# SIO Chronic Diseases

A proposal to establish a programme
for a strategic innovation area

# *SIO CHRONIC DISEASES*

## Content



*Högerklicka i innehållsförteckningen för att uppdatera innehåll och sidnumrering.*

# 1 The strategic innovation area

Since the spring of 2012, Sweden's strong life science regions (Linköping/Norrköping, Västra Götaland, Skåne, Stockholm/Uppsala and Umeå) have established "Sweden as International Centre for Life Science" (SILS) with the aim to develop a world leading ecosystem for life science. The focus has matured into an initiative that is appropriate for a Strategic Innovation Area (SIO) – SIO Chronic Diseases – focusing on chronic diseases, using diabetes as a pilot case. It was accomplished in collaboration with a similar strategic initiative aiming to transform the most excellent diabetes research (Strategic research Environments, SFOs, in diabetes) to innovations and patient benefit. The purpose for SIO Chronic Diseases is to take national responsibility and develop sustainable research and innovation processes for the life science sector in Sweden. This ambition is reflected in the organization and programme management. A newly released VINNOVA report stresses that more coordination is necessary in Sweden (Global trends with local effects -The Swedish Life Science Industry 1998-2012, Vinnova 2014:03). This SIO programme highlights the needs.

Translating life science discoveries into practical applications is an important societal challenge where funding agencies, academia, health care and industry have a joint responsibility. In order to meet the societal challenges identified by EU, which are a) increased capital for innovation development, b) non-communicable diseases and c) effective innovation structures, for the first time a national Swedish structure has assembled addressing each one of these points. Three key actions have been identified to be required to meet these challenges on a national level: (1) efficient platforms for triple helix interactions and early knowledge sharing; (2) clinical excellence and facilitated access and improved collaboration in clinical research and clinical studies; and (3) increased competence, capacity and capital for growth. The proposed initiatives will utilize and coordinate the most excellent Swedish science present in the SFOs, important national research infrastructures, existing innovation systems at universities, health care innovation structures and the Swedish biotech, medtech and pharmaceutical companies with a view of creating an internationally competitive life science ecosystem. The proposed SIO will also act as a Swedish node for linking to EU based inititatives, such as Horizon 2020 (H2020).

Existing infrastructure in the above areas and existing private, as well as public financing initiatives for innovation support, will be used as starting point. These will be further developed and complemented, starting with diabetes as a pilot case, with the aim to increase the pace of innovation in areas of prevention, diagnostics, management and treatment of the disease. Continuous evaluation will allow experience gained in the pilot case to accelerate implementation of similar initiatives in other chronic disease areas, e.g. cancer.

SIO Chronic Diseases does not include direct investments in higher education activities, an area that is essential for the life science sector. However, the need of competence and skilled labour will automatically be taken into consideration when implementing SIO Chronic Diseases due to the participation of several universities.

## 1.1 Definition of the strategic innovation area

SIO Chronic Diseases involves innovation support in all stages; from idea generation (both demand-driven and research-based) and development to implementation in the health care system. Projects/companies aiming to develop new ways to prevent, diagnose, monitor, manage or treat patients with chronic diseases will benefit from the programme. Actors in SIO Chronic Diseases include life science industry in Sweden (biotech, medtech, pharmaceutical), the health care system, academic research institutions and other organizations influencing the value chain, including innovation systems, incubators, biobanks, investment entities and venture capitalists.

Chronic diseases were chosen as a focus area because (A) a solid research base, including basic science, clinical science and epidemiology, makes chronic diseases a Swedish area of substantial strength; (B) chronic diseases present major economic and global health care challenges for society; and (C) chronic diseases offersignificant business opportunities for the life science industry in Sweden and abroad.

To enable efficient implementation of the proposed actions the initiative initially focus on one chronic disease; diabetes (in its widest possible sense, including obesity and metabolic, as well as associated cardiovascular diseases), which on its own contributes to around 7.9% of all health care costs in Scandinavia (Frost & Sullivan, F&S, 2013). Diabetes was chosen for the following reasons: First, there are two governmentally supported SFOs in diabetes in Sweden (Stockholm-Umeå and Lund-Uppsala), which during the last four years have developed and further strengthened the already strong Swedish diabetes research. Second, these two SFOs are already working actively with innovation processes and have together formulated one of the agendas behind this SIO. Third, AstraZeneca, a global pharmaceutical company, recently announced that thesite in Mölndal outside Gothenburg will become one of three strategic global R&D centers with a special focus on cardiovascular and metabolic diseases including diabetes, which means that the entire eco-system required to develop early research findings to patient benefit is present in the diabetes area in Sweden. Fourth, diabetes is one of four diagnoses in the Project 4D (the others being arthritis, breast cancer and congestive heart failure) and conclusions from the pilot can therefore be applied to the other diagnoses. The Project 4D is a triple helix collaboration project, initiated by Karolinska Institute and Stockholm County Council, which aims to accelerate the pace of translating research findings into patient benefit (www.ki.se/4d).

