSP)?** (offering the e.mobility service to the end-user/EV-driver, including charging session, search and find and other services)
    - **Energy supplier?**
    - **Combination** thereof?
    - Attempts to also take another role in future?

- With which **other market-actors are you cooperating** to provide the charging service and which role do they play?
    - Who is providing the physical equipment (i.e. charging points)

- Who offers the charging service to the end-user?/Whom does the end-user pay?
- Who owns the grid?
- Who supplies the energy?

Cluster 3b: Ideas on EVCI model (for LochemEnergie)

- *What are you already doing with regard to charging infrastructure and e-mobility in general?*

- Which exact charging infrastructure model would you like to implement and why?

- Do you already have ideas about possible business models and if so, which ones?

- How do you plan to organize the payments of the charging sessions?

- Which role does your organization want to play in the market and why?

- With which other market-actors are you planning to cooperate in order to be able to provide the charging service?

Cluster 4: Personal Capacity

- What was your **(organization´s) motivation** to get involved in the provision of charging infrastructure?

- To what extent is there a **shared story line or vision** that links your organization´s motivation to other local actor´s motivations with regard to the (specific) role you and your organisation take in the EVCI market?

- To what extent where there certain **individuals** within your organization who i**nitiated** and pushed forward the project? (=entrepreneurs)

- What role did your **member´s skills, knowledge and experience play** with regard to the specific role your organization was able to take in the EVCI market?
  - How well developed do you estimate your organizations **administrative capacity**?
  - How well developed do you estimate **fundraising skills/resource mobilization** within your organization?

- How difficult is it for your organization to **recruit members** with appropriate skills and experience with regard to the charging infrastructure project? (=managing membership)

- What **experience did you gain**/ what did you learn from earlier projects and how relevant where these experience for the charging infrastructure project?

Cluster 5: Cultural Capacity

- How high would you estimate the **legitimacy of sustainability issues** within the local community?

- How would you describe the **relation of your organization to the community**?

Cluster 6: Organizational Capacity

- To what extent were/are you **supported by the local government** in the provision/exploitation of charging infrastructure?

- To what extent are sustainability objectives, and more specifically e-mobility, put on the **agenda** of the local government and other local powerful actors?

- How important was your organization´s **network** to realize the charging infrastructure?

Cluster 7: Infrastructural Capacity

- To what extent were **existing (local) facilities** enabling or constraining your organization in getting involved in the provision of charging infrastructure?

- To what extent did the **level of urbanization** of your location play a role in choosing the specific charging infrastructure model?

With who else to talk? Reports/Documents that could be useful to me?

This was my last question. Do you have any further comments or things you want to add or share?

It was really interesting and definitely an important contribution to my research! So thank you very much again for your contribution!

Also, I would like to stress once more that I will deal confidentially with the recordings of this interview and your personal data.

Also, if you wish to **review our transcription or results** of the analysis of this interview, that is of course possible for you!

In case further questions come up during my analysis, **would you mind me contacting you once again for clarification?**

Do you have any other questions?

9.3.2 For municipalities

Respondent:
Interviewer: **Hannah Fröb**

Date, time

Thank you very much for your time and willingness to hold this interview with me!

My name is Hannah Fröb and I´m a Bachelor student Human Geography, Spatial Planning and Environment at Radboud University Nijmegen. I am currently writing my Bachelor thesis on the role of Local Energy Initiatives in the provision of electric vehicle charging infrastructure (EVCI) at the local level. The **objective of this research** is to get a better understanding of the role Local Energy Initiatives can play in the provision of EVCI at a local level given the specific characteristics of their own organization and the (local) contextual factors that might influence their possibilities of taking a stake in the provision of EVCI. I want to find patterns between the different capacities a LEI can draw on and the charging-infrastructure model that has been chosen. I hope that in the end, I will be able to formulate some "Lessons Learned" for other LEIs who attempt to get involved in the provision of EVCI as well.

So, the **aim of this interview** is to get a better understanding of your municipalitie´s vision on and policy for the provision of EVCI and your motivations to cooperate with the local LEI for the provision of EVCI. Furthermore, I want to find out how you see/asses the LEI and their cpacpities.

The **data** obtained in this interview will only be used for this thesis and will be dealt with confidentially. The complete interview will only be accessible to me and my supervisor, the analyzed results will be published in my thesis on the thesis repository of my University. Is that okay for you?

I want to **transcribe** the whole interview for the means of a better analysis and we would therefore kindly ask you whether you would mind me **recording** the whole interview?
…… Okay, thank you.
I estimate that the **interview will take about an hour**. Is that okay for you?

Your participation in this research is really important and helpful, but should you have any reasons for wanting to stop the interview, you of course always have the possibility to do so or to ask questions.

Do you have any practical or general questions left for now?

Okay, great, then let's start with the first question.

<u>Cluster 1: Introduction</u>

1. What is your background and your role within the municipality of xy?
2. According to your estimation, how important are sustainability objectives within your municipality?

