

The Emergence of *Green* Venture Capital

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THE EMERGENCE OF *GREEN* VENTURE CAPITAL

Innovative financing mechanisms are needed to facilitate sustainable development. In the past few years, socially responsible investments have emerged as a successful type of financing scheme but many ecological-oriented start-up companies remained underfunded. Apparently, environmental innovations have only recently caught the attention of an important financial sector: venture capital (VC). The article describes the emerging phenomenon of environment-related VC (or *green* VC) and provides an overview of the current market for this type of investment. This is why this paper delves into this industry, revealing its characteristics, processes and mechanisms. The study also uncovers the main problems faced by entrepreneurs starting eco-oriented enterprises, as well as venture capitalists interested in such type of start-up businesses. Finally, the paper analyses the drivers for *green* VC and attempts to identify the sources of innovation and the uniqueness to this emerging financial products. The paper also provides a definition of *green* VC.

INTRODUCTION

One of the main mechanisms for financing innovative start-up companies is *venture capital* (VC)¹. Increasingly, venture capital is being directed towards entrepreneurial ventures that demonstrate various aspects of sustainability (be it environmental innovation and/or social benefits). Eco-innovations by companies such as *Ballard Power Systems'* fuel cell technologies have been recognised by investors as having the potential of drawing big returns of the scale that venture capitalists are after.

This recent interest in sustainable solutions may be an indirect result of the successes and popularity of *Socially Responsible Investment* (SRI), which have so far been mainly channelled into mutual funds. Indeed, there has been a phenomenal growth of such funds, the amounts invested, and the rapid proliferation of investment and analytical products catering to this segment. According to the *Social Investment Forum*, the total assets under management in portfolios screened for socially concerned investors in the United States of America (USA) climbed from €1.69 trillion in 1999 to €2.31 trillion in 2001 (SIF, 2002). This trend is not confined to the USA only. The universe of retail ethical funds doubled in size every three years in the UK during the 1990s, from €517.9 million in 1990 to €5.15 billion in 1999² (UBS Warburg, 2001).

Despite these successes, environment oriented start-up businesses have not caught the attention of most venture capitalists (Diefendorf, 2000). What explains this situation? Is it

¹ Venture capital is used in this paper to refer to *venture capital funds*, that does not encompass *individual* private investors.

² Note: All currencies have been transformed into Euro by using Universal currency converter, at <http://www.xe.com/ucc/convert.cgi> on 13/03/02

likely to change? What drivers would help environment-oriented start-up companies get the flow of capital and expertise – available through venture capital – to make their businesses grow at a faster rate?

This paper address these questions by delving into a new stream of venture capital emerging in different places worldwide, which we label *Green Venture Capital* (henceforth *green VC*). We argue that *green VC* shares some features of other types of Venture Capital (VC) and yet it also demonstrates some unique features and innovations of its own. The paper should be situated within the ongoing debate over the sources of profitability of *green* firms (Lenox and King, 2002), on profitable eco-innovation (Rennings, 2000), and the ongoing concern of many practitioners to make the ‘business case’ for sustainability³.

BACKGROUND AND METHODS

The paper stems from discussions with a number of specialists in the VC field in Europe⁴. Initially, a search on the topic of ‘*green* venture capital’ (and related nomenclature) in VC practitioners’ databases was undertaken. We soon found that no such category exists currently. Classifying ‘*green VC* firms’ cannot be done straightforwardly. Many firms use the words ‘ecological’ or ‘environmental’ as a way of promoting some their environment-related activities. Curiously, others firms purposely do *not* market themselves this way because they assume it would be more difficult for them to secure funding. Neither venture

³ For a critical review of this debate, see Dyllick and Hockerts, 2002

⁴ The data presented here has been drawn from a research undertaken for a Masters thesis at the IIIIEE, Lund University (Randjelovic, 2001), and represents part of an ongoing research program on forms of Innovative Finance for Sustainability at INSEAD Business School’s Centre for the Management of Environmental Resources (CMER).

capital associations have separate sections on *green* VCs. Overall, although substantial literature review was undertaken, we found very little academic and popular literature that makes an explicit link between environment (or sustainability) with VC.

Despite this gap in the literature, we found many VC practitioners who were investing in start-ups that had an environmental benefit or theme, and many eco-entrepreneurs who had launched their companies using venture capital.

The research was necessarily exploratory in its nature. Data was compiled through websites, company material and interviews. It is thus subject to bias and we must be somewhat careful with results. Thirty-three semi-structured interviews with European *green* and *mainstream* VC firms and managers, and specialists or practitioners in VC were undertaken between July and August 2001. Additionally, five eco-entrepreneurs, with start-ups companies in varying stages of their development, were also interviewed. Many of these interviewees at this stage prefer to remain anonymous – explaining why some of their quotes included in this paper are not assigned.

We limited our study to ‘environmental’ innovations rather than attempting to discuss ‘sustainability’ innovations, which would necessarily include *social* issues. From our preliminary reading on the topic, we found that socio-oriented start-ups tend to face different issues and problems than environmental start-ups; not the least because most of them have their main market based in developing countries. Furthermore, many of these firms are funded by a kind of ‘venture philanthropy’ (i.e. sponsorship and foundation based funding that uses some venture capital processes), which moves the discussion away from

profitability and mainstream take-up of eco-innovation. Thus this paper is limited to studying venture capital financing originating and destined for developed countries only.

FEATURES OF VENTURE CAPITAL

Venture capital is a rather recent phenomenon. The Venture capital industry draws its origin in the USA in 1946, while in Europe VC was established only in 1970's (Metrick, 2001, EVCA-a, 2001). Since then, various governmental mechanisms, such as tax exemption and subsidies, have enhanced the VC growth in many countries (in particular, the United Kingdom), which result in VC to become a strong source of financing (Bovaird, 1998). In conceptual terms, "venture capital is a type of financial capital provision, usually in *equity*⁵ form, which is invested in high-risk ventures and which offers the possibility of significant gains to compensate for the risks involved in such investments" (Reid, 1998, p.14). VC can also be seen as a type of early-stage private equity that provides capital to enterprises that have not yet been quoted in the stock market (or which will never become a public company). More broadly, VC refers particularly to investment made for the launching, early development or expansion of the business (Serge, 2000).