Due to the chronic nature of the disease and numerous co-morbidities that make this patient population particularly sensitive to long-term drug-safety, clinical and regulatory hurdles are considerable. However, the immense size of the potential market has stimulated a growing pipeline of potential new therapies aimed at addressing the unmet needs of tighter glucose control and reduced complications, improved safety profiles and greater convenience for patients. Finally, most of the challenges that need to be addressed are generic for the entire life science sector and the actions proposed in the SIO programme will therefore be applied to other chronic diseases when appropriate.

A generic model for collaboration within life science

The structures proposed in SIO Chronic Diseases will stimulate unique and innovative collaborations involving the life science industry, the health care sector and academia, by focusing on a common objective – solving the diabetes challenges. A key aspect of SIO Chronic Diseases is that it will generate a novel generic model for effective interdisciplinary, cross-sectorial collaboration in the life science area with a view of addressing prevention, diagnosis and treatment. This broad remit opens up direct collaborations with other SIO initiatives, such as Digital Health and MedTech4Health. Thus, it will provide a unique environment for life science organisations; integrating research, innovation, enterprise and health care, thereby creating conditions for industrial and clinical development, improved health and a better life. The pilot programme in diabetes will ultimately result in a generic process that can be applied to other therapy areas.

## 1.2 Current position of the innovation area

An important export industry and employer

Accordning to the recent VINNOVA report, the pharmaceuticals industry in Sweden invests around 7,8 bn SEK in R&D, and the export of the Life Science industry (pharmaceuticals and medical technology) amounts to ca. 90 bn SEK(ca. 8 percent of total export). "In 2012, the industry in Sweden encompassed 40 764 employees in 1 487 companies. Many of the companies have larger operations in other countries but only their activities in Sweden are included. The number of companies in Sweden active in R&D, product development, consulting or manufacturing (i.e. excluding sales and marketing) in life science was 791, with a total of 29 652 employees. Companies dedicated to sales and marketing, often also managing clinical trials in the region, employed 11 113 personnel in 696 companies (Vinnova 2014:03 , p. 11). More than 100 biotech and pharma companies, engaged in R&D in Sweden, were actively working with drug development in 2013. Most companies were micro-sized companies with 10 or fewer employees (79%). Only two companies, AstraZeneca and SOBI were large (>250 employees), and by far the largest, AstraZeneca with 5 800 employees in Sweden. After several years of cutbacks, Mölndal in western Sweden remains the only AstraZeneca research site in Sweden. The site in Mölndal is one of three global strategic research sites focused on research in areas of metabolism, cardiovascular, respiration, inflammation and autoimmunity.

190 companies were engaged in medtech R&D activities in Sweden in 2011; 13 of these were large companies and the vast majority (80%) were SMEs. Elekta, a global medtech company has recently moved all its R&D activities abroad whereas GE Healthcare still has 1600 employees in Uppsala engaged in developing products for medical imaging and medical dignostics and tools for pharmaceutical research. Gambro, Getinge and Sectra are other medtech companies that are making important contributions to Swedish medtech innovations.

Significant research and innovation potential

A large number of human studies are performed at Swedish university hospitals, many of which are lifelong and give vast knowledge on disease mechanisms, prevention and development.

Many research projects performed at universities have the potential to result in innovation in medtech, pharma and information and communications technology (ICT) sectors and high quality academic research is indeed a prerequisite for research intense companies to be active in Sweden. It is therefore of considerable importance that the government's last two research and innovation bills have included substantial investments in biomedical research and its applications. The national programme for establishment of SFOs has created academic life science centers of excellence, several of these focus on chronic diseases, such as diabetes, cancer and neuroscience and other areas of relevance to this programme, e.g. stem cells and regenerative medicine, epidemiology and nanoscience. Several international collaborations through European Framework Programme-financed projects have been initiated in chronic disease areas and research activities and new ideas have been generated. Many of these consortia are coordinated by Swedish universities.

