



Institut für
Strategische Innovation &
Technologiemanagement



STUDY

**Feasibility Study on financial instruments for
green-tech start-ups and eco innovation sector
in Baden-Württemberg**

Realized by IST Institut for Strategic innovation &
Technology management and bwcon GmbH
in the frame of the Alpine Space Project



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1 Introduction

Within the framework of the FIDIAS (financial instruments for sustainable development in Alpine Space) project as part of the EU Transnational Cooperation Programme ‘Alpine Space’, several feasibility analyses are conducted. The aim of the FIDIAS project is to develop innovative financial instruments and services to support local and regional authorities, business investment operators and green-tech small and medium sized enterprises to avail of the opportunities of financial tools. Thereby, FIDIAS pursues the objective to strengthen competitiveness and innovation of ‘eco-innovative’ small and medium sized enterprises in Alpine Space Regions. Thus, it should also support green-tech companies to find appropriate funding offers, and advise the financial service provider and the public authorities to provide valuable instruments.

According to these aims, this thematic study gives an overview of the existing equity funding landscape in Baden-Württemberg, their value for green-tech companies, and what kind of measures may improve the situation where necessary. The aim of the feasibility studies is to find out if there should be so-called “green SME funds” established in the Alpine Space Programme to promote start-ups in the green technology and eco-innovation sector. As yet, there have been 5 feasibility studies conducted in the Alpine Space regions: Lombardy in Italy, Rhône-Alpes and Provence-Alps-Côte d’Azur in France, and in Austria and Slovenia.

This sixth study for Baden-Württemberg differs from the other five. In Baden-Württemberg, a diverse infrastructure of equity instruments supporting early-stage ventures in technology- and service-based industries already exists. Thus, a feasibility study does not seem appropriate – as the existing infrastructure serves as proof of feasibility – but instead, the sixth study should evaluate the benefit of the existing equity funding landscape in the regional state of Baden-Württemberg for start-ups and SMEs from the green technology and eco-innovation sector.

For this study, it is difficult to set the boundary for the term “green-tech start-ups,” because the term “green technology” is not consistently defined. The range for green-tech encompasses, for example, everything from better production methods to safe resources, right up to a new tidal power plant, a problem that will be discussed later in this study. In this study, the definition of the FIDIAS for green-tech start-ups and founders is used. Start-ups and small and medium sized enterprises which develop technological processes for the protection of the environment, resources, energy, and climate are considered to be green-tech.

FIDIAS takes a closer look at these green-tech start-ups, obstacles for founders, and how the field of green-tech could best be stimulated. Green-tech companies may have special requirements compared to other industries. However, the main aspect in this study is the acquisition of money for the founders to bring their ideas to fruition in the form of a viable business. In that regard, early-stage venture capital is an important funding instrument for such start-ups. A closer look at the current state of early-stage venture capital in Baden-Württemberg is therefore needed.

While there may be many different obstacles start-up founders encounter, securing respective financial funding can be considered a particularly important one. However, start-up founders may also trade off between founding a company and having a family. In Baden-Württemberg, where the regional economy is very successful, potential founders have numerous chances to have a well-paid career at a prestigious company. Choosing to start one’s career in a

company may be perceived as involving less risk than building their own company. This may be a reason for the low number of start-ups in general in Baden-Württemberg, compared to other regional states in Germany (Egeln, et al., 2013, S. 77). The number of annual start-ups in Baden-Württemberg per 10,000 employable citizens has been lower than in comparable states like North Rhine-Westphalia, Hessen, and Bavaria since the 1990s. (Egeln, et al., 2013, S. 59)

Nevertheless, the key challenge that still remains for founders is financing their projects, especially in the early phase of the start-up. The problem is the large amount of money needed, and the high risk of failure start-ups face, especially in their early stages (Bötel, Binnewies, & Dautzenberg, 2013, S. 13). Problems with financing are significant impediments for entrepreneurs, but if financial resources for funding are available and accessible, the probability of survival is higher. (Berg, et al., 2011, S. 49)

Considering that sustainability, and therefore innovation, in the green-tech sector is frequently argued as being both strategically and societally very important (e.g. by policy makers in Germany, as you can see in all of their party manifestos), the share of green-tech start-ups in terms of general start-up activity is comparatively low. Of all the start-ups in business incubators in Germany, just 13.6 % are green-tech start-ups, 50% of these can be considered as high-tech start-ups (Fichter P. D., 2014, S. 10-11).

For comparison, the percentage of green-tech start-ups in California is 32.8%. That is, double the amount in Germany. This higher intensity, green-tech venturing is mirrored by specialized infrastructure, for example specialized green-business incubators such as the Venture Greenhouse in San Rafael, and the LA Clean-tech Incubator (Dr. Weiß, 2013, S. 7-8).

The field of environmental technology, renewable energies, and resource efficiency is very important in Baden-Württemberg. According to the innovation council of Baden-Württemberg, and a combined study of McKinsey & Company and the institute for applied economic research, this area is one of four with a very high growth potential in Baden-Württemberg. (Egeln, et al., 2013, S. 39) & (MWF-BW, 2013)

Most start-ups use public funding offered from savings banks, cooperative banks, and private merchant banks. Venture capital is still a less commonly used funding type, for which there are a number of reasons. One of them is the recent tendency of venture capital funds turning away from early-stage investment and therefore tightening the offer of early-stage risk capital. One reason for this may be the fact that investments in venture capital funds, at least in the recent decade, have not been very profitable in Germany (Mulcahy, Weeks, & Bradley, 2012).

The earlier the stage a start-up is in, the more risk the venture capitalist faces in investing. However, a venture fund will only work sustainably if it earns money, which seems difficult enough in Germany as it is. For these reasons, return-oriented venture capital funds seem rather reluctant to commit to the early-stage start-up phase (seed and pre-seed). It has been a critical trend that private venture capitalists back out from early-phase financing. Some experts believe that there is demand for additional venture capital in the early stages of start-ups in Baden-Württemberg.

As a result, public and publicly co-financed venture capital funds become more and more important. Such funds are not simply focused on the return, but also on social aspects like growth, jobs, living standards, and prosperity, in addition to fiscal objectives like commercial

and income taxes. For these reasons, public venture capital funds can invest in more risk-intensive start-ups in the early phase, where even if they lose some money, they can still reach a societal and fiscal return that justifies their investment. (Bötel, Binnewies, & Dautzenberg, 2013, S. 35)

On the other hand, it has not been proved that the relatively low start-up intensity in Baden-Württemberg is caused by an insufficient availability of venture capital. On the contrary, to raise the offers of venture capital would not necessarily mean a rise in start-ups, because the percentage of venture capital used to finance start-ups is still very low. However, the small percentage of venture capital still makes up a huge percentage of the funding volume for start-ups. (Egeln, et al., 2013, S. 77-78)

In general, just 1.7% of all newly founded businesses use venture capital for funding (Egeln, et al., 2013, S. 82-83). Additionally, of all newly founded businesses which use external funding, only 6% use venture capital. But, from the volume of capital provided as external funding to newly founded businesses, venture capital accounts for 25%. Thus, even if only a few start-ups use venture capital, it is still an important financing instrument because of the comparatively high share of risk capital in the overall amount of money invested (Egeln, et al., 2013, S. 86).

The early-stage venture capital investments in Baden-Württemberg follow a similar scheme, but in the sector of clean-tech, venture capital investments seem to still be underrepresented in both Germany as a whole, and Baden-Württemberg in particular. The following data and numbers come from PEREP Analytics by order of the Bundesverband Deutscher Kapitalbeteiligungsgesellschaften (BVK):

In 2013, 594 companies obtained early-stage venture capital with a total value of €434.3m. In the sector of clean-tech in 2013, only 14 companies in Germany obtained early-stage venture capital with a total value of €30m. This is equal to a share of only 2.4% for the clean-tech sector on the basis of the number of companies (14 out of 594), or a share of 6.9% on the basis of the amount of money invested (30 out of 434.3).

These numbers already indicate two main findings that were repeatedly confirmed in this study:

- (1) Despite the policy maker's intention to foster investments in the clean-tech field as one means of supporting a cleaner environment, (privately funded) investment in the green-technology sector in Germany is still relatively low.
- (2) Comparing the share of companies which received investment (2.4%) and the share of capital they absorbed (6.9%), it seems to indicate that green-tech start-ups may be more capital intensive than other industries.

The first finding is further emphasized by the fact that 13.6% of all start-ups in business incubators in Germany are characterized as clean-tech start-ups. This means that the share of early-stage, green-tech start-ups is not evenly matched with respective venture capital funding (compare the 13.6% to the 2.4% or 6.9%). This can be interpreted that the early-stage venture capital market for green-tech companies is yet underdeveloped, and that green-tech start-ups have a comparably hard road ahead to securing sufficient funding. A large portion of the interviewees of this study shared this interpretation.