⁵ *Equity* is capital invested in an enterprise, which is not quoted on a stock market (hence, it is private capital). This capital can be used for the development of new products and/or technologies, to make acquisitions or to strengthen a company's balance sheet. For more details see European Venture Capital Association (2001). <http://www.evca.com/>, [2001, December, 6]

Venture capital managers are often actively involved in the management of the start-ups companies they invest. In return for the capital invested, venture capitalists receive equity shares and privileges, such as active participation in the enterprise's governance, management and profit sharing. This is why VC has often been described as a 'hands-on management'.

VC is highly risky. Investment is made in the very early stages of development of the *investee* companies (normally start-ups), and only a small percentage of entrepreneurs succeed in the market – only one or two out of ten investments return profit (Bovaird, 1990). Because of such high risk, VC has the potential to provide a superior *Return on Investment* (ROI). In return for financing the company's start-up and growth, venture capitalists might expect return rates of capital at around 1000% over five years (Zider, 1998).

Structure and Flow of Venture Capital

The venture capital industry has three main players: entrepreneurs who need funding, investors who invest in a VC fund and venture capital managers who choose entrepreneurs that will receive funding and who make sure that the start-up will be successful on the market in order to multiply the investment. Figure 1 presents the parties involved as well as the simplified flow of capital among them:

INSERT FIGURE 1 ABOUT HERE

Venture capital begins with investors who invest in a VC fund (Phase I in Figure 1). As Sahlman (1997, p.103) puts it: “Investors, of course, are looking for businesses in which management can buy low, sell high, collect early, and pay late”. There is pressure from the investors on VC managers to find appropriate *investee* companies.

Because of VC’s risky nature, venture capitalists use sophisticated investment decision procedure (Phase II in Figure 1.). They tend to place emphasis on the market attractiveness, product differentiation, managerial capabilities and competitive threat (Tybjee and Bruno, 1997). They also perform detailed due-diligence assessments of the company and assess potential liabilities. Thus, VC managers need to have expertise (or a network of experts available to them) to realize the potential of the product and its market potential. The process of choosing to invest ends with providing funding to a start-up and receiving equity shares in return.

VC can be invested in different stages of the investee company’s growth: in very early stage as a seed or start-up capital, or in a later stage, close to the moment of selling the investee company on the stock market. Put simply: the earlier the investment, the riskier. This is why many venture capitalists are reluctant to invest in the early start-up stage, which is normally left to ‘angel investors’⁶ and/or family and friends of the entrepreneurs.

⁶ *Angel investor* is a private investor who provides capital directly to start-up companies, usually in the very early stage of development, and in smaller amounts of capital, when compared with VC managing firms.

Once VC managers have made the investment, their involvement is not yet over. The term period between investing and *exiting* (i.e. selling equity shares on the stock market), can take from one to five years. The exiting means returning investment together with the profit gained to the initial investors (see Phase III in Figure I). To exit successfully, VC managers tend to perform various post-investment activities, such as financial statement monitoring, business strategy advice and overall monitoring of the investee company (Van Osnabrugge and Robinson, 2000). Such levels of involvement in the management can be seen as ways of ‘controlling’ the risk VC run when investing in start-ups. Although in the view of an uninformed person venture capitalists are gamblers on new businesses, the ‘hands-on management’ implies levels of commitment to the enterprise not seen in other types of investments. Does this commitment serve only economic rationale? The next section explores this topic.

THE EMERGING PHENOMENON OF *GREEN* VC

From the description of venture capital in the previous session, it would seem that VC and the concepts and practices of sustainable development are worlds apart. VC is often thought of as ‘neutral’ way of financing start-up companies, independently of kind of business, normally having a short-term perspective. Sustainable development, on the other hand, is concerned with the direction and the actual content of companies’ products, services and practices, having a commitment to long term orientation (Rennings, 2000, p. 322).

A business-oriented understanding of sustainable development, however, tries to find the link between environmental and social activities performed by firms and their financial performance. Under the rubric of the ‘triple bottom line’ of sustainability, investing in eco-innovations is expected to create shareholder value. For example, the Swiss group *Sustainable Asset Management (SAM)* defines sustainability as: “a business approach to create long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments.” (SAM, 2001)

So far, most sustainability-oriented capital has been invested in large-cap⁷ companies, via the inclusion of (positive and negative) screening criteria by mutual and pension fund analysts and rating agencies. Here analysts try to identify profitable corporations that also strive to minimize the ‘environmental footprint’ of their operations, while contributing to the economic and social development of the communities in which they operate internationally (UBS Warburg, 2001).

The screening methods employed by European *Socially Responsible Investment (SRI)* tend towards a ‘best in class’ approach, rather than using only negative criteria which would, for example, avoid nuclear and tobacco industries. Companies are judged in relation to others in their sector, against criteria such as their environmental policies and programmes, the use of environmental management systems, renewable resources, and conditions placed on suppliers, quality of stakeholder relations, the quality of environmental reports and communications, among other criteria.

⁷ ‘Cap’ is short for capitalization. That is a market value for the company’s stocks which is calculated as the amount of stocks times the stock price. There are small, mid and large cap companies. Large cap companies have usually market value of greater than €3 billion.

Although *green* VC can be considered a type of SRI, it could not easily use the same criteria for the selection of their investments. This is because in their initial phase, start-ups firms often consist of two or three people and only *the idea* for the innovative product or service, which, in most case, has not yet reached the manufacturing and/or commercialisation phase. Start-ups could thus be considered the ‘concept of the firm’; they normally do not have management systems, supply chain issues or environmental/social reports. The evaluation of the environmental aspects of the business must thus be based on different grounds – more to do with the future, rather than the actual performance (environmental, social and financial) of the company.