A major competitive advantage for SIO Chronic Diseases is access to world-class biobanks and population-based nation-wide health data registries enabling genuinely population-based genetic studies of multifactorial diseases. The Biobanking and Molecular Resource Infrastructure of Sweden (BBMRI.se, now part of the European BBMRI-ERIC) builds a national infrastructure for biobank samples from patients and healthy volunteers generating new possibilities of discovering diseases at an early stage and determining the best treatment. The Swedish National Quality Registries contain 73 registries (many with focus on chronic diseases) with individualized data from medical intervention and outcomes after treatment.

SciLifeLab represents a unique national research infrastructure, focusing on genetics, molecular bioscience and protein science. It is a collaborative venture between Karolinska Institute, Royal Institute of Technology, Stockholm University and Uppsala University, which already engage close to 1,000 scientists, with a clear national outreach. Two of the diagnoses in the Project 4D, diabetes and heart failure gained funding from the AstraZeneca SciLifeLab call in 2013 in hard competition with hundreds of applications.

MAX IV is already providing, and the European Spallation Source (ESS) will provide new and improved techniques for studying how proteins, enzymes and other biological material work on a molecular and atomic level, potentially leading to substantially increased understanding of pathophysiology.

Other important research infrastructures include Swedish Toxicology Sciences Research Center (Swetox) and Swedish Bioimaging.

So called innovation gateways within the health care system are also important instruments for facilitating the introduction of innovations in health care as well as commercializing ideas from public health care providers.

Sweden has a well-developed incubator system compared to other countries. Each university has an incubator with specific focus on life science offering expert knowledge in business development to early stage companies. Conceptually new incubator structures are evolving, i.e. AstraZeneca's BioHub in Mölndal.

Existing research funding

It is difficult to estimate the research funding in the total life science area, but regarding the two diabetes SFOs, at the four universities Karolinska Institute, Lund University, Umeå University and Uppsala University, a rough estimate would be 0.6 billion SEK annually for academic research in diabetes from the Research Council, EU, as well as from regional sources.

H2020, EU's main funding programme for research and innovation, will run from 2014 to 2020, with a total budget of 8 billion EURO for "Health, Demographic Change and Wellbeing". Several calls in the area of chronic diseases have been announced. The European programme "Knowledge and Innovation Communities" (KIC) will continue under H2020. In 2014 there is a call within "Innovation for healthy living and active ageing", which to a large extent concerns chronic diseases. SIO Chronic Diseases should be viewed as a stepping stone for Swedish organizations to take the lead in larger H2020-funded collaboration projects.

All major universities in Sweden have an Innovation Office. The main objectives of these offices are; to support individual researchers and research activities on issues related to innovation, to support the utilization of research results and to catalyze industrial collaborations. The non-diluted funds (25 + 35 MSEK in 2013) that VINNOVA provide for valorization of research results within the program "Verification for Growth", are important tools for the Innovation Offices and tech transfer organizations.

## 1.3 International competition for the strategic innovation area

Sweden's international competitiveness

Sweden's research and innovation potential was described in section 1.2. Sweden is however in spite of large governmental investments in research and innovation clearly losing ground within the life science area; The Swedish Research Council estimates that Sweden has declined from fourth to eighth position in terms of number of publications and citations over the last two decades and that the country has moved from third to sixth position in terms of number of clinical trials/studies performed. Life science companies have reduced their Swedish workforce; in the pharma industry alone the number of employees in Sweden has declined by almost 50% since 2001. During the same period, the number of employees in the

Danish sector has increased by around 50%. In addition to lost jobs when companies move activities abroad, Sweden lose export and tax revenues and the collective knowledge and competence base erodes. A British study has indicated that the Swedish health care system is less inclined to utilize innovative products than comparable countries; among 14 studied countries Sweden ended up in 13$^{th}$ position. It is thus clear that several countries have overtaken Sweden within the life science.

Unfortunately there is clearly a relative declining trend in life science in all three sectors in Sweden; in academia, in industry, and in the health care system, which has to be reversed. These three sectors are tightly linked, which means that that when one is not functioning properly, it will inevitably influence the others. In order to regain our international competitiveness Sweden must become better at collaborating between sectors and between disciplines. Strengthening links between academia, industry and the health care system is key to turning the declining trend in Swedish life science.