In 2013, 27 companies obtained early-stage venture capital with a total value of €55m in Baden-Württemberg. In the clean-tech sector in 2013, only 1 company obtained early-stage venture capital with a total value of €1.8m. This is equal a share of only 3.7% for clean-tech on the basis of the number of companies (1 out of 27), or a share of 3.3% on the basis of the amount of money invested (1.8 out of 55).

With this information, the landscape in Baden-Württemberg seems to be similar to the one in Germany; but the figures alone are still not large enough to form a viable statistical conclusion. Consequently this study follows an interview-based approach, as appropriate empirical data on the question at hand is not available.

2 Equity funding landscape for green-tech start-ups in Baden-Württemberg

In the following, the present diverse equity funding landscape infrastructure for early-stage, green-tech start-ups in the regional state of Baden-Württemberg is described. This encompasses regional funds allocated in Baden-Württemberg and to some extent non-regional funds that have significant regional-specific activity in the region of Baden-Württemberg, corporate venture capital activities of companies located in Baden-Württemberg, regional networks of venture capitalists, and business angels.

The following description and characterization, however, does not claim to comprehensively analyze and cover every activity of the respective organization or type of entity, but focuses on the basis of the context of this study. As sources for the following analysis, desktop research on the basis of literature and internet sources, as well as the organization's website profile and interviews with the actors have been used.

There are several venture capitalists in Baden-Württemberg, both publicly and privately funded. They all provide equity capital to innovative and fast-growing companies in Baden-Württemberg, from the seed phase on to the growth phase and expansion phase. The infrastructure of venture capitalists in Baden-Württemberg is already established, very diverse, and complex. With this in mind, the following is focused on the seed and start-up phase, because these seem to be the most crucial phases in which the availability of equity funding for green-tech start-ups may stimulate deal flow and venture activity.

For early-stage investments, the investors have different sets of criteria for the selection of founders to invest in, such as how many employees the company has, how old the venture is, the amount of annual turnover or total asset, and the amount of equity capital the founders themselves must bring into the company. These criteria generally aim at small and medium-sized young companies. Additionally, the organizations focus on technology-based innovation (as opposed to e.g. service driven innovation).

Typically, the investing organizations request a prototype or proof of the concept. Intellectual property should be owned by the company, ideally safeguarded by filed patents. The product or process should offer high customer value, unique features, and strategic advantages in relation to existing competition and solutions. The market aimed for should have high growth potential in order to enable significant growth in company value, which in turn ensures that the investors receive a return on their investment.

Start-ups fulfilling these criteria still have a few more steps to go. Usually, a business plan has to be handed in. This is followed by a due diligence, where the technology, the market assessment, and business planning are assessed to expose hidden risks.

A general intent to approve the investment on this basis is followed by contract negotiations. Here, the investor and the venture team get into closer contact, and the team is further assessed: Do the founders truly commit to their own ideas, do they have the right intuition for business, do they demonstrate the necessary management practices? These are crucial criteria for the investor to examine, as they provide an indication as to what extent the investor, after having invested, would need / want to get involved in the management of the venture in order to support the original founders.

While these fundamentals are applied by virtually all interviewed investment bodies in a more or less similar fashion, there still remain some differences to be outlined in the following, in more detail. The following map illustrates the entities that have been interviewed in the course of this study, in order to exemplify the equity funding landscape in Baden-Württemberg. Of course, this illustration does not claim to depict the equity funding landscape comprehensively. Rather, characteristic entities and their location are depicted. For example, from the various Sparkassen equity entities, only an exemplary one in Pforzheim has been interviewed (S-Kap Pforzheim):

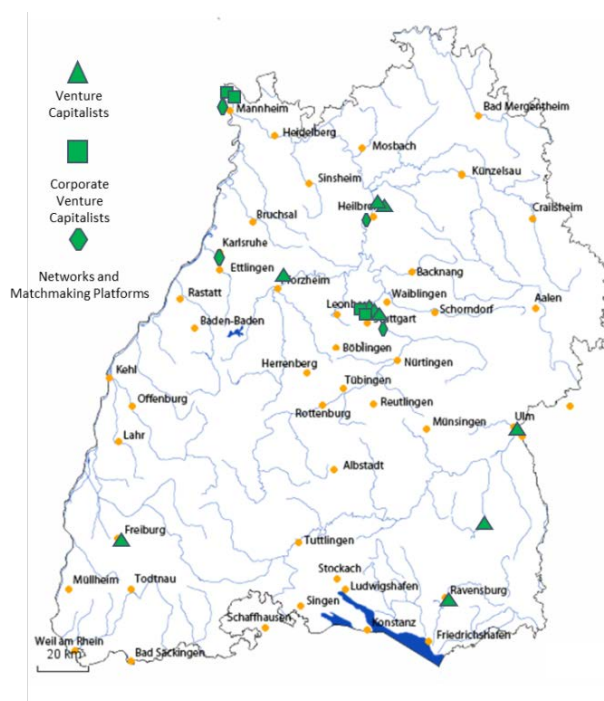


Figure 1: Equity funding landscape in Baden-Württemberg

2.1 VC-Fonds BW – Venture Capital Fund Baden-Württemberg

The VC-Fonds BW was established in August 2014. This fund is managed by the Mittelständische Beteiligungsgesellschaft, MBG. The MBG is a publicly funded equity investment company. Shareholders are regional industry chambers, industry associations, and the regional credit services sector.

Because not only public funding money but also private money is involved, the VC-Fonds BW is more profit-driven than other funds of the MBG, which are solely publicly funded. The VC-Fonds BW is a cooperation of the regional state of Baden-Württemberg, the SV Sparkassen Versicherung/Lebensversicherungs AG and the Württembergische Versicherung AG.

The MBG acts as a 'side investor' to this fund and also manages the VC-Fonds BW. As the state of Baden-Württemberg brings in €4m and the other shareholders each €2m, the total amount of funding available is €10m. Additionally, the MBG can raise the effective fund investment volume by providing additional open or silent participations.

Still, the fact remains that the fund's investment volume in light of the equity funding landscape in Baden-Württemberg, as well as the equity demand of the green-tech sector, seems to be rather limited. All interviewees were quite explicit on this point, stating: "the fund's volume is a sum of money that a VC-investor would usually reserve for one single company alone."

Nevertheless, the same interviewees acknowledged a positive signal, "it signals an interest and shows motivation to support, yet the effective impact is expected to be rather limited." However it remains, as one interviewee put it "€10m is not enough at all."

VC-Fonds BW executes lead as well as co-investments. Ideally however, a lead investor with relevant industry experience is involved. This is due to the fact that the VC-Fonds BW has limited resources available to manage, .i.e. support the venture team it invested in.

Initial contact is usually made by the venture. The venture has to hand in an individual and detailed business plan. The contract is individually prepared for the venture and will include customary conditions for the respective industry (Buddensiek & Selbherr, MBG: VC-Fonds BW: The investment process, 2014).

Formal selection criteria for the start-ups are standard. The venture must have less than 50 employees. The annual turnover or total assets must be less than €10m. (Buddensiek & Selbherr, MBG: VC-Fonds BW: Criteria for an investment, 2014). Typically, founders are expected to bring in some of their own money. This serves to align the risk and motivation from both sides; if the investor loses money, the founder loses money, too. However, if founders are not be able to invest money, or can prove their unquestionable commitment otherwise, MBG might also waive this general rule.

Usually the fund invests between €300,000 and €500,000 in the first financing round, and up to €1.25m in later financing rounds. The MBG usually participates with a 4:1 ratio, which means if the VC-Fonds invests €400,000, the MBG invests an additional €100,000. Not more than 12.5% of the fund volume is to be invested in one single company.

The VC-Fonds invests equity in the form of open participation and acquires ordinary and preferred shares in companies. It only acquires a minority share and the planned exit is usually after three to five years.

The maximum investment sum of €500,000 in the first round of financing compares well with the other equity investment instruments discussed within the context of this study. However, the following applies to this, as well as to the other instruments discussed: If technology-based, green-tech start-ups have any specific characteristic (if any at all ...) from the perspective of equity investment, it is their over-average capital need (compared to e.g. IT-

based start-ups). In light of this, the investment sum seems rather limited or perhaps even insufficient, considering the longer pre-growth phase of such technology-heavy, infrastructure-oriented, green-tech start-ups (Buddensiek & Selbherr, MBG: VC-Fonds BW: Investments, 2014).

2.2 Seedfonds BW – Seedfund Baden-Württemberg

Seedfonds BW is a virtual fund which acts solely as an additional investor together with the High-Tech Gründerfonds, HTGF. HTGF is a publicly owned fund for high-tech start-ups in Germany. The reason for creating the “Seedfonds BW” was to entice the HTGF to invest more in Baden-Württemberg, because other regional states like Bavaria showed comparably more HTGF investments.

Regarding this motivation, according to MBG the secondary investor model seems to work pretty well: The number of HTGF investments in Baden-Württemberg has significantly increased since the introduction of this feature. As a result, the possibility of raising the fund’s volume is currently being discussed. This would, according to the HTGF, provide a further motivating signal to potential high-tech founders (Bötel, Binnewies, & Dautzenberg, 2013, S. 28).