Therefore it would appear that a *green* VC’s environmental orientation depends on the content, direction or effects of the start-up company that it decides to support. How then do we decide if a start-up company is indeed ‘*green*’? One approach is to look at the concept of eco-innovation to see the future environmental and social implications of the products and services that a firm will eventually generate. According to Rennings, (2000, p322), *eco-innovations* can be defined as: “measures of relevant actors (firms, politicians, unions, associations, churches, private households), which (i) develop new ideas, behaviour, products and processes, apply or introduce them, and; (ii) contribute to a reduction of environmental burdens or to ecologically specified sustainability targets”. In our research we mainly focus on product-based eco-innovations developed by start-up firms.

A typical example of eco-innovation financed by VC is the manufacturing of wind turbines for the electricity generation. Wind energy can be considered a type of *green* VC investment because of its obvious environmental benefits-the use of renewable energy and

zero emissions in the use of the turbines. Of all the new renewable energy technologies, wind power has made the most significant commercial progress. Today, wind energy is much cheaper than nuclear power and competitive with all forms of fossil fuel based power generation. More importantly, it is estimated that costs will decrease up to 45% within the next 15 years (Turkenburg, 2000).

In October 1999, the *European Wind Energy Association*, the *Forum for Energy and Development*, and *Greenpeace International* jointly released a study (*Windforce 10*), which contends that wind energy could meet 10% of the world's electricity demand by the year 2020 (EWEA et al., 1999). Clearly, this represents a significant opportunity for *green VC* financing. The recent growth in the use of energy from wind power was partially supported by governments such as Denmark and Germany via legislations and financial mechanisms (EEA, 2001). However, future profitability of such investments and other renewable energy innovations certainly depend on the existence of what Porter and van der Linde (1995) call 'environmentally friendly regulation'.

State of the Art in Green VC

A growing number of venture capitalists invest in environment-oriented start-up companies. As an emerging phenomenon, both the number and variety of *green VC* fund-types are expected to change in coming years. For a number of sub-categories, we compare the current features of *green VC* with conventional or mainstream (or non-*green*) VC companies (henceforth referred as VC). This comparison makes it possible a discussion about the unique qualities of *green VC*. One of the most explicit differences is in the size

of the industry. In 2000, *mainstream* VC investment in Europe and the USA totalled €154 billion. This figure dropped substantially in the first half of 2001, when *private equity*⁸ and venture capital investment reduced in 13 % in the USA and Europe (EVCA-c, 2000). Two main reasons account for such decrease: the downward momentum of the *Initial Public Offerings* (IPOs)⁹ of venture-backed companies – particularly in the Information technology (IT) industry – and the lack of innovative projects in Europe, which could eventually be targeted by venture capitalists (Gompers, 1998; EC, 2001). Figure 2 presents venture capital investments in the USA and EU during this period.

INSERT FIGURE 2. ABOUT HERE

The figure also shows that VC investments in both the USA and Europe have increased over the past five years. The total amount invested in last five years was around €540 billion. To give a sense of scale, this is equivalent to the aggregated GDP of Scandinavia (Denmark, Norway, Sweden and Finland). Compared to this figure, *green* VC is in its infancy – we estimate that in 2000 *green* VC accounted for approximately €33 million in

⁸ Contrary to the USA, In Europe *private equity* and *venture capital* investment are often used interchangeably. For details on the data provided here, see: <http://www.evca.com/Venture.htm>.

⁹ *Initial Public Offering* (IPO) is the process of launching a company for the first time by inviting the public to subscribe in its shares on the stock market

Europe and €67 Million in the USA, which represents only 0.08% of the total amount invested by VC industry¹⁰.

Besides size, there are other quantitative and qualitative differences between mainstream and *green* VC. Table 1 summarises the main differences founded in these two types of investment and the following paragraphs explore these differences, selectively taken from the table, except the size which was previously explained with the Figure 2.

INSERT TABLE 1 ABOUT HERE

The total number of active mainstream VC companies in Europe and USA situates at around 1600, with more than 850 active firms in Europe¹¹ (row 'b' in Table 1). Compared to mainstream VC, the number of *green* VC firms in Europe and the USA is much smaller. We found twenty European and around twenty-five US companies dealing with *green* VC.¹² For example, when searching in the member list of the European Venture Capital Association (EVCA) we found seventeen VC companies that have 'environment' as an investment category, which represents only 2% of the total number of EVCA members¹³.

¹⁰ This data was gathered from various sources such as interviews and websites. Because some venture capital companies did not want to disclose information, it is possible that the real amount invested is higher than the one presented here.

¹¹ Number of companies listed as members of European Venture Capital Association (EVCA) and National Venture Capital Association (NVCA). Since there are companies that are not members of these associations, this number is expected to be higher.

¹² The number of companies was identified by compiling data provided by participants in the *Sustainable Private Equity Conference*, held on 19th of January 2000 in Switzerland. Additionally, data was also collected from various websites that provide information for eco-entrepreneurs, such as <http://www.sustainablebusiness.com>, (10/07/01).

¹³ Data from the EVCA website section created for helping entrepreneurs that seek financing. Using 'environment' as a searching criteria in each industry sector, 17 start-up companies could be identified, (15/08/01).

Conversely, some mainstream VC companies actually invest in environment-oriented start-ups, such as in fuel cell technologies, but they do not claim such orientation. Our research included the first category only. The average amount invested is very small compared to that invested by the mainstream PE industry¹⁴ (row 'c' in Table 1). While the average amount of mainstream VC invested was about €120 Million¹⁵, some sources interviewed approximated that around €1,1 Million (approx. \$1 million U.S.D) is usually invested in eco entrepreneurial companies in Europe¹⁶.