Sweden's main competitors and potential collaborators

Sweden's main competitors in the pharma, biotech and medtech areas are established eco-systems in US and Europe, and emerging eco-systems mainly in Asia are also becoming increasingly competitive:

- San Francisco Bay Area: Close links between world-renowned centers of excellence and universities, including University of California at San Francisco, Stanford University and the University of California at Berkeley, and numerous significant life science companies makes the Bay Area a top-ranked life science ecosystem. Companies with presence in the Bay Area include Novartis, Bayer HealthCare, Takeda Pharmaceuticals, Amgen, Onyx Pharmaceuticals, Genentech, Abgenix and WaferGen Biosystems.
- The Greater Boston area: Home to five of the top eight NIH-funded hospitals and the top five NIH-funded universities, including Harvard and Massachusetts Institute of Technology. Big Pharma companies have established large research centers in this environment while closing down research centers elsewhere. Companies that have made the greatest investments in Boston include Pfizer, Sanofi, Novartis, Shire, AstraZeneca and Merck. The Massachussets Life Science Center, founded five years ago is now the leading hub for life science in US.
- New York/New Jersey: Has the world's highest density of academic institutions, which has attracted numerous significant life science companies, e.g. Pfizer, Merck, Johnson & Johnson, Imclone, Bayer, Celgene, Novo Nordisk, Progenics, Bristol Myers Squibb, Panasonic Healthcare and Allergan.
- Cambridge: One of Europe's leading ecosystems based on the strengths of Cambridge University. The cluster is home to approx. 25 percent of Europe's biotech companies as well as the world's largest medical research charity, the Wellcome Trust. A number of global pharmaceutical companies have operations and/or headquarters in Cambridge, e.g. AstraZeneca, Pfizer, Amgen, Genzyme, Mundipharma and Takeda.
- Munich: Several high-ranking academic institutions, including Ludwig-Maimilians-Universität, Teknische Universität München, three Max Planck Institutes and the Helmholtz Zentrum München, as well as a high density of health care clinics have attracted a wide variety of life science companies, e.g. Roche, GSK, Merck, Daiichi-Sankyo and GE Healthcare. Biotech companies, large corporations, scientific institutions and clinics collaborate in the areas of oncology, and cardiovascular and autoimmune diseases, with the aim to become a model region for personalized and target-oriented medicine.
- Shanghai is an example of an emerging life science cluster with high potential, gathering more than 400 life science companies, research and service institutions. South Korea constitutes another emerging life science cluster.

Boston and Cambridge have been studied within the framework of SILS to obtain a better understanding of their activities.

## 1.4 Contributions to solutions to global societal challenges

Considering the market potential for prevention, diagnosis, treatment and management of chronic diseases, significant business opportunities are obvious for the life science industry in Sweden.The world's population is rapidly ageing and demographic changes result in socioeconomic challenges for health care systems since ageing is associated with an increased prevalence of chronic diseases, such as diabetes, cardiovascular diseases, cancer and Alzheimer's disease, as well as clinical conditions associated to lifestyle. Poor health due to chronic diseases is in fact today greater than from infectious and parasitic diseases, representing a global shift in disease epidemiology. As much as one third of all European citizens are already estimated to have at least one chronic disease and the number is likely to continue to increase. The World Bank has estimated that the cost of health care within EU will increase from 8% of GDP to 14% of GDP in the year 2030. In Sweden, health care costs have increased faster than GDP for several years, a development that clearly is unsustainable in the long run.

Type 2 diabetes is a chronic disease, which constitutes a most significant global health challenge. According to the International Diabetes Federation, more than 317 million people have been diagnosed with diabetes and an additional 187 million are likely living with undiagnosed diabetes. The market for type 2 diabetes therapeutics in China is growing rapidly and is expected to outpace Europe to become the second largest diabetes market in 2017 (F&S, 2013).

Diagnosing chronic diseases early in their development is vital for better and more effective treatment and for solving the socioeconomic challenge. There is a need to advance to earlier diagnosis and improved methods of monitoring disease. Quick and accurate diagnosis benefits individual patients by improving treatment outcome. New, less invasive technologies are needed for early detection of chronic diseases, to enable health care professionals to intervene at an earlier stage of disease progression. This will require an improved molecular understanding of disease mechanisms, onset and progression, as well as a new battery of diagnostic technologies. In addition to early detection, there is a need for new patient-centered and effective treatments and to better monitor the effectiveness and safety of therapies.