Seedfonds BW is managed by MBG and LBBW Venture Capital GmbH. Investors of the fund are the state of Baden-Württemberg, the L-bank, the LBBW Venture Capital GmbH and the MBG. There is no legal structure behind the Seedfonds BW and the money is provided by the investing entities on request. Technically, either the MBG or the LBBW Venture hold the investment fiducially for the Seedfonds BW. (Bötel, Binnewies, & Dautzenberg, 2013, S. 27)

The fund’s volume is €1m. Per round of funding, they invest up to €100,000 if HTGF invests €500,000 at the same time, which adds up to €600,000 total joint investment. Funding takes place as a combination of open participation and subordinated loan. Together with the HTGF, Seedfonds BW holds 18% of the company (3% Seedfonds BW and 15% HTGF). The loan can be converted into shares in later investment rounds, to maintain 3% of the company share.

The formal selection criteria for the ventures are the same as in the VC-Fonds BW scenario described above. Additionally, the company must be less than one year old.

As Seedfonds BW only invests as a co-investor of the HTGF, the venture team will make their initial contact with the HTGF, and then the HTGF will ask Seedfonds BW whether they would like to co-invest, which they typically do, given that the respective venture is situated in Baden-Württemberg (Bötel, Binnewies, & Dautzenberg, 2013, S. 27), (Buddensiek & Selbherr, MBG: Seedfonds BW, 2014).

The side-investor model, in general, seems to work pretty well and is believed to have a stimulating impact on technology-based start-up activities. However, the overall fund volume (€1m), as well as the maximum volume per investment (€100,000), indicate the limitations of this instrument. In this regard, Seedfonds BW is viewed in a similar way to the VC-Fonds BW, as a positive sign being set, signaling a political interest in support for early stage venturing – but still having a limited real-life impact when comparing ambitions with the investment potential.

Even when considering that the maximum investment of this instrument is leveraged by a HTGF investment of up to €500,000, this amount still may be considered inadequate, at least

when taking into account the longer pre-growth phase of technology-heavy, infrastructure-oriented green-tech start-ups (Buddensiek & Selbherr, MBG: VC-Fonds BW: Investments, 2014). Moreover, while this seed investment instrument may help in a very early stage, the question of a seamlessly continued growth-investment, similarly supported, does not yet seem to be covered by the other instrument implemented.

In that regard, while the HTWG is enabled to add to a single investment with further investment, which rounds up to €900,000, Seedfonds BW would not be able to match these further investments.

2.3 RKF Risikokapitalfonds – Risk Capital Fund

The RKF is a virtual, “evergreen” fund initiated in 1995 by the regional state of Baden-Württemberg. The money is provided by the regional state. RKF is managed by MBG with a fund volume of €20m and usually acts as a co-investor.

The average investment amount is €500,000. In 90% of the cases, the investment is carried out in the form of a silent participation. As a general rule, the earlier the stage of the company being invested in, the more likely the investment will be made in open participation. However, to reduce overhead cost (e.g. contracting, notary...) smaller early-stage investments may also be acknowledged as silent participations. The exit usually occurs after five to seven years. Since 1995, the RKF has invested in 130 high-tech start-ups. Until 2012, 32 successful exits were made.

The selection criteria are similar to those described above. Also, the recipient of the investment must not be owned by another company with 25 % or more shares, which would itself not fulfill the formal selection criteria.

However, the companies have to be able to ensure a return on the silent participation, i.e. stable cash flow. The RKF aims for an investment return of 15% for MBG, with a fixed remuneration that always accrues, and a profit participation in years with a profit. Although, the impression is given that this target yield is not always realized: “in general it works well, but not as well as planned.”

The investment form of the silent participation aims to balance investment risks with investment return, enabling RKF and the MBG to execute investments in companies that may not qualify for a debt loan due to their risk profile. In line with this, the silent participation model may change to also enable open participations, according to MBG. RKF’s role as a vehicle for MBG to invest in more risky company situations while expecting a higher return on the other side, will then be emphasized even more

While the volume, the evergreen setup, and the risk profile also seem to be as supportive for green-tech sector companies, the investment focus still seems to be on later stage, i.e. expansion investments rather than start-up investment. The cause for this is the silent participation construct, which only makes sense for the investor in investment cases of stable revenues and positive cash flows, otherwise “we would fund our own interests.” It could still be argued that the fund volume and the average amount of invested money are not sufficient for capital intense green-tech start-ups. (Bötzel, Binnewies, & Dautzenberg, 2013, S. 28-29)

2.4 High-Tech-Gründerfonds – Regional activities in Baden-Württemberg

HTGF provides equity investments for early-stage technology companies in Germany. It was founded in 2005 to close a gap in the equity funding market. At this time, and in part because of the burst of the dotcom bubble, many private investors turned away from early-stage and seed investments (Bötel, Binnewies, & Dautzenberg, 2013, S. 25).

Besides the federal ministry for economy and technology (about 75-80% of the volume is federal money) and the KfW bank group, there are also industry investors like BASF, Robert Bosch, and Daimler, among others. Regional states with the highest investment shares are Berlin, Bavaria, North Rhine-Westphalia and Baden-Württemberg.

With a total fund volume of about €500m (€300m in the second round, €280m in the first round), HTGF is the largest seed fund active in Germany. The volume of the first round has mostly been invested at this point in time.

HTGF usually acts as a lead investor, typically in the first round alongside investors as business angels or seed funds. In later investing rounds, HTGF usually acts as a co-investor. In the first financing round, the company receives up to €500,000. The average amount of money HTGF invests is €900,000, usually in about three rounds for the engineering sector. As the HTGF does not itself invest in later stages, the HTGF then relies on partners, e.g. growth funds, banks etc. An exit is expected after four to five years (Bötel, Binnewies, & Dautzenberg, 2013, S. 26).

Besides providing capital, the HTGF aims to also provide consulting in the fields of management, business, and financial engineering. However, regarding domain-specific questions of e.g. technology or the market, the HTGF relies on partners to be able to provide that type of consulting and expertise.

The formal selection criteria for venture teams are the same as those for Seedfonds-BW. In addition, the founder should bring 20% of the funding amount into the business, but 50% of this amount can be financed by other investors, e.g. the Seedfonds BW. Until now, about 10% of the venture teams who applied received funding (350 out of 3800). This is a significantly higher rate compared to other funding bodies. This leads to the perception that the HTGF virtually tries increase the number of investments (rather than trying to increase the return on invested capital). Accordingly, HTGF actively “acquires” venture teams by, for example, supporting business plan contests to receive contact to potential start-ups (Brandkamp & von Frankenberg, HTGF: Finanzierungs Kriterien, 2014).

HTGF earns 15% of the company as a combination of open participation and subordinated loan. In later investment rounds, HTGF converts parts of the loan into silent participation to keep the 15% of the company and avoid dilution (Brandkamp & von Frankenberg, HTGF: Beteiligungsprozess, 2014). This “one size fits all” approach provides the benefits of reducing negotiation (take it or leave it) and overhead (standard contract) costs. Nevertheless, some interviewees criticized this model as, at least in some cases, being too expensive from the perspective of the founders. At the same time, it is very welcomed as a substantial and stimulating early-stage instrument: “it is indeed criticized for being too expensive. This, we could discuss forever. But in the end, we are all very happy, that there is at least this one offer for the field [i.e. seed stage].”

HTGF is a good example of a (largely) publicly-funded equity investment instrument that places emphasis more on the welfare, fiscal, and economic effect – rather than providing an investment return as an investment instrument on its own. Thus, this model may also be generally suitable for the green-tech field.

However, in light of the partly investment-heavy technologies in green technologies, the €500,000 given in the first financing round can be argued to be insufficient. Still, it is agreed that the HTGF as an investor has a very positive, motivating effect on founders. They provide a very visible “brand” in the field of early-stage investment, easily recognizable and approachable. More than that, even if limited in volume, the HTWG’s initial seed investment can increase the attractiveness of a start-up for later stage investors. Thereby, green-tech companies may benefit from early-stage HTGF investments by leveraging this investment to motivate more substantial, later-stage investments by other investors.

2.5 ERP Startfonds - European Recovery Program Fund

The ERP-fund is a financing instrument for small and medium-sized technology-based companies. It works with equity capital for the early and the growth phase of companies. The fund is managed by the KfW bank group.

The ERP fund invests as a co-investor, if at least one more venture capitalist is involved as a lead investor. The focus is on information and communication technology, system and process technology, and biotech. Usually the KfW invests the same amount of money as the lead investor and follows the conditions of the lead investor.

The formal selection criteria for the company are the same as for the VC-Fonds BW. Additionally, the operational company should not be older than ten years, and the founder should bring 20% of the funding amount into the business, of which 50% can be financed by other investors.

At the maximum, the ERP fund invests €5m in one company, but not more than €2.5m per year. Between 2005 and 2009, the average amount of invested by the ERP was €454,329. This funding is provided in several rounds. On average, there are two funding rounds per company. The aim is to exit at the same time as the lead investor.