Both the USA and European mainstream PE firms provided a similar portion of financing to *early stage* enterprises (start-ups), which accounted for around 14% of all VC investments (EVCA-b, 2001; Venture Economics, 2002). However, this portion is fairly small, compared to *later stage* financing. As a consequence, nowadays the time to exit the mainstream VC investment situates at around 1-2 years – an investment period may not be enough for eco-innovations to become commercially viable. Indeed, our research indicated that the time to exit averages five years for most *green* VC investments (a difference represented in row 'd' in Table 1). Many of the eco-entrepreneurs interviewed by us expressed the need for a longer period of product development to reach a market breakthrough. These start-ups are often product-based and the product cycle is longer than service-oriented innovations such as '*dotcoms*'.

Environment prerogatives are, as one could expect, the core difference between mainstream and *green* VCs (row 'e' in Table 1). Mainstream VCs usually include

¹⁴ These figures represent only small part of total PE investments, compared to conventional investments it represents 0,15% of European and 0,06% of U.S. PE investment.

¹⁵ Data were taken from the member list of EVCA (2001), because the it has data of all participative venture capital companies, size of the investments they have and sectors they invest in

environmental issues in their investment decision procedure as a risk factor only. Environmental issues are seen as a risk carrier or a potential liability to the start-up. Often, external consultants are hired to assess environmental and/or social risks related to the specific potential investee company in due-diligence procedures. *Green* VCs, on the other hand, consider the capacity eco-innovations have to add value to an enterprise, besides the risk reduction factor. Hence, it can be said that *green* VCs have the potential to generate ‘double-dividends’ – the creation of both low environmental impacts or risks and financial returns (see: Porter & van der Linde 1995).

Mainstream and *green* VC have somewhat different sources of financing (see row ‘f’ in Table 1). The main source of financing for mainstream VCs is provided by institutional investors, which are composed by pension funds and banks. In 2000, pension funds accounted for 24 % of the total investors in VC funds, while banks accounted for 22 % (EVCA-c). For *green* VC funds ‘high net worth’ individual investors represent almost 50% of their investors, which have often chosen *green* VC funds because of their environmental and social beliefs and/or the understanding of the potential double-dividends of sustainability related investments. This, in fact, constitutes the fundamental difference between the typical orientation of investors (or drivers for investing) of mainstream and *green* VC shown in row ‘g’ of Table 1.

The main difference between mainstream VC and *green* VC is found in the type of target investment (row ‘h’, Table 1). Mainstream VC managers tend to invest in fast growing sectors, such as information technology (IT) or communications, which account for 23% of

¹⁶ Interview with anonymous VC firm

total invested amount in Europe (EVCA-c, 2001). Our data show that *green* VC firms currently invest in the following groups of technologies: (i) Wind, solar, and wave energy; (ii) Desalination and water recycling; (iii) Organic agriculture; (iv) Fuel cells; (v) Industrial processes technologies.

Wavegen, a start-up funded by *green* VC provides a good example of an eco-oriented start-up. The company was established in 1992 in Scotland to research innovative technologies and manufacture equipment for wave energy production (Ross, 2001). In 2000, the company secured a 15-year contract with the Scottish electricity utility to supply wave energy to the grid (*Wavegen*, 2002). The expressed commitment of the UK Government to reduce carbon dioxide emissions by 20% by the year 2010 under the United Nations Framework Convention on Climate Change (CEPS, 2000), and to have 10% of the energy supplied by the grid coming from renewable energy sources is expected to facilitate the adoption of wave technology. In other words, there are many grounds to believe that wave energy technology could repeat the success of wind energy in the 1990s. Considering the projected unit cost of electricity generated by wave technology¹⁷ first decades of the 21st century, wave energy could become an attractive investment for *green* VC.

Companies such as *Wavegen* have the potential to be targeted by *green* VC funds, such as *Sustainable Asset Management* (SAM). This *green* VC firm established two funds in the year 2000 with a total amount of €86 Million (SAM, 2002). Approximately 40% of the investors in the fund are high-network individuals, with particular interest in sustainability-

¹⁷ The projected unit cost of electricity generated by wave technology situates at around €0.08, while the cost for wind energy is estimated to be €0.06. Wave generated electricity has the potential to achieve substantial cost advantages in next 20 years and, eventually, transform fossil fuel generated electricity in an anti-economic activity. For more details see UNDP (2000).

oriented firms. SAM-PE (Private Equity), for instance, invests in three main areas: emerging energy, resource productivity and healthy nutrition¹⁸. When screening for eco-innovative start-ups to invest, SAM-PE assesses social, economic and macro-societal environmental trends. Because of its commitment to investing in more environmentally sound companies, SAM-PE is a didactic example of a *green* VC enterprise. In this respect, *Wavegen* could eventually create value to VC financiers, such as SAM. However, not all eco-innovations get the necessary funding and not all *green* VC managers find appropriate eco-innovations to invest in. The following section explains why such situations happen; it provides an overview of the current problems faced by both ‘sides’ of *green* VC industry.

ECO-INNOVATORS AND GREEN VC: A PROBLEMATIC RELATIONSHIP

Many eco-innovators and *green* VCs alike consider the words ‘sustainability’ or ‘environmental’ problematic for the promotion of the enterprise. Often, start-up companies and VCs are reluctant to use these words even if sustainability principles are somehow embedded in their products. As one *green* venture capitalist stated: “Our name often makes investors think that we just ride bicycles and eat vegetables”¹⁹. Although such type of interpretation constitutes an important barrier to be overcome within the industry, it is certainly not the only one faced by *green* VC managers and eco-entrepreneurs. Below we selected the most prominent ones, identified in our research.

¹⁸ For more details see <http://www.sam-group.com/>

¹⁹ Anonymous Interview (04/07/01)

Lack of a proper network: Since entrepreneurs and VC firms normally ‘find each other’ via active networks, the lack of a good network can certainly represent an impediment for the start of such relationship. In Europe, for instance, there is no formal network for eco-entrepreneurs and *green* VC firms. Neither are (enough) conferences, trade fairs and information platforms for information and knowledge sharing about *green* VC, such as the *Investors Circle*²⁰ in the USA. Some initiatives have emerged recently in the UK. There, a network has been formed²¹ to match investors with entrepreneurs in the field of digital technologies that contribute to social and environmental change. Although this represents a step forward, such type of network still needs to be extended to other members of the European Union.