Still, a large number of patients with diabetes world-wide will not be diagnosed before diabetic complications, such as neurological, renal and cardiovascular diseases results in the first contact with the health care providers. Therefore, there will be a considerable need for understanding the disease mechanisms, which will lead to better treatments of diabetic complications. Chronic diseases are also tightly coupled to lifestyle factors and a Qualified Mixed Paradigm for Treatment and Prevention (WHO) is necessary to successfully combat these types of diseases. This view is represented in the SFOs and the VINN Excellence Center Anti-Diabetic Food Center, as well as in the Project 4D where people at risk will be identified, and e.g. diet and exercise interventions developed as preventive measures. Here are new opportunities for innovation and novel business, such as IT applications for monitoring and managing appropriate and targeted lifestyle modifications. Another example is innovations within the area of food science, e.g. represented by the Anti-Diabetic Food Centre.

In the near future, mobile applications are likely to play a key role in assisting people with chronic diseases in better managing their condition and as a consequence reduce health care costs. Mobile applications can aid the daily management of chronic diseases by supporting behaviour changes, facilitating communication and easing the hassle of keeping track of all relevant parameters that have an influence on the disease. This is the focus of the recent KIC

(Knowledge and Innovation Communities, a EU initiative on innovation) call "Active Living and Healthy Ageing" from European Institute of Technology (EIT). Sweden and Karolinska Institute plays a key role as the Scandinavian node coordinator for one KIC application.

## 1.5 Vision and future potential for the strategic innovation area

The vision is that in the year 2020 Sweden has a world-class ecosystem for life science, recognized internationally for its efficient interdisciplinary, dynamic network of strong academic research environments, small enterprises,global life science industry and health care system, that together foster innovation, health care solutions and and growthThe ecosystem is well known and attracts international collaborations and investments. A highly competent, coordinated and agile national innovation system will effectively identify and offer support to early stage life science SMEs with high growth potential. The SIO programme is envisioned to place Sweden in the international top five of most innovative life science eco-systems.

The vision is that the structures in the SIO programme will enable actors in the Swedish life science sector, academia, health care as well as industry, to take on leading roles in H2020-financed projects/consortia.

Once successful in the diabetes area, the vision is that the process can, and should be, continously applied to other therapy areas, like cancer, presenting large societal challenges and business opportunities, thus further accelerating the development and growth of the life science sector in Sweden.

The vision will be reached by creating improved conditions for effective cross-disciplinary triple helix collaborations and by capturing an increased flow of commercially viable projects from academia and small enterprises to patient benefit, with the aim to maintain and improve a better life and society.

By allowing small companies access to competences present in large companies and vice versa and by stimulating the generation of new innovative cross-sectorial, interdisciplinary projects, SIO Chronic Diseases will create and maintain employment in the life science sector in Sweden.

## 1.6 Most important needs to fulfill within the strategic innovation area

The relative competitive edge that Sweden has enjoyed in life science has today in many ways eroded s. Increased public initiatives and good basic research results, when judged from an international perspective, have not been transformed into innovations that meet marketplace needs in sufficiently high levels. At the same time, the country faces major challenges within the health care sector, especially due to an ageing population with increasing demands and better economic standards.

SIO Chronic Diseases takes these two challenges as its starting point – the industrial structural changes that affect life science industry in Sweden and globally and the societal health challenges.

It was discussed in the SILS- initiative, that the global pressure for change within industry together with the growing academic and industrial competition from new super economies, such as China and India, has radically altered the conditions for small open economies, such as Sweden. This has been well documented by, e.g. VINNOVA. With an increasing global market and mobility, Africa is the next challenge where health will be in focus.

A global life science industry in transformation

Large life science companies, just like similar companies in other sectors, have adapted to a situation where knowledge is globally available and the costs for searching and acquiring

scientific and other information are radically lower than producing it within the internal organization, or via local collaborations.

One consequence of the globalization of knowledge and the new equilibrium in the world economy is that major corporations, which are also driven by constant demands to increase their stock value, sell off, reduce or close down their research units. In Sweden, this phenomenon was recently demonstrated by the closure of AstraZeneca's research programs for pain and neuroscience in Södertälje and for respiratory diseases and inflammation in Lund,and St Jude Medical´s operation in Järfälla.

It is therefore crucial to find new routes along which novel scientific knowledge and ideas can travel in order to create value. It is only when knowledge is transformed to a novel innovative product or service that the value-creating potential is realized.