Between 2005 and 2009, 661 companies applied for funding from the ERP. 594 of them were accepted, which equals an acceptance rate of over 90%. The main reason for this is the spadework of the lead investors and a rather formalized, straightforward application process that does not even require a business plan. The contract is made by the KfW under the same conditions as the lead investor has defined (Hanow, 2014), (Bötel, Binnewies, & Dautzenberg, 2013, S. 23-24).

Based on the available volume and the maximum investment amount (€5m), the ERP may be considered as adequately addressing the intense capital appetite of technology-heavy, green-tech start-ups. However, the KfW only invests the same amount of money as the lead investor, and this renders a significant limitation in reality as typical lead investors back off from high volume investment in the early stage.

2.6 S-Kap Beteiligungsgesellschaft – S-Kap Investment Holding

The S-Kap is a subsidiary of the Sparkasse Pforzheim Calw. There are around ten similar Sparkassen holding companies in Baden-Württemberg, for example in Heilbronn, Freiburg,

Biberach, Ulm and Ravensburg. The fund volume is €40m and the money is provided by the Sparkasse.

The S-Kap invests as lead investor and as co-investor as well, but if the investor is outside the area of Pforzheim, they only act as a co-investor. There are no restrictions on which industries the S-Kap is allowed to invest in. Automotive, IT and IT services, jewelry and watches, machinery, and plant engineering are the main industries, because all of these industries are well established in the Pforzheim area.

Usually, the Sparkasse provides the debt capital for a company and the holding company will add equity capital on top of that. S-Kap also provides equity capital for companies which are not customers of the Sparkasse. There are no defined criteria for the companies, but the aim of the S-Kap is to support regional medium-sized businesses.

On average, the S-Kap invests €750,000. In the early-phase there is usually open participation, while silent participation is used for more established companies. In addition, they participate with subordinated loans and *jouissance* – participation rights capital.

There is no fixed number of investment rounds. It can be a onetime investment, or it can be an investment divided into stages, e.g. along defined milestones. As mezzanine capital, the participation has a defined end, usually between five to ten years. As direct participation, there is no focus on a defined exit of the investment. Nevertheless, there are typical exit phases like the growth-phase or if the company reaches profitability.

Contact is usually made via the network of other investors or by the Sparkasse. So, the S-Kap gets recommendations as to which company they should invest in and then contacts the company or start-up (Sparkassen Informationstechnologie Betreiber , o.J.).

Generally speaking, the volume of the S-Kap is one of the larger instruments discussed herein. Thus, it can be perceived as supportive also for the capital-intense, green-tech sector. However, the fairly strict regional focus aimed at supporting the regional economic landscape is not compatible with the industrial focus of “green-tech”. Moreover, and similar to the RKF, the investment focus seems to be more on later stage rather than on start-up investment.

2.7 *Zukunftsfonds Heilbronn – Future Fund Heilbronn*

The Zukunftsfonds Heilbronn is privately funded with a volume of €200m and is strongly focused on the region of Heilbronn. The Zukunftsfonds only invests in start-ups from other areas if the founders are willing to build their company near Heilbronn. So, it is a regional structure fund to strengthen the area around Heilbronn. Since the establishment of Born2Grow for early-stage investments in 2013, the Zukunftsfonds Heilbronn has focused more on later-stage investments.

At the moment, Zukunftsfonds Heilbronn holds 16-18 investments, usually as lead investor.

The fund is focused on automation and electronics, energy and environment, IT and communication, life sciences, material sciences, and nanotechnology. In the Heilbronn area there is a medical technology cluster, so this is naturally a strong industry bias for the fund.

The average amount of investment is €8-12m. The participation can be a silent as well as an open participation. The individual conditions are mutually defined.

To contact potential founders, the Zukunftsfonds works together with networks like the Venture Forum Neckar, which make the initial contact and pre-selection. The Venture Forum Neckar, for example, scans 600 to 800 companies per year. If there is a network pitch event somewhere, the Zukunftsfonds will be present to select two or three interesting companies which subsequently get the chance to present their venture to the Zukunftsfonds (Villinger, Zukunftsfonds Heilbronn Investmentstrategie, 2014).

The fund volume, €200m, is comparably significant and would be a good basis for even high-volume investments in capital-intensive, green-tech start-ups. However, similar to the S-Kap, the investment focus is determined by regional Heilbronn industries. Here, other industries are already significant, so investments in the green-tech field may apply but are not as likely to receive support as other industries that are more established in the region.

2.8 *Born2grow Seedfond – Born2grow Seed Fund*

The BORN2GROW GmbH & Co KG was established in 2013 in Heilbronn as a private venture capital investment instrument with focus on technology-based, early-stage investments. It is a spin-off and subsidiary of the above described Zukunftsfonds, and thus acts in a similar way with the exception that Born2grow is more focused on early-stage investments, and that the fund volume is significantly smaller. The fund, accordingly, keeps a regional focus on the area of Heilbronn, while additionally acting beyond that region within the area of Germany, Austria and Switzerland (DACH region).

The fund is focused on Automation and electronics, energy and environment, medical technology, IT and communication, nanotechnology, and material sciences. The maximum investment is €500,000. On average, the investment is between €280,000 and €320,000, typically in two rounds. Open participation is preferred, but if the other investors are silent partners, Born2grow is a silent partner as well. Currently, Born2grow has 9 investments as both a lead and co-investor.

Similar to the previously described Zukunftsfonds, Born2grow works together with regional networks to get into touch with founders (Steffen & Victor, 2014).

As the regional focus is not as strict as in the case of the Zukunftsfonds, Born2grow may support green-tech start-ups, at least in their very early stage (seed). As an investor for that seed stage, the fund also invests jointly with the HTWG fund, which renders such an initial investment as substantial, even when considering technology-heavy, green-tech start-ups.

Nevertheless, the portfolio is broadly diversified over various industries such that green-tech investments seem to only account for a small fraction of (potential) investments. Furthermore, even if this provides good support in the seed phase, in particular for technology-heavy, green-tech start-ups, there is no seamless hand-over to a growth capital source. The “natural” partner, Zukunftsfonds Heilbronn, most likely disqualifies itself because of the strong regional focus.

2.9 *Corporate Venture Capital regional activities in Baden-Württemberg*

Aside from the equity funding bodies described above, “traditional” industrial companies from Baden-Württemberg (themselves or by way of an investment subsidiary company) also seek to participate in promising technology-based start-ups. They do this not only to realize high yields, but also to pursue the strategic interests of the company. Regarding the venture capital

landscape in Germany as a whole, these corporate venture capital instruments were amongst the most active (according to the number of investments) venture capital investors in recent years, contributing the highest amount in capital (Schwarz, 2012). Accordingly, corporate venture capital is attributed an already very significant, and increasingly important role in the equity funding landscape.

This situation rendered in the equity funding landscape of Germany is even more accurate for Baden-Württemberg in particular, as industry corporations situated in Baden-Württemberg are particularly active in the field of corporate venture capital. Taking the aforementioned HTGF fund as an example, a public-private partnership, half of the companies participating in its first round are located in Baden-Württemberg (Renz, 2013). The idea behind this fact is not solely driven by seeking attractive opportunities for strategic or high yield participations, but also to create opportunities for promising cooperation, increasing the reach of the company's networking and testing joint venture opportunities. Thereby, larger corporations use such corporate venture capital activities as a link to innovative high-tech start-ups.

As corporate strategy is one guideline for the respective focus of corporate venture capital activities, this rich source of capital and start-up support is only partly relevant for the green-tech field. In regard to the specific lens of this study (green-tech start-ups), amongst the most relevant corporate venture capital activities in Baden-Württemberg are e.g. Bilfinger Venture Capital GmbH, Freudenberg Venture Capital GmbH, MAHLE GmbH und Robert Bosch Venture Capital GmbH.

For the corporate venture capital entities in Baden-Württemberg, investments in early-stage start-ups do not regularly apply. As they aim at integrating the companies they have invested in into the "mother" company at a later stage, they fear that a too early, too small, and immature investment would not survive this integration: "in general, we prefer to invest in later stages, in companies or start-ups that already have a running business and generate returns. The reason for that is that we want to integrate them into our company in the end. It would be more or less obstructive if the start-ups would be too small. In that case, the start-up we integrate would rather be perceived by business unit managers as a stumbling block rather than a valuable addition to the portfolio."

2.10 Business Angel funding regional activities in Baden-Württemberg

In addition to the institutionalized funding instruments described above, Baden-Württemberg is particularly rich in business angels who make significant investments. This type of equity funding is believed to stem from Baden-Württemberg's long tradition in family-owned, small and medium sized (SME) businesses. This has led to a comparably high number of wealthy individuals, families and highly capitalized family offices that are also active in equity funding for technology-based start-ups.