Different meanings for ‘sustainability’ and ‘environment’: Many entrepreneurs and *green* VC firms mentioned that environment and/or sustainability is perceived as less profitable (and even as a costly burden) that hampers the chances of getting funding. Indeed, many eco-entrepreneurs eliminated the environmental perspective out of their business plans so they could access mainstream funds more easily. For *green* VC firms, there are also some differences in perception as to what constitutes ‘sustainability’ or ‘environmentally responsible’ behaviour, and what will be a profitable investment.

Lack of a ‘good’ business plan: According to some venture capitalists, funding for start-ups is often refused because entrepreneurs submit a ‘bad’ business plan. Venture capitalists perceive a ‘bad’ plan as an incomplete or inconsistent business concept, a lack of essential data (e.g. expected revenues), or too much irrelevant data (such as an overemphasis on

²⁰ see www.investorcircle.net

world environmental problems). For instance, a *green* VC firm representative²² told us that an entrepreneur submitted a business plan with ten pages on the science of climate change, and only four on the business concept. Apparently, ‘bad’ business plans is not unique to eco-entrepreneurs but rather a pervasive problem in the industry.

VC finance timing: Many eco-entrepreneurs have their requests for financing refused simply because of the stage of development of the start-up. From the point of view of venture capitalists, start-ups in a very early stage of development represent a too high risk. As many of the *green* VC firms are themselves quite new, they have so far tended to favour businesses that are relatively ‘mature’, if compared with ‘good’ business ideas that still need to be ‘incubated’. Such situation generates a gap in financing, which is not totally filled by other types of investors, such as *angel investors* – a private investor who provides capital directly to start-up companies in the very early stage of development.

Lack of Expertise and Skills: Lack of skills and expertise is a problem in both ‘sides’ of the *green* VC investment. On one side, the research showed that VC firms or managers refused to finance eco-innovations because they did not understand a particular technology or the industry the entrepreneurs wanted to enter. On the other side, venture capitalists have the opinion that eco-entrepreneurs lack the business skills, such as marketing, management or financial skills, which are necessary to run their businesses. Thus, entrepreneurs may need proper environments, such as ‘technological incubators’ to be properly developed. In such contexts, the eco-entrepreneurs, who tend to have a technical

²¹ see <http://www.vitamin-e.net/>

²² Who prefer to remain anonymous.

orientation, learn the managerial competences necessary to make their ideas to succeed in market terms.

Lack of potential market breakthrough: Many entrepreneurs are refused financing because their technology seem not to have the potential to be commercially viable within the lead-time expected by investors. Financing may be also refused for start-ups that are expected to compete in a mature industrial sector (automotive industry, for instance), or they think that the technology – and the team behind it – will simply not attract enough attention on the market in the short-term.

Having described existing problems of the relationship between *green* VC managers and entrepreneurs, it is not appropriate to discuss the potential *green* VC funds have to expand. The following section summarises the peculiarities of the *green* VC market by looking at the drivers for eco-innovations, as well as the sources of innovation in the *green* VC's themselves.

THE POTENTIAL OF GREEN VC TO EXPAND

According to the arguments presented in the previous sections, *green* VC is expected to have some intrinsic uniqueness – when compared with the broader categories of VC. Obviously, there are also many common issues faced by both types of investment. Because *green* VC is, in essence, a niche market in the broad area of VC investment, it inherits many problems from its 'parent' investment segment.

Many of the problems faced by *green* VC can expect to be resolved in time as the field becomes more sophisticated and as the market ‘learns’ about sustainability. Apparently, what is now needed are some ‘big successes’ in *green* VC to draw attention and capital towards earlier stages of financing start-ups. The VC industry needs to learn about eco-innovations and, similarly, eco-innovators – whether they are start-ups or other environmental professionals – need to learn about *green* VC and other innovative finance mechanisms. Venture capitalists operate in one of the riskiest zones of investment and they expect to be compensated for this risk by high returns on their investments.

The point at which a VC (whether *green* or not) would describe the relative ‘success’ of a venture would be at the stage wherein equity shares of the *investee* company are sold to other shareholders, usually as an Initial Public Offering (IPO). Of course, many ventures do not even make this far. The primary aim of venture capitalists is to gain sufficient return on investment in order to repay their investors, as well as to keep a percentage of the profit as income for themselves. Thus, the success of the venture is judged by the way in which the market considers the potential for the business to create value in the future. For *green* VC managers, this means that *what* they are funding is innovative and subject to particular market and non-market drivers (regulation, in particular), and *how* they are funding it (i.e. how they manage their investments and bring the eco-innovation to the market) requires a unique approach. These two aspects are covered in the following sections, schematically represented in the figure below.

INSERT FIGURE 3. ABOUT HERE

The main drivers for eco-innovations and subsequently *green* VC expansion, represented in the figure, are regulatory and technology push and market pull (Rennings, 2000). Technology and regulatory push can motivate entrepreneurs to start companies with environmentally beneficial new products (such as wave energy), while market pull, based on the investors' demand and competencies of *green* VC managers can also influence the development of eco-innovations (see Figure 3.). Below the drivers and competencies are further discussed.

Drivers for value creation

Traditionally, environmental 'externalities' are not adequately priced or valued by the market. Rennings (2000, p 326) reminds us of market imperfections – long debated by economists – that can hinder eco-innovations: “As long as markets do not punish environmentally harmful impacts, competition between environmental and non-environmental innovation is distorted.” One way of curbing such imperfections is via environmental regulations, such as the IPPC Directive²³. Regulatory guidelines such as IPPC have the potential to trigger the development of 'cleaner' technology, such as wave and wind energy, discussed in the previous sections. The regulatory push is expected to have to more influence than other determinants for eco-innovation expansion, which is discussed below.

²³ IPPC directive stands for Integrated Pollution Prevention and Control issued in 1996 on EU level. The IPPC directive would drive emerging start-ups to be able to fit into existing supply chain of companies already following IPPC directive, in other words IPPC directive could become and eco-innovation driver.