<u>Cluster 2: EVCI in xy (insert name of municipality here)</u>

3. How important does the municipality find the promotion of e-mobility and the provision of EVCI as a part thereof?
4. Which vision does the municipality have tor the provision of EVCI?
5. Which rules and jurisdiction on the field of EVCI exists in the municipality of xy?

Cluster 3: Cooperation with locale LEI

6. What was the municipality´s motivation to cooperate with the LEI for the provision of EVCI?
7. In which way exactly did the municipality cooperate with the LEI?
8. To what extent does the municipality perceive the LEI as a trustworthy partner, and why?
9. According to your estimation, which capacity does the LEI have or lack that are relevant for the provision of EVCI?
   Probing: interdisciplinary skills, professionalism, networks, financial capacity, administrative capacity, legitimacy in local community, local knowledge?

With who else to talk? Reports/Documents that could be useful to me?

This was my last question. Do you have any further comments or things you want to add or share?

It was really interesting and definitely an important contribution to my research! So thank you very much again for your contribution!

Also, I would like to stress once more that I will deal confidentially with the recordings of this interview and your personal data.

Also, if you wish to **review our transcription or results** of the analysis of this interview, that is of course possible for you!

In case further questions come up during my analysis, **would you mind me contacting you once again for clarification?**

Do you have any other questions?

9.4 Appendix 4: Deductive Code List

Category 1: Role in EVCI market

Subcategory 1.1: Chosen EVCI-model

- charging level
- private/public
- connected to e-CS
- direct use renewables
- smart charging

Subcategory 2: Chosen business model

- Mark-up
- Increasing retail sales
- Advertising revenues
- Integrated into customer prepositions
- Retailer-to-charge point
- Retailer-to-EV

Subcategory 3: Market-role

- Energy supplier
- CPO
- EMSP
- Combination
- Future ambitions

Category 2: Personal capacity

Subcategory 1: Member´s skills

- Knowledge EVCI
- finance
- administrative
- communication
- marketing
- technology
- *ITC*

Subcategory 2: Motivation

- need in community
- mix of motivations
- sense of urgency

Subcategory 3: Shared storyline

- vision making/framing

Subcategory 4: Entrepreneurship

- individual/collective
- strategic negotiation situations
- using windows of opportunity
- inner motivation
- convincing stories
- open & flexible attitude
- transformational leader

Subcategory 6: Learning capacity

- earlier projects
- other cases
- monitoring
- critical reflection

Subcategory 6: Resource mobilization

- fundraising skills

- strategic financial planning

Subcategory 7: Managing membership
- professional members
- sense of community ownership
- relation professionals & members

Category 3: Cultural capacity

Subcategory 1: Legitimacy sustainability
- low
- middle
- high

Subcategory 2: Social capital
- trust
- shared norms

Subcategory 3: Relation LEI to community
- good
- not so good
- transparency
- personal contact
- trust

Category 4: Organizational capacity

Subcategory 1: government backing
- public leadership
- co-investment
- passive support

Subcategory 2: network
- local level
- regional/national
- other LEI´s

Subcategory 3: regime dynamics
- dominant coalitions
- agenda
- capacity to interact with dominant coalition/large institutions

Category 5: Infrastructural capacity

Subcategory 1: available facilities
- technology
- grid

Subcategory 2: Biophysical circumstances
- level of urbanization
- for generating renewable

9.5: Appendix 5: Detailed Case Descriptions

9.5.1 Grunneger Power

Personal Capacities

As LEIs cannot realize EVCI all by themselves but always have to cooperate with others, it is an important capacity for them to be able to align their own visions with that of other relevant actors. Such storylines needed to be shared with the municipality in first instance in the case of GP. Important **shared storylines** with the municipality were the ambition to solve the chicken-egg problem, boost the transport transition and get prepared for future demand. In that sense, GP is simply an actor that can help the municipality to achieve their sustainability targets. Furthermore, the municipality wants to *"steer the price-development"* of charging sessions (personal communication, C. Munneke, 10-05-2019). It was therefore important for them that GP could promise them a lower charging tariff for their members at their CPs (25 instead of 35 cts/kWh). Besides, the participative character of GP played a role: *"We as a municipality like the cooperative idea"* ((personal communication, C. Munneke, 10-05-2019).

The skills and knowledge a LEI has, are to a large extend based on its **member´s skills** (Middlemiss & Parrish, 2017). GP seems to have a lot of relevant internal knowledge thanks to its members. Norbert Buiter describes his cooperative as a "*professional research consultancy (…) where professionals from ICT and many different backgrounds are working to build the blocks that are needed to change the whole system"* (personal communication, 10 May 2019). GP´s core team is indeed an interdisciplinary team with e.g. professionals from accountancy, project management and marketing. Furthermore, they have a high administrative capacity, given the fact that they have 11 payed employees, an own energy company and a daughter firm that is responsible for the administration of all projects and services they are offering. However, the municipality as GP´s partner does feel that a lot of learning-by doing is involved and that GP is normally not very routinized in what they are doing yet: *"We do notice that everything is done for the first time, so we pay a lot of learning-money"* (personal communication, C. Munneke, 10 May 2019).