The motivation of these individual investors is not necessarily high-yield investment, although for family offices in particular, equity investment is described as a natural part of their necessary portfolio diversification. Moreover, some owners of successful, family-owned SME treat their equity funding fairly similarly to the aforementioned corporate venture capital activities of larger corporations. However, significant differences still remain in terms of equity tickets (typically a lot smaller), legal structure (there is not necessarily a legal entity reserved

for venture capital activities) and contract / condition formalism (very individual on a deal-by-deal basis).

In addition to this, the business angels in Baden-Württemberg are described as not only bringing capital to the table, but also their extensive entrepreneurial and management experience, knowledge, and resources. For some business angels, this is even described as the main motivation: bringing their entrepreneurial experience and knowledge to good use after having e.g. retired from business or sold their own company (which frequently is the source of capital being invested).

Accordingly, business angels prefer to invest at an early stage, when a comparably smaller amount of capital can buy a larger equity share, and where the “smart” part of the money (entrepreneurial and management experience) is more likely to unfold its highest effectiveness for raising the company’s valuation.

This alone would render business angels as excellent support instruments for complex, technology-heavy, green-tech start-ups: As a seed investor, business angels would not necessarily invest a larger amount of money, but with their experience in building equity funding structures, their extensive network etc., they should perfectly be suited to help the start-up even beyond the seed phase. In addition to that, from all the instruments in the equity funding landscape of Baden-Württemberg, the business angels taken as a whole are believed to provide, in total, the highest amount of funding capital. This total can only be estimated of course, but according to expert judgment, the total capital available from business angels in Baden-Württemberg for early-stage funding of technology-based business add up to several million Euros.

However, this rich and attractive source of funding equity seems as yet to be underutilized. One reason for this is what experts describe as inefficiencies in the matching of start-ups with potential business angel investors: “Everyone is talking about Business Angels, but nobody has actually seen one, at least not the founders in need of capital” as one interviewee put it. The explanation for this seems to be that in Baden-Württemberg, business angels typically try to stay incognito, as individuals as well as with their equity transactions. Thus, start-ups in search of capital are faced with the challenge of identifying potential business angels, a search that, due to the lack of transparency in that segment of equity funding, may be pretty costly, time-consuming, and not necessarily successful in the end.

Nevertheless, some regional networks organize pitching events such as matchmaking platforms, where start-ups may pitch their idea to an audience that is typically joined by some business angels. Additionally, there are explicit regional business angel associations, e.g. the Business Angels Region Stuttgart (BARS).

Thus, with respect to green-tech investments, support from business angels seems to be a good match from several perspectives. However, matchmaking seems to be fairly inefficient at the moment, which seems to be particularly true for green-tech start-ups. As one green-tech founder put it: “If I were an IT founder, I would know where to go – the Cyber Forum, if I were a health care founder, it would be similar. As a green-tech founder however, I have no clue where to go – to my knowledge there is as yet no effective matchmaking platform for our industry.”

2.11 Regional networks and matchmaking platforms in Baden-Württemberg

As indicated above, beyond investing entities, the equity funding landscape in Baden-Württemberg is further characterized by regional networks and other matchmaking organizations that aim to efficiently bring together investing entities and individuals with potentially interesting start-ups. These networks may have a more regional character, focusing on a particular area of Baden-Württemberg, or may have a more industrial focus, e.g. focusing on the IT industry. Amongst those networking associations in Baden-Württemberg are the Baden-Württemberg:Connected e.V., CyberForum e.V., the MAFINEX technology center, and the Venture Forum Neckar.

Typically, these networks maintain a rich list of relevant contacts to equity funding entities and business angel individuals. They will offer diverse forms of “applications” to start-up founders that enable an efficient pre-selection of teams and business ideas by the network’s staff. For the pre-selected teams or those who are applying, the network’s staff may offer some basic advice and consultancy, e.g. in regard to the creation of a business plan. Moreover, on the basis of the pre-selected teams, the network arranges “pitching” events, where the teams present their ideas to an audience of potential investors who have been invited to the event by the network. Similar to equity investing entities, for the pre-selection, formal selection criteria apply.

As just one example of these associations, Baden-Württemberg:Connected e.V.¹, one of the most successful European Technology networks, offers to start-ups. Entrepreneurs and SMEs continuous support and contact with investors, business angels and venture corporate. Bwcon organized since years the Heidelberg Innovation Forum² (HDI) to promote the matchmaking between business and investors side. Since 2015, in the frame of FIDIAS, bwcon e.V. and bwcon GmbH, together with Umwelttechnik BW and KicInnoEnergy Germany, the Green Innovation and Investment Forum (GIIF)³ has been initiated. The 2-days event, GIIF offers to the best 20 business ideas from the Smart Energy Industry sector an intensive and personalized coaching day (the first day of the event) and a pitching day, where they can present their business idea in front of relevant investors, business angels and VC representative. The HDI and the GIIF represents for the the (green-) IT entrepreneurs two concrete opportunities to be connected to (mainly private) funding.

Next to this the Venture Forum Neckar mediates contact to a significant number of actively-investing business angels. The association is funded by circa 40 continuous members (Bötel, Binnewies, & Dautzenberg, 2013, S. 20).

As formal pre-selection criteria for the Venture Forum Neckar, the start-up must be technology- or high-tech-based, with the start-up being situated in the area of Heilbronn-Franken or Heidelberg. The team of founders should be profound and appealing. The equity capital requested should be not less than €100,000 (Rögner, Venture-Forum Neckar, 2014),

¹ Baden-Württemberg: Connected e.V, with more than 600 companies, research center and institution active in the IT sector, is shareholders of the bwcon GmbH, Partner of FIDIAS

² www.heidelberg-innovationforum.eu

³ www.green-inno-forum.eu; the GIIF has been organized as one of the innovative service implemented in Baden-Württemberg by FIDIAS

(Bötel, Binnewies, & Dautzenberg, 2013, S. 20). About 500 applications are received at the Venture Forum Neckar annually and only 7% of those (~35) will be selected to present their ideas to potential investors (Bötel, Binnewies, & Dautzenberg, 2013, S. 20).

The filter process starts with reviewing the formal criteria in a first, form-based step, which is, after positive assessment, followed by a request to hand in a business plan. If that business plan is assessed positively, the team is invited for an interview. Together with the impressions won, the business plan and information on the start-up will be provided to potentially interested investors. If any investor shows interest, the network will coordinate face-to-face meetings for the investor and start-up. From then on, in the best-case scenario, their discussions and negotiations will continue independently from the network, which at this point steps out of the process. (Rögner, Venture-Forum Neckar, 2014)

In addition to this explicit pre-selection process, there also seems to be an implicit one: the network staff expects the founders to be profound entrepreneurs, at least in regard to identifying relevant supporting entities, e.g. the network themselves. That means that while the HTWG for example actively "acquires" start-ups, the Venture Forum Neckar relies rather on the founders doing that work: "actually they should know who to address [when in search of funding], if they want to be business men, they should know where to find the relevant networks. We do not believe in 'carrying' founders to become entrepreneurs; nobody will continue doing that later on. The founders have to take care themselves, in the end they will be in charge." This may illustrate this network's level of aspiration regarding the entrepreneurial skills of potential founders.

The numbers of the outlined example seem to be pretty typical for these kinds of networking and matchmaking platforms. Their business mission seems to focus on providing a rather strict filter in selecting significantly less than 10% of the applying start-up teams to present their ideas to potential investors. This appears to make sense from an investor's perspective, as the exclusive, rather than inclusive, pre-selection conducted by the Venture Forum Neckar aims at reducing the search cost for the investors – a significant challenge, particular for investing individuals, i.e. business angels. This on the other hand, leads to a relatively thin deal-flow and a naturally limited number of subsequent transactions. This in turn limits the extent to which these networks may be able to support green-tech start-up activity.

However, such a matchmaking platform focused solely on the green-tech industry sector may provide an efficient means for mediating contact between green-tech start-ups and investors strategically or financially interested in these technologies. As it is, the Green Innovation and Investment Forum has been established in Baden-Württemberg to cover this gap. The long term goal of GIIF is to evolve as a regular yearly event providing green-tech start-ups with specialized consultancy and advice for creating an appealing business plan, and presenting their ideas professionally to investors and the like.

3 Benefit of existing equity funding landscape for green-tech start-ups

In regard to the main question addressed in this study – how the benefit of the existing equity funding landscape in Baden-Württemberg for green-tech start-ups can be assessed, and if necessary, be improved – a key challenge has already arisen from the question of how to define "green-tech" in the first place.

With this question in mind, the FIDIAS project provides a concise definition: it relates green-tech to start-ups that aim at developing technologically-based processes to protect the environment, conserve resources and energy, and thereby support climate protection within the sense of environmental protection. Such innovations may materialize as products, processes, or services. In terms of environmental technology, this may, e.g. encompass technology-based innovations in the area of water, air, recycling, design-to-reuse, eco-design, and the like. Such solutions may relate to IT, e.g. sensors, controllers, green IT, or take-back solutions. In terms of resource efficiency, such solutions may relate to efficient production processes and urban factory with links to IT, e.g. automation, sensors, and controllers. In regard to energy efficiency, these solutions may relate to smart grid and renewable energy, again with links to IT, e.g. sensors, big data management, hardware, and controllers.