Green VC's success rests firmly on how well the market – in our case translated in the view of *green VC* managers – perceive the potential value-creation of the start-up and/or the eco-innovation of an existing businesses. This is especially true of new *green VC* funds, which only have a small number of investments and thus cannot easily spread their risk as larger VC firms. As it can be observed in Figure 3, the *regulatory push* is a relevant factor influencing both the development of new technologies and the willingness of investors to fund eco-oriented start-ups. The regulatory push influences the eco-oriented start-ups as well; by direct governmental measures (such as the IPPC), that have a direct impact on new established eco-oriented start-ups. Thus, because of the 'triple' influence (see Figure 3) the relevance of regulations is maybe the most important in development of eco-innovations and their VC fund raising.

Changes in the pension fund laws in Europe consist of a special type of regulatory push that can induce investors to fund eco-oriented start-ups. For instance, Germany has recently issued a law for pension funds to disclose information about ecological, ethical and social characteristics in their investments (Article 115 of the *German Pension Legislation Act*, 2002). The UK has a similar law, which obliges pension funds to declare the extension in which social, environmental or ethical considerations are taken into account. According to *EIRIS* (2002), this regulatory approach is expected to be broadened and made more stringent in the future – eventually covering all EU countries. Since pension funds are currently the main investors in VC funds (24-25% in Europe and the USA respectively), such changes have the potential to significantly affect the investment market for *green VC*. As a result, one can expect that the amount of capital available to

eco-entrepreneurs via *green* VC firms and managers can significantly increase in the near future.

Without the backing of venture capital many eco-innovations will not be able to grow at the rate needed to reach the commercialisation stage. This means that the perception of investors, in the potential profitability of eco-innovations is of crucial importance to lifting many of these businesses off the ground. The perception of investors and *green* VC managers of the commercial viability of eco-innovative start-ups together with *green* VC managers' internal competencies represent part of the *market pull* explained in the next section.

Competences of Green VCs: nurturing and managing start-ups

As discussed previously, regulatory push in some cases (e.g. pension legislation) influences investors to seek more environmentally and socially responsible funds, such as *green* VC funds to provide capital to eco-innovations (see Figure 3). Once the actual investment is selected and capital raised, the success of the investment is, to a certain extent, reliant on how well the start-up is managed and how 'well' the financier exits the investment. Hence, a particular competitive advantage of *green* VCs may be located here. If the VC (whether *green* or not) firm or manager has particular competence in techniques of corporate environmental management, they will be in a position to help *investee* companies to grow 'right' from the start. This would mean screening, assessing, stipulating and assisting entrepreneurs in ensuring that their businesses processes and products are managed in a way that have low environmental impact and social burden. They would thus be able to assist start-up companies (whether eco-innovative or not) avoid many

environmental problems and costs in the future. This is one area wherein *green* VCs could lead other VCs, creating positive environmental outcomes in the process.

Furthermore, after a *green* VC firm successfully sells the shares of eco-innovative start-up in the stock market (technically, ‘exiting’ the investment), it certainly will be in a better position to justify the investment on eco-innovation, as well as to attract more investors. In this respect, a ‘cleaner company’ would be a selling argument for investors – it lowers costs and liability risks, as well as demonstrates an interest in creating value over the long-term. With an increasing number of investors searching for sustainability attributes in companies (such as the SRI-oriented mutual funds), this could result in a profitable venture for *green* VC. For instance, during the period of June 1995-October 2001, *Dow Jones Sustainability Index* (DJSI) continuously outperformed the *Dow Jones Group Index* (DJGI)²⁴.

FINAL CONSIDERATIONS AND DIRECTIONS FOR FUTURE RESEARCH

In this paper we explored an emerging phenomenon within the venture capital industry: the one of environment-related VC or ‘*green*’ VC, as we named it. We initially described the characteristics, market and processes of VC and, in order to demonstrate the unique aspects of *green* VC, we compared it to the so-called mainstream VC. We also discussed the main barriers and drivers currently faced by *green* VC firms and managers and the eco-

²⁴ Obviously, one could question the extension in which the pre-requisites forming the *Index* reflect environmentally responsible companies. The stocks also included some *blue ships*, such as *General Motors*, *Shell*, and *Dow Chemicals*, which also blurs the *real* reasons for investors to put their money in those stocks. Nonetheless, one cannot ignore that the allegedly ‘cleaner’ companies were valued more investors than of those that presented an image of proactive sustainability – even if this event was coincidental. For more details see <http://www.sustainability-index.com/>

innovations supported by them. By doing so, our article arranged dispersed data, which allowed us to systematically describe and analyse this emerging phenomenon.

We emphasised that, as a unique thriving type of financing, the development of *green VC* seems to depend on the implementation of some specific types of regulations. This would positively influence the general conditions for *green VC*, such as changes in the rules that facilitate funding for eco-innovations (the ones guiding pension funds, for instance). On the other hand, *green VC* managers, eco-entrepreneurs and investors need to develop competences on environment-related strategies and practices, which can create economic value *and* reduce environmental impacts/risks.

According to our study, comparing the financial performance of *green VC* funds with mainstream VC is fundamental for further development of the research area of *venture capital financing*. This is why we endeavored into this exploratory research. By providing some (anecdotal) success stories of *green VC*, we expect to have persuaded academics to follow up on our research. In the *organization & environment*²⁵ front, for instance, future research could assess governmental measures and mechanisms that improve the general climate for the development of eco-innovations in existing businesses, as well as the emergence of eco-oriented start-ups. In *studies of technology*, it seems essential to identify (alternative) technologies that are not only technically feasible to materialize in the coming years (such as wave energy technology, mentioned in this article) but also able to become candidates to receiving *green VC* funding. In fact, such demand suggests that technology and management studies have to be brought together in future venture capital financing

²⁵ For an overview of the *Organisation & Environment* field, see: Orssatto (2001).

research. In order to facilitate such a process (in particular, research design), as well as a general discussion on the topic, based on the article, we propose the following definition for *green VC*:

Green venture capital is a type of financial capital provision invested in high-risk environment-oriented ventures, which offers the possibility of ecologically sound business practices, as well as significant gains to compensate for the risks involved in such investments.