Another important personal capacity for LEIs is the **management of their members**: being dependent on them and their involvement, they need to make sure that they have enough passive members for financial resources, but especially also active members that volunteer within the cooperative (Spear et al. 2009). In the case of GP, a situation in which not enough members were involved into the operational processes led to the need to employ payed employees. Having 11 payed employees now, GP is less dependent on active members now. However, the professionalization of the organization brings about new challenges: the relation between "normal" members and staff changes, a whole structure of daughter firms develops, and some members are wondering whether GP actually keeps its cooperative character or completely mutates towards a company (personal communication, N. Buiter, 10-05-2019).

Regarding the role of **entrepreneurship** within the LEI, pushing forward the EVCI-project, it became clear almost immediately that N. Buiter is the EVCI-entrepreneur within GP, who developed the idea, planned the process and lobbied in the political circuit. Although he clearly states that *"this is not a one man show"*, that other member´s skills were crucial in the exploitation phase (e.g. marketing/PR) and that one colleague within GP is doing the administrative part of the EVCI-projects, it became clear that the focus of GP as a whole and thus of most employees does not lay at e-mobility at the moment.

In order to further develop their skills, capacities and professionalism, LEIs need the **capacity to learn**, e.g. from earlier own projects or from other´s experiences (Hoppe et al., 2015). GP learned many relevant skills from earlier implemented projects, such as proper project planning, juridical procedures, financial planning, the development of strong business cases as well as the development of the organization´s internal organization. However, within the cooperative world, they were pioneers on the field of EVCI, so that they could not really learn from other cooperative´s experiences. It is rather the other way around, that many other Dutch LEIs got inspired by their EVCI-concept (e.g. LochemEnergie, VrijstadEnergie). However, other concepts and projects related to e-Mobility that other LEIs developed, such as e-CS fleets (LochemEnergie) were very inspiring and informative for GP.

Cultural Capacities

The general legitimacy of sustainability-objectives within the population of Groningen is difficult to estimate. In the past years, sustainability and climate change have become more dominant in the general societal discourse. N. Buiter thinks that in Groningen, GrunnegerPower has had an influence on this development, however it is difficult to prove any clear relationship. For example, a poll in Groningen has shown that today, more people would be willing to invest in a collective solar park than 5 year ago. N. Buiter thinks that this public attitude has been implicitly influenced by the successful projects of GP, but whether this is really the case is not sure. Furthermore, he thinks that the impact of GP is much bigger than on the 1000 individual members because GP influences municipal policy that affects all citizens of the city. However, most citizens do not see that GP is involved in this. In general, however, the visibility of GP within the city and the community is growing, also due to the public CPs and the e-Taxi´s using the CPs and GP´s logo. Also, the general trust in GP is growing. In the founding and pioneer phase, GP experienced a lot of skepticism and was not really taken seriously *("these are good willing volunteers*"), *"because you don´t have any track records, no proven projects"* (personal communication, N. Buiter, 10-05-2019). The more projects they have successfully implemented however, the more people realize that they are a serious organization.

Organizational Capacities

Organizational capacity is defined as the values that formal organizations that are active in the community hold and the connections that the LEI has to other relevant/dominant actors within the community (Middlemiss & Parrish, 2010). One important aspect hereof that I have been using in my conceptual model (figure 5) is that of **government backing.**

In the case of GP, the municipality has a general good will towards GP, among other reasons because of the above-mentioned shared storylines. N. Buiter formulates that GP has a kind of "indulgence factor" (author´s own translation) in front of the municipality. The municipality itself, however, does not like this formulation: They do want to support bottom-up initiatives but also want to make clear that these are not unrightfully favored over other possible actors – there is no room for nepotism within the municipality (personal communication, C. Munneke, 10-052019). GP also realizes that they are not automatically supported by the municipality: The municipality´s trust must by firmly based on good arguments and well-planned projects. In general, the municipality trusts GP´s skills and capacities because of their professionalism, the skilled people within the organization and because they have shown several times that they can implement complex projects very well. The municipality has therefore been GP´s client for several times, e.g. for the writing of the municipal solar policy. They have also supported GP financially, by giving them a loan for founding their energy company "Energie van ons". This means that GP and the municipality are also connected through a mutual dependence – financially seen and in order to meet their sustainability goals. Public Leadership has been important

as well; an employee of the municipality has asked GP whether they want to take over the EVnet CPs and has thus given an opportunity to them (personal communication, C. Munneke, 10-05-2019). The municipality was also not complicated in making public parking spaces available for CPs.

Regarding the **regional regime dynamics**, it can be seen that sustainability objectives as well as e-mobility more specifically have an important position on the agenda of the "regional regime", meaning in this case predominantly the municipality. The municipality has high ambitions regarding many different aspects of sustainability. E-mobility in particular is seen as very important to reach one´s emissions targets, but in a city as Groningen, e-mobility is also important for life quality and clean air purposes (personal communication, C. Munneke & P. Meelker, 10-05-2019). In their founding phase, GP did have an outsider position and was not taken seriously by dominant actors such as the municipality or firms. Nowadays, however, *"the role of GP in Groningen cannot easily be planished anymore"* (personal communication, N. Buiter, 10-05-2019).