It seems fair to argue that this definition may have its roots in an expression of political will, rather than an industrial logic or a segmentation of existing markets. This political will relates to the attempts of the Western European countries to conserve the environment and improve the balance of economic welfare and environmental protection, thus reducing the environmental footprint of societal and economic development. The motivation for this may lie in the discussion on global warming, the expected long-term increase in energy cost in general, or in specific regional decisions like the pullout from nuclear power generation in Germany.

Following this, the term and its definition provided above may seem to make perfect sense. However, this political or intention-driven definition is, as yet, unmatched by the industrial reality. This may, in part, be also due to the fact that green-tech seems to be an industry segment, if it is one, which will gain relevance more in the future than it has in the past. Moreover, much of what can be summarized under the definition outlined above is likely to have a two-faced character: a business which is green-tech is likely to also be an IT business, a sensor business, an automation business, or something similar.

All of these industry segments are well known and matured to the extent that they are efficiently served in the equity funding landscape of Baden-Württemberg. Accordingly, there is currently no equity funding organization specializing in the green-tech field in Baden-Württemberg – a significant share of the interviewed experts question whether this would even make economic sense. They argue that from an industry perspective, any green-tech start-up is likely to be better off if supported by an industry-specific, experienced investor, e.g. a Green IT start-up may receive better support from an IT-specialized investor than from a green-tech-specialized investor.

This line of thought can be tracked down to the reporting structures of all organizations that have been interviewed in this study. This activity reporting usually has some industry segmentation, yet typically shows no “green-tech” segment. If a segment is included which seems to be within the context of green-tech (e.g. clean-tech), it does not come close to the previously outlined definition. This is why at the current state, a quantitative assessment of what share of equity landscape activity accrues to green-tech cannot be surveyed within the limited efforts and time frame of this study. Such reporting would require a significant effort for analyzing each organization’s activities in detail. Moreover, such reporting seems to be of more value for policy makers, and thus it seems unlikely that the interviewed organizations

would develop such reporting on their own. As such, it seems likely that such reporting would have to be funded from public bodies.

3.1 Distinguishing characteristics of green-tech start-ups

In light of the considerations outlined above, it may not be surprising that the interviewees applied a wide variety of definitions to the term green-tech. Some would apply a rather broad scope, which would come closer to the project's definition (including for example water conditioning, filter technology, mechanical engineering, smart grids, e-mobility, energy storage, power-to-gas, and thermal power stations). Some would apply a rather strict understanding that e.g. would solely focus on the energy sector (e.g. efficient energy generation, energy management, and energy saving).

Almost all interview partners described the field of green-tech as a huge and wide-ranging field of industries: "If you want to, you can put almost every business somehow in the field of green-tech." Some interviewees would even refuse any characterization or segmentation of their activities in terms of green-tech, as they would argue that any type of "industrial innovation" contributes to the field rendered by the definition above: "If you take a look at who claims to be 'green-tech', this renders the term vague and meaningless." Some interviewees argued on the characteristic of the term having emerged as an expression of a political will. For this reason, they would say many start-up companies these days try to "claim" that they were "green-tech" – obviously trying to match a current, fashionable term that is expected to raise chances for financial support. "Looking at what is termed 'green-tech' these days, it makes me laugh sometimes" one interviewee said.

Following these arguments, green-tech would rather be a part of the brand / company profile than depict specific industrial characteristics of a company. In this respect, interviewees argue that saving the environment is a priority issue in politics and society. Accordingly, green-tech is considered to be a much appreciated field. Thus, many start-ups claim to be 'green-tech' in order to improve their reputation, create a positive image, approach policy makers, and the like.

For all of these reasons, the interviewees refused to distinguish green-tech start-ups from other 'types' of start-ups or other industry segments. Rather than doing this, they argued that the same considerations, facts, and figures that apply to green-tech also apply to any type of technology-based start-up in Baden-Württemberg. This was further supported by more or less every interviewee which was able to report on personal experience and contact with start-ups that would qualify as green-tech, according to this study's definition. Based on their experience,, the interviewees stated that most cases had been pretty similar and comparable to experiences with and contacts to other, i.e. not-green-tech, technology-based start-ups.

At the same time however, the interviewees agreed on three exceptions to this general perception:

- 1. Green-tech start-ups can be very technology-heavy**, being based on very complex technologies, resulting in large-scale physical installation of a plant engineering type: a tidal power plant, for example, would render a very high degree of system complexity. Even a small scale prototype for a proof of concept would create significant capital demand. Such technology-heavy, green-tech start-ups would have a significantly **higher appetite for capital** and implementing such businesses from seed (proof of

concept) to growth phase **takes significantly longer time** than in other start-up-affined industries (e.g. IT).

As a consequence of the longer time-to-market and the comparably high amount of capital needed, the financial engineering may in those cases be comparably complex (likely a combination of investors and instruments such as equity, debt loan, and mezzanine). This complexity is likely to exceed the financial expertise of technology-skilled founders, which may render a prohibitive hurdle when considering founding a start-up in the green-tech sector.

From the perspective of an investor, these types of technology-heavy, green-tech start-ups may not be perceived as (under high yield aspects) very attractive, as these infrastructure-based business models do not tend to scale very nicely. In addition, the comparably high capital appetite justifies the unusually high company valuations as an attempt from the founders to keep a significant share for themselves. This makes such cases plausible in the context of the alternative investment options available.

Additionally, investors expect the exit in these cases to be comparably far in the future, with a more complex realization. Because of this fact, some interviewees perceived their respective organization or fund as “just too small” for the financial, regulative, and technological complexity involved – given the comparably long time period expected until any option for a potential exit. This seems to induce a tendency to back away from such investment opportunities, and instead favor alternative investments in easier to handle fields.

- 2. Green-tech start-ups are likely to address highly regulated markets**, the implementation of the business being subject to extensive and complex, in part regionally different regulations and norms (Bürer, 2008). Based on this, interviewees perceive a significant risk, “that the law might change, and all of a sudden, the market you are acting in collapses.”

As always, volatility, in this case regulative volatility, is twofold: it can be perceived as a threat, but it also provides opportunities. While volatility thus generally calls for agile entrepreneurs, in the case discussed above for technology-heavy, green-tech start-ups, this agility is limited by the amount of money that has to be invested before such a company is market ready. As one interviewee put it, “such companies rather qualify as being of a plant engineering type, they may have potentially huge markets, the expected revenues may be hundreds of millions of euros or even billions, but it is a pretty hard road to tap into those markets and in most cases, you have to find the ‘right’ strategic partners first of all.” In light of this, a high scalable IT company seems comparably more attractive.

- 3. Green-tech founder teams in some cases can be different, i.e. more “mission” driven, more handcrafting** – requiring comparably extensive support in both business and technological aspects. While some interviewees argued that the “typical green-tech” founder is in no way different from the “usual” tech-founder, some argued exactly the opposite: “Of course, they are totally different people... they are thinking more in the long term, they may feel a mission wanting to improve the world and they don’t have that ‘classic’ business focus.” In addition to this, green-tech founders were also described as being more like tinkerers than engineers, having derived an innovative solution based on a long series of trial and error, rather than from a top-down analysis.

Both aspects may lead venture capitalists to perceive founding individuals as being too risky. The cultural incompatibility between being mission-driven (founder) and return-driven (investor) may be a source of mistrust, which makes it unlikely for the investor to invest in that team (Fichter P. D., 2014, S. 14; Fichter P. D., 2013). This was to some extent found to be proved in the interviews, as some interviewees characterized green-tech founders with fairly harsh words: “in some cases they [the green-tech founders] are typical inventors, that is, weirdos.”

But even if the investment is undertaken, green-tech founders seem to have a comparably high need for supporting advice, consultancy, coaching, and training, at least in the field of business skills, as well as strategic and tactical business knowhow. Again, this comparably high need of support renders such an investment comparably unattractive for the potential investor. For some of the interviewees, this extra need for support would even be prohibitive, rendering a venture team as non-investable per se.

3.2 Impacts of the equity funding landscape on green-tech start-up activity

Generally speaking, the equity funding landscape in Baden-Württemberg seems established with diverse, specialized organizations as discussed above. Based on the interviews, it seems that this equity funding landscape is generally as accessible for green-tech founders as for any other tech-based industry. Accordingly, every interviewee reported institutional and individual points of contact with green-tech companies.

This is mirrored by findings from interviews with team members of green-tech start-ups. They seemed to be well aware of the relevant players in the equity funding landscape Baden-Württemberg and would know about almost all potential investors and networks. They also seemed to have, at least to some extent, contact to business angels as well. On this basis, it seemed that the visibility of and awareness for the regional equity funding landscape may not be regarded as a severe handicap for green-tech founders in Baden-Württemberg.