This definition – and the study in general – have also important implications for practice. Based on the research presented here we hope to have convinced practitioners in financing – in particular, mainstream VC managers – to pay more attention on the potential value-creation of *green VC*. We demonstrated that there is a growing market for investment in eco-innovative companies but so far only those who see sustainable development principles and eco-innovations as vehicles for value-creation have target it. We wonder how long it will take for other venture capital firms to catch up with these visionaries.

References

- Article 115 of the German Pension Legislation (2002), in Stiftung Zukunftsfähigkeit (Foundation for Sustainability). http://www.stiftungzukunft.de/berichtspflicht_en.html, (accessed 18/02/02)
- Bovaird C. 1990. *Introduction to venture capital finance*. Longman Group: Essex
- Commission of the European Communities. 2001. *Communication from the Commission to the Council and the European Parliament on Implementation of the Risk Capital Action Plan (RCAP)*, EC: Brussels
- Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and (IPPC) control Official Journal L 257, 10/10/1996 P. 0026 - 0040
- Diefendorf S. 2000. The venture capital & environmental industry. *Corporate Environmental Strategy* 7: 388-399
- Dow Jones Sustainability Indexes. 2000. <http://www.sustainability-index.com/>, (10/03/02)
- Dyllick T, Hockerts K. Forthcoming, 2002. *Beyond the business case for corporate sustainability in Business Strategy and the Environment*
- Ethical Investment Research Service. 2000. *Changing World of Pensions: Guide for Pension Scheme Members*. EIRIS: London
- European Environment Agency. 2001. *Renewable Energy: Success Stories*. Environmental issue reports: 27. EEA: Copenhagen
- European Private Equity and Venture Capital Association (EVCA). 2000 a. Yearbook 2000. Vanden Broek Graphic Group: Bruges
- European Wind Energy Association, Forum for Energy and Development, and Greenpeace International. 1999. *Windforce 10*. <http://www.greenpeace.org.au/> (10/01/01)
- EVCA. 2001 b. Network news, November 2001. http://www.evca.com/html/press_news.asp, (10/01/02)
- EVCA. 2001 c. Press release. http://www.evca.com/html/press_news.asp, (10/01/02)
- Gompers AP. 1998. Venture capital growing pains: Should the market diet? *Journal of Banking & Finance* 22: 1089-1104
- King AA, Lenox MJ. 2001. Does it really pay to be green? *Journal of Industrial Ecology*. 5: 105-117

- Metrick A. 2001. Facing the challenge of venture capital. *Financial Times: Mastering investment*, **34 567**: 6-7
- Orssatto RJ. 2001. Environmental challenges in organizations. In: *International Encyclopedia of the Social and Behavioral Sciences*, Smelser N, Baltes P (eds). Elsevier: Oxford. **7**: 4590-92.
- Porter M, Van der Linde C. 1995. Green and competitive. *Harvard Business Review*. September-October: 120-134
- PriceWaterHouseCoopers and 3i Group plc. 2000. *Global Private Equity 2000*. PWHC: London
- Raicher S. 2000. European private equity: reaching adulthood. In *Private Equity and Venture Capital: A Practical Guide for Investors and Practitioners*, Lake R, Lake RA. (eds). Euromoney Books: London
- Randjelovic J. 2001. *Toward Sustainability Venture Capital: How Venture Capitalists Can Realize Benefits from Investing in Sustainability-oriented Start-up Businesses*. IIIIEE Reports 2001:12, IIIIEE: Lund
- Reid GC. 1998. *Venture Capital Investment: An Agency Analysis of Practise*, Routledge: New York
- Ross D. 2001. Give us a wave. *Our Planet Magazine*. Energy issue 2001. UNEP: Paris
- Sahlman WA. 1997. How to write a great business plan. *Harvard Business Review* **75**: 98-108
- Social Investment Forum. 2001. *Report on Socially Responsible Investing Trends in the United States*. <http://www.socialinvest.org/areas/research/trends/2001-Trends.htm>, (12/01/01)
- The Centre for European Policy Studies. 2000. Carbon emissions trading briefing note by the UK emissions trading group. <http://www.ceps.be/Research/Workparty/cop6/carbemistrade.htm>, (10/01/02)
- The World Fact Book. 2001. <http://www.cia.gov/cia/publications/factbook/>, (15/01/02)
- Turkenburg WC. 2000. Renewable energy technologies. In *World Energy Assessment: Energy and the Challenge of Sustainability*, (ed). UNDP: New York
- Tybjee TT, Bruno AV. 1997. A model of venture capitalist activity. In *Venture Capital*, Wright M, Robbie K. (eds). Dartmouth Publishing: England
- UBS Warburg Global Equity Research. 2001. *Sustainability Investment*. www.ubswarburg.com/researchweb , (20/02/02)

Van Osnabrugge M, Robinson RJ. 2000. *Angel Investing: Matching Start-up Funds with Start-up Companies*. Jossey-Bass: San Francisco

Venture Economics News. 2002 b.

http://www.ventureeconomics.com/vec/news_ve/2002VEpress/VEpress02_04_02.htm, (20/02/02)

Venture Economics. 2002 a. Source for private equity Industry research.