The challenge facing Sweden on a national level is that many key elements of the national innovation structure lack coordination. At the same time key existing initiatives, support structures and actors need to become more effectively integrated, aligned and strenthened in order to meet the expectations behind public and to some extent private funding during the last years.

Sweden's most important needs within life sciences – hurdles to be handled

(A) Structured coordination of national and regional investments
(B) Increased accessibility of research infrastructures
(C) Making industrial infrastructure more open for collaboration, e.g. the AstraZeneca open site initiative in Mölndal, the Biohub
(D) Closer contacts and greater access to the research environment's knowledge and platforms, including biobanks and related patient registers
(E) New financing solutions in order to bridge the financial gaps between early-stage R&D phases, i.e. pre-clinical and early clinical validation (Valley of Death)
(F) Sustainable links between regional nodes in the innovation support system
(G) Stimulation of clinical research at university hospitals
(H) A joint network allowing a national entry for clinical studies, meeting varying needs
(I) A health care system involved in development, early testing and critical evaluation of new techniques and treatments
(J) Long-term national strategies, which identify initiatives that will benefit patients, the health care system and industry

SIO Chronic Diseases will support initiatives that will address the needs above, ultimately leading to better prevention, diagnosis, management and treatment of patients with chronic diseases via a more efficient innovation infrastructure. Key elements of the programme include influencing the culture and innovation "readiness" in academia and industry, increasing interaction between all actors in the eco-system, bridging the competence and funding gap between basic research and the test/verification phase, and involving national health care providers in the innovation process. Industry and the health care sector, as well as academia, have to communicate their demands, needs and opportunities.

The work performed in SILS has already resulted in: a recommendation for a delegation for national collaboration in life science; a structure for disseminating good working methods; a policy for making infrastructure investments accessible for R&D; new financial solutions; a follow-up of ongoing investigations in clinical studies. All of these concepts will be applied in SIO Chronic Diseases programme.

# 2 SIO programme

## 2.1 Goals of the SIO programme

Short-term goals to be reached by the end of 2016

- SIO Chronic Diseases have launched the initiatives scheduled to start in 2014-2015
- Improved interaction and communication between academy, industry, the health care providers and end-users (people at risk and patients)
- More projects emanating from triple helix cooperation available for investment
- More effective innovation support systems; sustainable links between the regional nodes that constitute the innovation system
- Increased transparency regarding availability of competence,knowledgeand skills
- Several (5 – 10) SMEs have finalized the pre- and/or growth incubation programmes
- Increased public funding in the early verification phase and novel financial instruments established that bridge later phases of Valley of Death
- Increased opportunities for clinical studies at university hospitals, both early exploratory studies, and early phase I and IIa studies
- Identification of new therapy areas (2-4) suitable for implementation of similar initiatives

Long-term goals to be reached by 2020

- A world leading life science ecosystem.
- Companies continue to develop and grow with an increased number of employees and an increased contribution to economic growth.
- The pace of which biomedical research breakthroughs reach patients is accelerated
- Sweden is attractive for foreign investors and for industry R&D sites, and for global life science industry to perform pre-clinical research and clinical studies/trials in
- Increased number of R&D projects
- New seed companies
- Growth of existing companies
- Successful initiatives are implemented in new therapy areas . A continuous process for identification of new therapy areas is in place.

## 2.2 Contributions for renewal of the strategic innovation area

The initiatives proposed in the programme, addressing identified areas of improvement in different parts of the discovery value chain, will strengthen Sweden's competitiveness in the life science area by increasing and improving interactions between all actors and competences in the ecosystem, by increasing funding in the early discovery phase and by actively involving the health care system in the innovation process.

The programme's contribution for renewal lies in its cross-regional, cross-sectorial and interdisciplinary nature, forming the first genuinely national structure in life science R&D and innovation. The programme will substantially facilitate triple helix collaboration and coordination on a national level and will contribute to competence and knowledge development and result in significantly strengthened networks and relations, which will create value for all involved actors. The programme's strategy is thus to stimulate cross-regional, cross-sectorial and interdisciplinary interaction, from early stage idea/concept generation throughout all phases of the value chain ending with value creation and patient benefit.

## 2.3 Energy relevance

Technology transfer to other sectors, leading to energy savings or new energy sources, may occur. New technology within the life science area may result in both increased energy usage, as well as energy savings. Novel solutions for health care closer to the patients will e.g. ultimately lead to reduced travels with clear reductions in energy consumption.