Another factor, that I want to count underneath "regional regime dynamics" here, but that I have not included into my conceptual model beforehand (figure 5) is the local **EVCI-policy of a municipality**, as it forms a framework for the LEI´s and other actor´s actions. The municipality of Groningen has a well-developed EVCI-policy, giving the fact that in a city as Groningen, the dispersal of E-mobility is seen as quite urgent and that many people are dependent on public parking- and charging here. They have developed location criteria for public CPs (with the aim to ensure that CPs will be well dispersed throughout the whole municipality) as well as criteria for the outer appearance of CPs. Other important criteria for the municipality are that CPs will be occupied sufficiently, that the charging price will be affordable and that the number of CPs will increase quickly. Until May 2019, the municipality of Groningen was using the "open market model" (paragraph 4.1.1), in which they had a contract with Allego. GP´s own taxi-CP therefore needed to deviate technically from the technical specifications that were agreed on in the contract with Allego. From June 2019 on, the municipality will be part of a new concession (paragraph 4.1.1) by the provinces of Groningen and Drenthe, in which they will work together with Allego again. Cooperatives such as GP cannot become part of this concession, but they might become an energy supplier for some of the realized CPs via "Energie van ons" (personal communication, N. Buiter, 10 May 2019).

As mentioned above, GP´s **networks** with other LEIs (e.g. HIERopgewekt, small neighboring cooperatives) were especially important to spread the word about "cooperative charging infrastructure" and to inspire others to do the same as GP. GP could not learn much from other LEIs about EVCI, but about related topics such as e-CS. Furthermore, personal and professional networks were very useful: for example, N. Buiter had already built up a network in the field of e-mobility when he was still working in accountancy. He could use this network later on for his EVCI project at GP.

Infrastructural Capacities

Regarding existing facilities that GP could use to realize their EVCI-project, especially the EVnet CPs they could take over and public parking spots that were already available or that were made available by the municipality were important. Furthermore, the level of urbanization had an important influence on the local circumstances for developing EVCI: in a rather big city with limited space and air quality problems the municipality sees it as urgent to stimulate the uptake of EVs and therefore to build up public EVCI. There is also sufficiently demand from within the community as many people are dependent on public parking and charging.

9.5.2 Inselwerke eG

Personal Capacities

For Inselwerke eG it was important to have **shared storylines** with both municipalities and local Small Middle enterprises (SME)/location partners they were cooperating with. For both municipalities and local SME, the idea of creating a green image of oneself by providing EVCI was important. Besides, such a green image also fits well the general image of the island of Usedom, which stands for good and healthy sea air. For municipalities, this green image was in first instance important with regard to Usedom as a touristic destination: The idea is that providing EVCI for tourists might help staying an up-to-date touristic destination. Besides, EVCI is also more and more a service that tourists, mostly coming from bigger cities where e-mobility is already more normal, expect (personal communication, S. Pflock, 23-05-2019). Furthermore, municipalities of course have the responsibility to provide services for the public, thus also EVCI, and to meet certain sustainability targets. They also see the possibility that EVCI can help develop the rural region they are located in.

For local SME, it was the idea that they could use the green image for marketing and for acquiring new clients/guests. However, in the case of S. Wollenberg, this did not really work out. For him, intrinsic motivations such as wanting to boost the energy transition and to help stimulate e-mobility were a more important argument (personal communication, 06-05-2019). This correspondents to what Inselwerke eG realized, namely that their location partners where the people *"who want to take proactive responsibility"* (personal communication, R. Tettenborn, 17-04-2019).

Regarding their **member´s skills** and thus related skills and capacities of the LEI, their interdisciplinary team, in which people brought in experience from different professions, was an important prerequisite. Relevant professional backgrounds were for example engineering, economics and regional development. It was also important that some people had a strong personal interest in e-mobility, motivating them to learn more about it by themselves. A lot of know-how Inselwerke eG have now, has been developed learning-by-doing: not only their knowledge about EVCI, but also their administrative skills with which they are now able to offer billing services and a hotline to themselves and other LEIs. For all this know-how they are regarded as "professionals" by local partners (personal communication, S. Wollenberg, 06-05-2019; S. Pflock, 23-05-2019). Therefore, next to actual skills, a professional appearance, insistence, and integrity of Inselwerke´s members were crucial as well in order to build trust: *"A lot of insistence but nevertheless a very professional appearance. We knew what we were talking about and this helped us in building trust. This is extremely important, especially when you enter a new economic branch."* (personal communication, R. Tettenborn, 17-04-2019)

This last aspect is also connected to the personal capacity of **entrepreneurship**. In the case of the Inselwerke eG, two individuals that are also part of the board played the role of entrepreneurs for EVCI. They both know the region and its people very well, have many personal contacts and were not giving up in advocating for their EVCI project. They played a crucial role in building up cooperations with location partners and for building trust. However, the whole board together with the supervisory board which was very constructive and did not only take immediate cost-effectiveness into account, practiced a collective form of entrepreneurship. They were even lobbying in front of the minister of the province for EVCI-subsidies.