<http://www.ventureeconomics.com/>, (20/02/02)

Wavegen. 2002. <http://www.wavegen.com/>, (20/02/02)

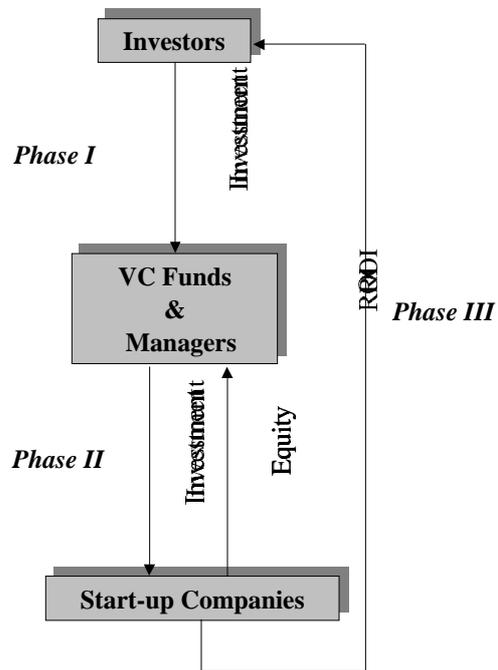
Zider B.1998. How venture capital works. *Harvard Business Review*. **76**: 131-140

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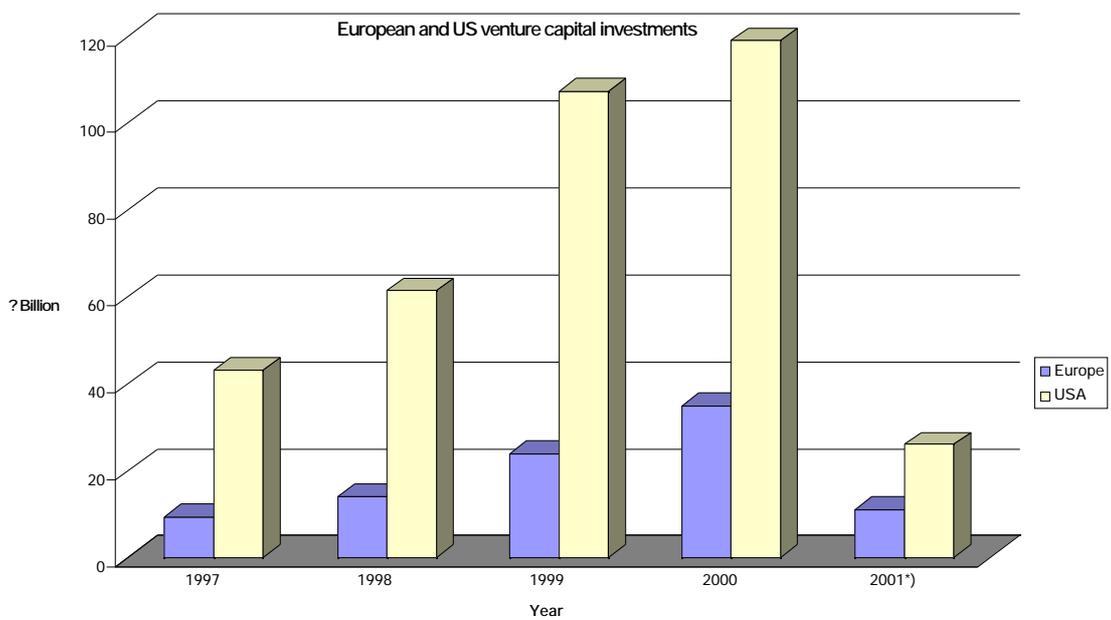
APPENDIXES

Figure 1. The venture capital structure



Source: Adapted from Zider (1998, p. 135)

Figure 2. European and US Venture capital investments during a five- year period



*) This is valid for the first half of the year 2001

Source: Compiled data from: (i) PriceWaterHouseCoopers and 3i Group plc (ii) Venture Economics and (iii) EVCA a. The USD currency was converted into Euros by using Universal Currency Converter at <http://www.xe.com/ucc/convert.cgi>, (03/01/02).

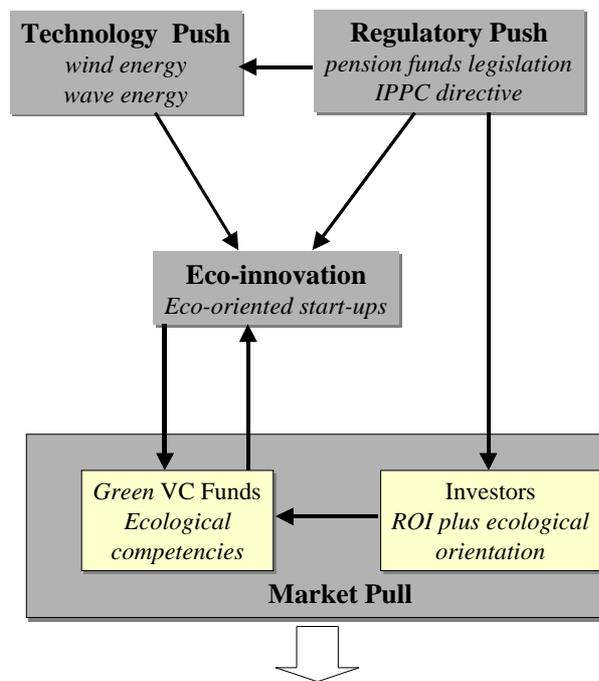
Table 1: Differences between mainstream and *green* VC firms

VC in Europe and USA	Mainstream	<i>Green</i> VC
a) Investment size (Figure 2.)	€154 Billion	€100 Million (0.08% of the size of the mainstream)
b) Number of VCs	Around 1600	Around 45 (4.5% of the number of mainstream)
c) Average amount of investments	€120 Million	€1,1 Million
d) Duration of investment	2-3 years	3-5 years
e) Environmental prerogatives	Environmental risks and liabilities	Environmental or/and social screening
f) Sources of financing	Pension funds and banks	High net-worth individuals

g) Investors orientation	Typical Return on Investment (ROI)	ROI plus ecological orientation
h) Current targets for investments	Communications, Software, Information Technology	Renewable energy, water and cleaner technology equipment

Source: Data for mainstream VC was mainly gathered from websites and publications of EVCA and Venture Economics. Data for *green* VCs was gathered from interviews with *green* venture capitalists and public information in www.sustainablebusiness.com

Figure 3. Determinants of eco-innovation expansion



Source: Adapted from Rennings (1998:326)