Nevertheless, privately funded, return-oriented players do not seem to be very attracted to green-tech start-ups. Vice versa, green-tech founders do not seem to address these organizations as frequently as founders from other industry sectors. One of the interviewed funds did not even have a single green-tech investment in its current portfolio, and claimed never to have been contacted by a green-tech start-up. As the respective interviewee put it, “this probably is because these start-ups have a comparably high capital demand and we are not necessarily the right contact for that.” This seems to be reinforced by the fact that technology-heavy, green-tech start-ups will likely need substantial additional funding in later stages as well. “I just have to be able to sustain it,” as one interviewee put it, to indicate that they might back off from an interesting early-stage investment if they are unable to also afford the substantial later stage investments: “for every invested euro [in early stage], we must have a further two or three euros available for later stage investment.”

This is mirrored by the perception that interviewed green-tech start-ups reported. A CEO of one of the interviewed start-ups, while searching for funding, encountered the statement: “change it to IT; it is 100 times easier to get money for IT.” Instead, they would (similar to other interviewed green-tech founders) rather fund their company on their own, with the help of friends and family. As this CEO perceived it, “the time horizon is too long, they [i.e. investors]

all have already burned their fingers in some case and they fear the political risk of changing regulation.”

Nevertheless, the Born2grow seed fund listed one of its current ten investments as matching this study’s green-tech definition (smart home systems). The Zukunftsfonds Heilbronn counted four of its current 20 investments as green-tech in that sense (naturally all regionally sited in the area of Heilbronn).

As fostering growth in the green-tech sector seems to actually be supported from a political agenda point of view, funding support for green-tech start-ups might be expected to be relatively strong from (at least partially) publicly-funded investors (e.g. HTGF, MBG...). Those funds have been initiated from the public side and thus work with federal money. When looking at those publicly-funded funds in light of respective publicly-funded funds in other regional states of similar economic strength (e.g. Bavaria), almost all interviewees agreed that not only the number of publicly funded investment entities but also their volume of public funding money may be regarded as minor. Some interviewees were fairly explicit on this point, “there is nowhere [in Germany] with less public money in the field of venture capital than in Baden-Württemberg. Bavaria has invested €500m in the last 15 years and Baden-Württemberg just €1m.”

Moreover, none of these funds seems to employ EFRE resources to leverage the fund’s volume. Some interviewees would welcome such a practice, whereas others would argue that EFRE resources could be brought to better use in other fields, rather than risky equity investments: most interviewees acknowledged that spending federal money for high-risk investments generally is difficult to (politically) argue for. If used for stimulating early-stage investment, it seems likely that the public investor will not see a good return and may perhaps even face a negative one, i.e. in fact lose at least a part of the invested money. However, as with the HTGF, the return may present itself in fiscal, well fare, and economic aspects. Accordingly, in some regions outside of Baden-Württemberg, EFRE resources have been used to leverage publicly-funded, venture capital instruments. Similarly for Baden-Württemberg, some interviewees would see such practice as urgently needed, but not likely to arrive, which seems to cause a bit of frustration: “it would be of course desirable to have EFRE resources for venture capital investments, but until now those resources have been invested into infrastructure rehabilitation.... ”

Instead, the publicly-funded investment instruments leverage their volume with money from the private sector. Accordingly, the strategic interest of these instruments is not driven exclusively by a political agenda, but from the strategic investor interest of the private sector as well. Thus, at least with regard to green-tech investments, they do not seem to work distinctively different when compared to the purely privately-funded investors. “We arrange our deals by technology and not by market,” as one interviewee from this sector put it.

Nevertheless, green-tech investments can also be identified here. Of its current 380 investments, the HTGF holds about 30 investments in green-tech companies, five of them located in Baden-Württemberg. This equals 15% of the investments in Baden-Württemberg, since the HTGF holds about 30 investments in Baden-Württemberg. MBG also claims to have some deal flow and investments in the green-tech field. However, as discussed previously, the segment reporting does not satisfactorily match this study’s green-tech definition, and accordingly, the exact share of investment could not be derived.

Some corporate venture capital organizations in Baden-Württemberg like Bilfinger Venture Capital GmbH, Freudenberg Venture Capital GmbH, MAHLE GmbH, und Robert Bosch Venture Capital GmbH strategically invest in green-tech. Thus, they not only look for interesting investment opportunities, but additionally, any start-up being assessed should also match their parent company's (future) portfolio. They aim at identifying new, promising technologies that may be added to the resource pool of the parent company later on. Thus, they seem more interested in enlarging their network reach than investing in single-business companies.

In regard to the question of whether green-tech start-ups adequately benefit from the equity funding landscape in Baden-Württemberg, in general, the interviewees exhibited the perception that equity investors recently showed a tendency to back off from early-stage investments. This applied to green-tech start-ups as well as others. In light of this discussion (further, sector-specific handicaps of green-tech start-ups), this might impact green-tech founding activities even more in comparison: because of the, at least for some green-tech start-ups, inherent and comparably high technical and regulative complexity, such green-tech start-ups would be in need of what is called "smart money." This would address the entrepreneurs' need for not only financial resources, but also supportive coaching in business and management, as well as technical areas. The interviewees perceived this need to be high or more frequent for green-tech founding teams, in comparison to teams addressing other industries. This was, at least in part, mirrored by the findings from interviews with green-tech founders: "first of all, we were not able to present our business idea in a way that investors would give us money for it. And in addition, the amount of money eventually offered to us was just too small."

Some interviewees question the extent to which this support is provided by the equity landscape in Baden-Württemberg. "Born2Grow is a private fund, but they still look after the individual development of the founders intensively, and in addition, the founders are also strongly backed up in the technical field as well. All the other [funds in Baden-Württemberg] according to my perception, just solely provide financial services. They miss the entrepreneurial background and support," as one interviewee put it.

Moreover, the funding volume of the investment instruments are at least partly perceived as insufficient, especially when comparing the fund volumes in Baden-Württemberg with economically comparable regions like Bavaria. Whether this has a negative impact on founding activities is disputed; some interviewees argue that more money would stimulate more founding activity. However, from the business angel side in particular, some argue that there is not a lack of money, but rather a lack of good ideas. „There are less founders in Baden-Württemberg than in Bavaria, in my eyes. I think one reason for this is that in Bavaria, they have managed to provide and foster a seamless transformation from university education and research to venture foundation", one interviewee expressed. As in this statement, Bavaria has been mentioned frequently in the interviews as presenting an example for the best practice regarding the diversity, volume, and efficiency of the equity funding landscape, as well as regarding the extent of the entrepreneurship culture being established.

The following map illustrates the equity funding landscape in Baden-Württemberg outlined above, including some green-tech start-ups. Because not all venture capitalists could reveal their portfolio, the green-tech start-ups in this map are just a few examples, given to show

where they are located. As the map shows, there may be a cluster in the area of Stuttgart, or one around Mannheim or Heilbronn. But, it also shows that there are green-tech start-ups widespread across Baden-Württemberg.

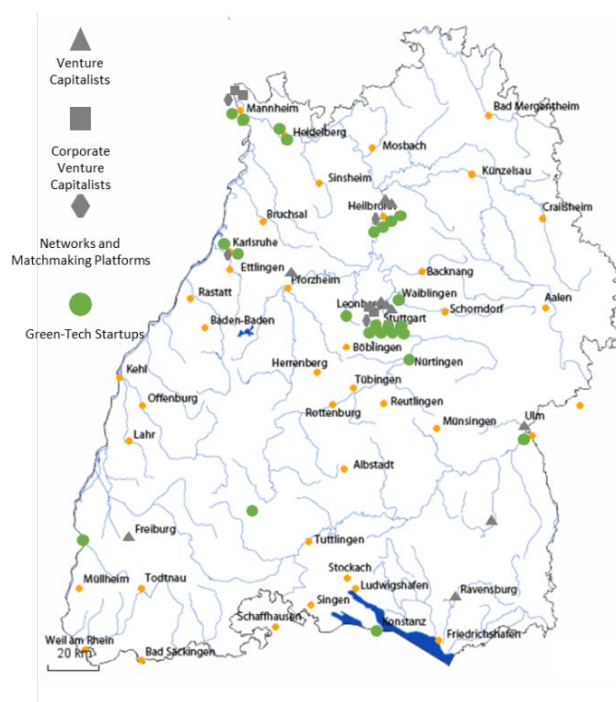


Figure 2: Equity funding landscape and green-tech start-ups in Baden-Württemberg

4 Potential fields of action to stimulate green-tech start-up activity

To reflect the findings previously discussed on the benefit of the regional equity-funding landscape in Baden-Württemberg on green-tech start-up activity, this study has also taken into account approaches implemented by other regional states and countries. This may offer further support to identify recommendations for potential supportive activities in Baden-Württemberg.