With regard to the aspect of **"Learning capacity"**, Inselwerke eG could learn some valuable skills from earlier implemented projects, especially from their PV-project in their founding period: the negotiation of prices, the experimentation and evaluation of different concepts, the way they can function as a

team well. *"We got to know our strengths and our weaknesses",* states R. Tettenborn furthermore (personal communication, R. Tettenborn, 17-04-2019). However, being one of the first LEIs in Germany developing EVCI meant that they could not learn much from other cases or projects within the cooperative world.

There are also some other capacities that came up in interviews with Inselwerke´s location partners. Firstly, they are locally embedded, foster personal contact with their partners and manage to find custom-fit solutions according to the needs of their partners. With this, they distinguish themselves from big enterprises: *„Before getting in contact with Inselwerke, I had messaged EON and RWE to ask if they want to place a charging point in front of my place. I did not event get a reaction. They don´t have any interest in things like that, they have other ambitions."* (personal communication, S. Wollenberg, 06-05-2019). Furthermore, they have managed to develop a local-fit solution, that fits their rural region.

Regarding their level of professionalization Inselwerke are still very dependent on voluntary work but have reduced their voluntary factor to be able to offer services such as a 24/7 hotline. They have their first payed employees and will soon move on to another one.

Cultural Capacities

The **legitimacy of sustainability objectives** within the local community is probably average. The need of the energy transition is already in the head of many people, but most of them are not yet acting accordingly, one of the only ones that do act are Inselwerke´s members and location partners. The general legitimacy of sustainability within the community does not hinder Inselwerke´s projects. Rather, they have the feeling that their projects have impact in the community. However, this is also due to the general trend within society in which sustainability becomes a more and more dominant topic.

With regard to Inselwerke´s **relation to the local community** it is striking that they experienced and still experience a lot of skepticism and unwillingness within the community because people were not used to the cooperative model in their region. Their participatory character did not even help them to open doors at municipalities: *„That is different in other regions, but here, I would say, this was no advantage, totally not. Maybe it was even a disadvantage, because this cooperative model is just not so common here in the East."* (personal communication, R. Tettenborn, 17-04-2019). Therefore, a lot of time and insistence is needed to actively build trust. Successfully implemented projects also help in this and their CPs lead to more visibility of the cooperative´s successes in the public: *"Now, in the 5th or 6th year since our foundation, people are observing us neutrally and see: Inselwerke are still there! And this creates some kind of trust."* (personal communication, R: Tettenborn, 17-04-2019)

Next to actively building trust, Inselwerke have also extended their action radius towards regions around Usedom where it is easier to draw on trust and motivation from within society.

Organizational Capacities

Government backing for Inselwerke eG is in most municipalities on the island of Usedom generally low. Many municipalities were very skeptical regarding their cooperative organization form and rather wanted to talk *"to people they already knew, for example some energy supplier that are already active in the region for a longer period*" instead of to a young cooperative team (personal communication, R. Tettenborn, 17-04-2019). It was generally a long process of building trust and the initiative to cooperate came from Inselwerke eG itself, e.g. by inviting municipalities to an information evening

about their “Usedomer Ladenetz”. However, in several municipalities, there were individual employees that liked what the cooperative was doing and advocated for them within their municipality. These, what Hoppe et al. (2017) would call public leaders, made it possible to work together with several municipalities, e.g. Trassenheide or Ahlbeck. Due to the above-described shared storylines, it was in the end also a win-win situation for the municipalities to work together with the LEI and they experienced them as professional, skilled partners (personal communication, S. Pflock, 23-05-2019).

The limited governmental backing is also connected to **regional regime dynamics** in which the cooperative model is rather unknown and energy cooperatives are thus in an outsider position. However, the “regime” (the municipalities and local businesses) are generally open towards sustainability objectives and e-mobility as it is important for them in a rural, but touristic region. It was therefore rather easy to get public parking spots in some municipalities (personal communication, S. Wollenberg, 06-05-2019), whereas in others, public parking spots were seen as almost holy, so that it was only possible to realize public CPs in less central locations (personal communication, R. Tettenborn, 13-05-2019).

The **EVCI policy** as aspect of the regional regime dynamics is not very far developed in the municipalities on Usedom yet. R. Tettenborn states that he does not know any municipality that had set up clear criteria, which lead to a situation in which they had to propose locations for CP based on trial-and error and could in the end only get a less central location where the parking pressure is not so high (personal communication, R. Tettenborn, 13-05-2019). However, in the interview with the municipality of Trassenheide I learned that they are in the process of developing an EVCI-vision and are also planning to cooperate with local SME´s in the touristic sector to develop EVCI, just as Inselwerke are doing it (personal communication, S. Pflock, 23-05-2019).

Regarding **networks**, personal networks were crucial for building trust and finding location partners that are willing to cooperate. For example, S. Wollenberg, one of the location partners, only got to know Inselwerke because clients of him knew members of Inselwerke and told him about the cooperative and their EVCI-project. Once he had gotten in contact with Inselwerke, he appreciated their personal contact and custom-fit solutions very much. Furthermore, Inselwerke´smembers used their personal and professional sustainability-related networks to learn more about EVCI and to lobby for their project. Inselwerke eG only got to know Bürgerwerke eG, when they had already realized their Usedomer Ladenetz to a big extend. However, the cooperative network helped them to disperse their EVI-concept and to develop the idea of a “citizen charging network” together with Bürgerwerke eG (personal communication, R. Tettenborn, 17-04-2019).

Infrastructural Capacities

Regarding existing facilities Inselwerke could use to realize their EVCI projects, especially public parking spots made available by municipalities where important, although this was not always easy to achieve. Furthermore, the low level of urbanization led to a situation in which Inselwerke were and still are the only party in the region taking action to develop EVCI. Municipalities and market parties seemed to not dare to invest in EVCI on Usedom yet: Due to the low EV uptake, CPs are not yet profitable enough for them.

9.5.3 LochemEnergie

Personal capacity

According to M. Scheepens, LochemEnergie has not yet built strong **shared storylines** that are aligned with other actor´s visions regarding EVCI as they are still in the brainstorming phase and do not know exactly yet how and if they would like to implement EVCI. However, during my time in Lochem, I could find several (potential) shared storylines, both with local SMEs and the municipality. With SMEs, the shared storyline is that the entrepreneur can extend their profile/services by also offering EV-charging (fitting the "Lochem Model"). The local entrepreneur can use this for marketing-purposes and to build up a green image of his enterprise. LE tries to find custom fit solutions according to the needs and possibilities of the SME. The most important storyline shared with the municipality is that LE helps them in reaching their targets and fulfilling their responsibilities: the municipality wants to be energy-neutral by 2030, meaning that they need a rapid transport transformation as well. They need to find a solution to the chicken-egg problem, and in their policy-document on the placement of CPs it says that CPs must be supplied by 100% guaranteed sustainable energy (Beleidsregel oplaadinfrastructuur elektrisch vervoer gemeente Lochem, 2014), which makes LE a perfect partner. Next to these pressing issues, the municipality wants to support local initiatives and likes the participative character of LE. Due to its participative character and local embeddedness, LE is a valuable partner for the municipality: *"They sit more in the sphere of influence, because they do it for their members. And the citizens. And they are an organization that starts acting very practically, with energy coaches, the energy center, … their local networks, their ability to connect people… this all makes them a wonderful partner for us as government to help realize our ambitions."* (personal communication, M. Mobach, 03-05-2019).

Based on mainly their **member´s skills**, LE has built up a significant amount of relevant internal and interdisciplinary knowledge, which is also noticed by the municipality: *"they have a lot of knowledge in many different fields"* (personal communication, M. Mobach, 3 May 2019). LE has active members from many different professional backgrounds: accountancy, economics, communication, engineering (e.g. they have specialists for hydropower or wind-energy) and jurisdiction among others. Their bookkeeping and PR are done by professional volunteers, one member has a good network on the field of subsidies and lobbying. All these skills help LE to perform well, also for their actions regarding EVCI. However, their specific knowledge on EVCI is mostly *"attached"* to LE (personal communication, M. Scheepens, 15-04-2019), by cooperating with and hiring people from within the "cooperative world". Another important skill of LE and their members is having the necessary realism for implementing projects: *"Within our organization we have a good balance between exiting projects and (financial) realism."* (personal communication, P. Stolte, 18-04-2019). However, it is still often a challenge for them to decide what to focus on and what not. There are many great opportunities, but limited capacities: *"What often happens in LochemEnergie is that opportunities come along where we need to decide: are we going to do this or not? And we are enthusiastic about all these things! This sometimes leads to bottlenecks."* (personal communication, P. Stolte, 18-04-2019).

Regarding **the management of members**, LE has an increasing number of members which is important for the financial basis and validity of the cooperative. Until now, the number of active members is growing along, staying around 10% of all members (personal communication, L. Otto, 02-05-2019). So up to now, LE does not face any problems finding motivated and skilled volunteers. However, it is sometimes difficult to find people with the right skills at the right time, as LE normally cannot open paid vacancies in the way normal companies do (personal communication, M. Scheepens, 15-04-2019).

Regarding **entrepreneurship for EVCI** within LE it became clear very quickly that T. Tekelenburg is the most important EVCI-entrepreneur, *"the enthousiast who harvests all projects"* (personal communication, M. Mobach, 03-05-2019). He is successful in recruiting new active members, in noticing and using windows of opportunity, in mobilizing resources through strategic negotiation and in influencing and shaping (municipal) policy (personal communication, L. Otto & P. Stolte, 02-05 & 18-04-2019). However, it also becomes clear that Tonnie cannot do it on his own, that collective entrepreneurship is needed. M. Scheepens therefore rather calls him a *"booster"* than an entrepreneur, as he often brings up ideas but needs others to implement them. Furthermore, he sometimes seems to be a bit too fast and needs the realism of others within the organization: *"There are often many loose ends left. That is okay and that is the power of Tonnie, but then you need someone like H. Geerlink that can combine all these loose ends."* (personal communication, M. Mobach, 03-05-2019). Furthermore, it is important to mention that e-mobility gets a lot of attention within LE in general: there is the working group "elektrip", consisting of six members that hold a meeting every two weeks. This interdisciplinary team is responsible for everything connected to e-mobility within LE and thus practices a kind of collective entrepreneurship as well.