Regarding such recommendations, one of the first fields of activity should be the stimulating of foundation activity in the green-tech field in general: motivate people to consider founding a company, implementing an entrepreneurship culture in the green-tech sector for Baden-Württemberg. To achieve this, domain-specific innovation forum (such as GIIF) and business plan competitions focussing on green-tech topics may support. Similarly, a regional, yearly green-tech award (similar to “CyberOne” in the IT field) - if significantly endowed - may raise the interest of green-tech start-ups. In Munich for example, there is a yearly “global entrepreneurship summer school” that focusses on such topics. Here, at one of the university-based entrepreneurship centres, student teams develop business ideas on a green-tech topic.

Moreover, domain-specific, i.e. green-tech focused programs at universities could promote entrepreneurship and stimulate students to search for ideas in this field and found a start-up. However, the challenge would remain that good students still have many possibilities to get well-paid (and secure) jobs at one of the countless SME or automotive companies in Baden-Württemberg.

One way to compensate for this fact may be providing young founders with domain-specific, green-tech founding scholarships. Such scholarships are established in Germany, e.g. for the IT / Health Care sector (Karl-Steinbruch-Stipendium), or regionally (BIEM-Program, Brandenburg). While non-domain-specific scholarships (EXIST-Gründerstipendium) are established, a regional domain-specific, e.g. a Baden-Württemberg green-tech scholarship, is not yet available. Such scholarships however, e.g. in form of a public-private partnership, may serve to support the political agenda of achieving an increase in green-tech start-ups.

As a next step, the field of availability for early-stage funding to support potential founders in their attempt to start a company may be addressed. As outlined above however, this does not only address the availability of money alone, but also the availability of domain-specific, supportive coaching and consulting. Domain-specific green-tech networks may be a good way to link green-tech-interested Business Angels and investors with green-tech founders at an early stage. As the interviewed green-tech founders put it, "I would invest more in consultancy for green-tech founders... I see a lot of founders stop when it gets to the point of writing a business plan." Like, e.g. bwcon, which initially started with consulting and coaching for IT-related domains and now is aiming to provide domain specific consulting and coaching also to the green-tech sector. However, the effectiveness of such a network would rely heavily on the ability to acquire and build up a domain-specific pool of green-tech coaching experts, as according to the interviewed experts, general start-up coaching would not help.

In California, the LA clean-tech incubator provides a good example for this case. They provide expertise, access to their contacts, working space, and even funding. California is also a good example for a clean-tech cluster, where green-tech companies and incubators are located close to each other, reducing the search costs for advice and other resources.

Nevertheless, the money question remains. Most interviewees agreed that more money in the equity funding landscape of Baden-Württemberg would be desirable, particularly more money provided from the public sector. Looking at other regions in Germany, using EFRE resources as leverage to increase publicly-funded fund volumes, seems to be one way to go, as most interviewees agreed. Some interviewees however argued that in addressing this field—more federal money for early-stage green-tech funding—care should be taken, that the thereby additionally (because of the federal money being invested instead) available early-stage private funding money would again be used for additional early-stage funding (by way of, e.g. side investments). Otherwise, private investors may instead, driven by high yield targets, rather use this for increasing their volume in later stage funding of the few "highflyers." This should be carefully considered and avoided.

However, these funding instruments would have to be adjusted to the specific capital requirements of green-tech start-ups, "...if I need €5m, I cannot give up 15% of my company for €100,000" a green-tech founder said. "That one year and the €100,000 or €200,000 that I need to develop an app, this I can get anywhere. But like I said before, with that amount of money you just get nowhere in the clean-tech sector." While increasing funding could be one way to achieve this necessary adjustment, another could be the implementation of alternative funding strategies. Some interviewees argued that, in particular for the green-tech sector, investing in IP, e.g. patents could be a viable option, reducing the amount of capital initially needed while preserving the chance of an entrepreneurial reward for both the inventor and the investor. Such an IP-focused investment instrument that supports founders in filing and

financing patents on their ideas could also be publicly funded, as the amount of money would be limited. Such programs are established, e.g. in EU SME-support programs.

Accordingly, one approach could be to create a regional, publicly-funded, green-tech-focused lead investor instrument that is active in the seed stage. As with the HTGF, such a lead investor instrument would not have to invest alone, but would likely be joined by industrial and institutional side investors. However, solving the hen and egg problem in this field, the party controlling a larger share of the risk (i.e. political regulation) investing, providing expertise, and support, may be perceived by other, non-public investors as a positive signal of commitment to the sector in general and the specific business idea in particular, stimulating such investors to follow into that initial public investment. In that regard, the public-funding model in the venture sector of Bavaria is frequently referenced as a positive example of best practice (while not necessarily being green-tech focused).

In this way, private equity and public funding should integrate into an increasingly organic vehicle for green-tech investments. The economic transition to green-tech renders such significant capital intensity that neither side seems to be able to fuel that shift on its own. Rather, the public sector should aim at getting private investors more and more involved in green-tech investments, which can only be achieved (at the moment) if the risks faced by investors, e.g. by changing regulation, are rendered more transparent and acceptable. Here, reducing elements of bureaucracy and / or providing tax advantages may also be a further measure that may serve for stimulating SME corporate investments into this field.

However, even if more founding activity in the green-tech sector can be motivated, and even if early-stage investment can be increased, the challenge of funding the capital-intense growth phase still remains. Interviewees frequently addressed the fact that, after the seed stage, there seems to be a lack of capital for growth investments, at least at the levels needed for technology-heavy, green-tech start-ups. Accordingly, they identify a need for appropriate funding instruments that aim at longer investment periods and higher funding volumes. Some argued that pension funds may be seen as exhibiting potential for such investments.

Additionally, some interviewees suggested that green-tech-focused investments could be stimulated by way of tax advantages (for the investor). This may also have the effect of attracting internationally-acting funding entities and draw international green-tech organizations into funding regionally-founded green-tech start-ups more often. This could be further reinforced by implementing reward/punishment schemes to promote green-tech business. In California for example, if an automotive company does not manage to sell a defined percentage of zero-emission cars within all of the cars it sells in California (zero emission vehicles mandate), that company has to buy registrations from a green-tech company, for example Tesla. In the business case of Tesla, this revenue stream has a significant impact.

Finally, in order to provide more transparency to this field and derive actionable insight for policy makers in a more comprehensive way than this limited study can do, accompanying research should be developed, funded and published on a regular basis for the state of Baden-Württemberg. In other regions of Germany, such approaches to regularly evaluate and promote the green-tech sector have already been implemented with specialized research institutions and universities. One example is the cooperation of the Borderstep institute and the EXIST-Gründerhochschule University of Oldenburg. Together, they have created a Green

Economy Gründungsmonitor to identify the intensity of green-tech start-up activity in Germany, and evaluate the situation in light of, for example the respective situation in California, and derive actionable insight for policy makers on this basis.

5 Appendix

5.1 Appendix 1: Interview partners

<i>Interviewee</i>	<i>Organisation</i>	<i>Adress</i>	<i>City</i>	<i>Web Site</i>
Venture Funds				
Oliver Trautmann	MBG Mittelständische Beteiligungsgesellschaft Baden-Württemberg GmbH	Werastrasse 13 - 17	70182 Stuttgart	www.mbg.de
Dr. Guillem Sague	High-Tech Gründerfonds Management GmbH	Schlegelstrasse 2	53113 Bonn	www.high-tech-gruenderfonds.de
Günter Steffen	BORN2GROW GmbH & Co.	Edisonstrasse 19	74076 Heilbronn	www.born2grow.de
Corporate Venture Capital				
Kai Engelhardt	Corporate Venture Capital (CPV), MAHLE GmbH	Pragstrasse 26 - 46	70376 Stuttgart	www.mahle.com
Andreas Wigger	Bilfinger Venture Capital GmbH	Carl-Reiß-Platz 1-5	68165 Mannheim	www.vc.bilfinger.com
Business Angels				
Dr. Andreas Chatzis	BARS Beteiligungs GmbH	Friedrichstraße 10	70174 Stuttgart	www.business-angels-region-stuttgart.de
Matchmaking Networks				
Sigrid Rögner	Venture-Forum-Neckar e.V.	Weipertstrasse 8-10	74076 Heilbronn	www.venture-forum-neckar.de
Experts				
Arndt J. Upfold	Ministerium für Finanzen und Wirtschaft Baden-Württemberg Referat 83 "Existenzgründung und Unternehmensnachfolge - ifex"	Theodor-Heuss-Straße 4	70174 Stuttgart	www.mfw.baden-wuerttemberg.de www.gruendung-bw.de
Dr. Frank Siebke	Siebke Consulting	Herchersgareten 6	79249 Merzhausen	
Harald Fuchs	HF Business Consulting	Eichendorffweg 4	73655 Plüderhausen	
Giovanni Maria Operto	Operto AG	Bergwisenstrasse 13	8123 Ebmatingen	
Greentech Startups				
Dr. Thomas Walter	Easy Smart Grid GmbH	Dessauerstraße 15	76139 Karlsruhe	http://www.easysg.de/
Hans-Martin Ehmann	GTR 2 GmbH	Dieselstraße 1	84056 Rottenburg a.d. Laaber	http://www.gtr-gmbh.de/

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