Regarding **learning capacity**, LE has learned a lot that might also be needed for providing EVCI from earlier own projects, such as how PCR-projects work, how to lobby and to influence policy, how to cooperate with energy companies, how to implement neighborhood projects, and how to convince and motivate people. Through earlier projects, they have also built up strong local as well as regional/national networks, among others with different universities. Furthermore they already gained quite a lot of e-mobility related experience by writing a strategic EVCI-plan for the municipality, by setting up an e-CS fleet and e-trip services, and by taking part in a smart-grid pilot project, in which they did not only test the capacity of the local grid but also found out more about the behavior of inhabitants with regard to e-mobility. However, especially other LEI´s EVCI-projects were very relevant: they got inspired and learned about different technical, fiscal and organizational possibilities from GrunnegerPower and VrijstadEnergie.

Cultural Capacity

Regarding the **legitimacy of sustainability objectives** within the population of Lochem, a poll has shown that there are many conservatives living in Lochem, that are rather skeptical about sustainable measures, but on the other hand also many "responsible" that want to leave the world in a good state for future generations (personal communication, M. Scheepens, 15-04-2019). Lochem has many wealthy inhabitants that live in a rural area with little noise, air pollution and congestion, so that several respondents have the feeling that many inhabitants do not see a lot of urgency (personal communication, M. Scheepens & M. Mobach, 15-04-2019 6 03-05-2019). AT the same time, however, according to the municipality, early and high sustainability ambitions of the municipality have led to a "*green society*" in which inhabitants above-average aware of the problem (personal communication, M. Mobach, 03-05-2019). In line with this argument, LochemEnergie experiences that there have until now always been enough motivated people that want to volunteer in their organization (personal communication, L. Otto, 02-05-2019). For most local SMEs, however, long term profit and sustainability seem to be still less relevant than high investment costs of e.g. CPs, so that many of them are not willing to invest in EVCI (personal communication, B. Dik & Y. Nieuwpoort, 23-05-2019).

LE´s relation to the local community is described as generally good and trustful. LE´s projects seem to be accepted and approved by the local community. However, most inhabitants seem to not fully understand the cooperative idea behind LE yet, but only see them as organization that is working

towards the energy transition: *"I think, that if you ask most people on the streets: 'what is LochemEnergie?', that most of them will say: 'that is that club with solar panels, these people that want to do sustainable things', but I think that they do not notice the cooperative idea in it."* (personal communication, M. Scheepens, 15-04-2019).

Organizational Capacity

LochemEnergy generally experiences strong **government backing**. The municipality has a general good will towards LochemEnergie, because of the manifold shared storylines mentioned above and because they like the cooperative, bottom-up idea they are standing for (personal communication, M Scheepens & M. Mobach, 15-04-2019 & 03-05-2019). The municipality trusts LE based on their earlier implemented successful projects and skills they have: *"I trust, that if LE does things, and they have also shown this in the past, that they will be able to implement it, also financially. They have the knowledge and skills for it. I have no doubts here."* (personal communication, M. Mobach, 03-05-2019). The municipality has already supported LE in many ways, especially financially, by giving them subsidies from innovation budgets for their projects and by being the client of projects that LEI can implement (e.g. smart grid project, strategic EVCI-plan). This financial support is rendered very important by LochemEnergie, also for their potential EVCI-projects: *"I don´t think that we will have all resources ourselves"* (personal communication, M. Scheepens, 15-04-2019). Furthermore, it will be crucial for LE to get necessary public parking spots from the municipality. However, it is not yet clear how easy this will be, since the municipality is not yet so far to give EVs priority on public parking spots in general (personal communication, M. Mobach & M. Jansen, 03-05-2019). Besides, although the municipality is generally supporting LE and is trusting them, they do not give them (financial) support on autopilot. They do know that LE is an organization that is dependent on volunteers and has limited capacities. Therefore, they always want grounded arguments that LE will actually be able to implement a certain project*: "I don´t think that they trust beforehand for 100% that we can set up a good business plan"* (personal communication, M. Scheepens, 15-04-2019). However, since LochemEnergie is in a rapid process of professionalization, their relation to the municipality is changing as well. What was easy-going and rather informal at first, are now becoming professional service partnerships: *"It does not work that easily anymore, that you can just quickly call us and ask: 'Do you maybe have a budget left over for this or can we do this?'"* (personal communication, M. Mobach, 03-05-2019). Both the municipality and LE will need to find their new position in relation to each other.

Regarding **regional regime dynamics**, sustainability issues and also e-mobility seem to be relatively high on the agenda of the municipality*: "the ambitions are sky high, but the translation to what this means financially, organizationally, which changes are needed, (...) that is still a big discussion"* (personal communication, M. Mobach, 03-04-2019). There is the will to work towards sustainability, but it is not clear yet how this should be accomplished. Transforming the transport sector is regarded as very relevant, since the transport sector is responsible for a big share of all GHG emissions in Lochem. LochemEnergie perceives the open-market model (See paragraph 4.1.1), in which the the municipality cooperates with Allego, as dominant coalition in relation to which they are rather in an outsider position: *"They call it open market model, which is strange, because it is actually very closed"* (personal communication, T. Tekelenburg, 30-04-2019). The municipality, however, explains that they have deliberately chosen for the open-market model and not for a concession to hold it open for several actors. Due to the unsecure future development of EVCI, they do not want to choose for one partner. In theory, LE could even become a partner within the open-market model as well (personal communication, M. Mobach, 03-05-2019). Anyhow, LE has the challenge that they are not taken

seriously by many market parties, because they are *"just a volunteer club"* (personal communication, M. Scheepens, 15-04-2019). Furthermore, not all market parties and governments understand that LE wants to be a relevant third party within society, and therefore do not think that cooperatives such as LE will stay relevant on the long run: *"Lately, the alderman said: 'I hope that your work will not be needed anymore in a few years from now. Because then, everything will be done'. Then I think, he hasn´t understood us correctly yet. Because that´s not the idea, we want to go on! But I think that many people see us like this."* (personal communication, M. Scheepens, 14-04-2019). Some individuals within LochemEnergie see the threat that if they do not manage to position themselves as a long-term relevant actor in society, their role might be taken over by market parties soon.

The municipality has set up criteria for the placement and outer appearance of CPs. However, this policy paper is already several years old. The expected occupation of CPs is an important criterium as well as the ambition that CPs should be well dispersed throughout the municipality. As already mentioned, they have chosen for the pen-market model in cooperation with Allego, meaning that if a citizen requests a CP, it will be tested based on the criteria of the municipality and by Allego. If the requested location fits both, a CP will be realized by Allego. Many CPs seem to be not yet profitable enough yet in Lochem so that many requested CPs are not being realized. Furthermore, in a radius of 300m around an Allego-CP, no other CPs are allowed to be placed, to make sure that the existing CP stays occupied sufficiently. Also, if another party than Allego wants to realize CPs, as LE for example, their CPs need to deviate technically from Allego´s ones. LE perceives this policy arrangement as very restricting, because many existing CPs are old/not up-t-date, but no new ones can be placed on their good locations (personal communication, T. Tekelenburg, 30-04-2019). Next to this open market model, the municipality is also applying the "Lochem Model", which LE has developed for them. It is based on the assumption that in a rural municipality such as Lochem, where there is not so much direct demand for public EVCI yet, the development of EVCI must be coupled to other services, such as local SMEs, museums, restaurants, e-CS, etc. to make it attractive and realizable.

Furthermore, there are juridical barriers that need to be overcome in order to let another party (e.g. LE) take over the eight old EVnet CPs. Jurists within the municipality think that a CP cannot simply be handed over because of the value of the ground positions of these locations (personal communication, M. Mobach, 03-05-2019).

Regarding the role of LE´s **networks**, it seems that especially their local and personal networks are of importance for realizing and financing their projects. With regard to the EVCI-project, this means getting in contact with local SME that are willing to invest in CPs, but also getting municipal subsidies. A member of the cooperative also works in the sustainability department of the municipality. Furthermore, LE has good connections in the wider region, such as in the Cleantech-Region or in the province of Gelderland.

Next to this, the "cooperative world" plays an important role for LE, where cooperatives are exchanging knowledge and experiences with each other. For example, N. Buiter from GP came to Lochem to give a workshop on their EVCI-implementation and business model. LE also got their inspiration to get involved into EVCI from GP and VrijstadEnergie. Other LEIs are thus very important to learn from and to exchange experiences with. Furthermore, cooperation with other LEIs, especially in their region, will be needed to position oneself within society, to share costs, and to implement strong projects: *"If we want to implement on a local level charging points, and solar parks, and wind, and…, we cannot do this all by ourselves on the local level. We need something else, we really want to gain a position in this field, as a community"* (personal communication, P. Stolte, 18-04-2019).

Infrastructural Capacity

LochemEnergie perceives existing CPs as restricting due to the rule that no other CPs are allowed to be placed in a certain radius around them (see above). Furthermore, the municipalities policies on public parking are perceived as obstructing.

Besides, being located in a rural municipality plays an important role for the implementation of EVCI in Lochem. While the municipality realizes that providing public EVCI is important, most citizens do not feel much urgency to step over to e-mobility or the need to have public EVCI available. As compared to bigger cities, there is no congestion, no noise and little air pollution. Furthermore, the distances between the different villages of Lochem are much longer than within a city, which might lead to more “range anxiety”. As there is not yet so much demand for public EVCI in Lochem yet, most companies also do not dare to invest in EVCI in Lochem yet. This has led to the “Lochem Model”, in which it is tried to connect the development of EVCI to other (social) services.