## 2.4 Other areas affected by the SIO-programme

The generic structure for innovation development is intended to facilitate value-creation in other areas with a need for clinical evaluation in order to overcome regulatory hurdles. The groups involved in different SIO Programme applications within the health area (SIO Chronic Diseases, SIO Digital Health, SIO Involve, SIO MedTech4Health, SIO Swedish Bioimaging National Innovation Platform) have agreed to take a joint responsibility to further strengthen Sweden's position. The programme will demonstrate how different strategies and actions become complementary and part of a concerted effort. The outcome of the joint effort will provide a foundation for Sweden to achieve an internationally leading position within the health area.

## 2.5 Global challenges or developments that effect the SIO-programme

The world's population is rapidly ageing leading to an increased prevalence of chronic diseases, such as diabetes, cardiovascular diseases, cancer and Alzheimers disease, as well as clinical conditions associated to lifestyle, as mentioned in section 1.4. The hurdles and challenges mentioned in 1.6 is also of relevance.The progressive nature of many chronic diseases creates a need for patient-centered education in self-management, addressing the needs of different groups. Development of improved biomarkers for chronic diseases is a key challenge. Novel biomarkers of chronic diseases may improve identification of individuals at risk and constitute possible targets for therapeutic manipulation to reduce risk of disease, i.e. prevention. For diabetes, lipid and inflammatory biomarkers are a step in the right direction and a clear demonstration that the reduced risk of a cardiovascular event is critical for evidenced-based medicine. Achieving this will require effective interdisciplinary, cross-sectorial collaboration.

## 2.6 Expected results and effects

The overall objective of SIO Chronic Diseases is to strengthen the competitiveness of the life science sector in Sweden and consequently make Sweden an attractive country for human capital, investments and industrial operations. The main results and effects are summarized in Table 1 below.

| Vision and goals of strategic innovation area | Results and effects | Actions and activities |
|---|---|---|
| Vision: In 2020 Sweden is a world-leading center for life science and a highly attractive environment for global life science industry to perform research activities in.<br>Goal: Continuously evolving strong research environment with access to valuable human capital, knowledge, infrastructure and financing; increased flow of commercially viable projects from academia and small companies that benefit patients; increased exports | Mainresults: Increased triple helix interaction; increased competence and knowledge of available skills; facilitated process for clinical studies<br>Main effects: More research and innovation solving unmet medical needs reach the patient; increased number of attractive ideas being developed into start-up companies or collaborations with industry; increased visibility, attractiveness and competitiveness of Swedish research in a global market place | The Arena – A platform for Interaction |
| | Main results: More competence and funding in the ecosystem, i.e. increased innovation capacity; several (5 – 10) SMEs have finalized the pre- and/or growth incubation programmes<br>Main effects: More commercial R&D projects in early and late stage; Growth in new companies and increased growth of existing companies; International investors attracted by the increased pace of innovation | $C^3$ |
| | Main results: Clinical excellence; a one point of entry for clinical research, competence, biobanks and patient registries, within a defined therapy area; increased academic and industrial access to health care clinics<br>Main effects: More exploratory clinical studies and early clinical trials (phase I and phase IIA) | Centers of Clinical Excellence |
| | Main results: Documentation of knowledge gained from the diabetes pilot case<br>Main effects: Identification of initiatives that can be implemented in other selected therapy areas | Monitoring and Continuous Evaluation |

## 2.7 Actors

SIO Chronic Diseases is strongly and widely supported by actors in the life science area in Sweden. All actors involved in the creation of SIO Chronic Diseases are listed in the Strategic Innovation Agenda. The organizations that have signed letters of intent are expected to actively participate in the programme, either in the overall programme governance and/or in the management of the proposed initiatives.

Main actors behind SIO Chronic Diseases are (see also enclosed Letters of Intent): ALIS (Association Life Science Incuabators Sweden, including, GU Holding, Karolinska Institutet Innovations AB, Lund Life Science Incubator, Medeon, Sahlgrenska Science Park, Sting, Umeå Biotech Incubator and Uppsala Innovation Center), Apoteket Produktion och Laboratorier, AstraZeneca, Chalmers, County Administrative Board of Stockholm, Elekta, GE Healthcare, HealthCap, Karolinska Institute, LIF, Linköping University, Lund University, Merck, Novo Nordisk, Pfizer, Region Skåne, Region Västra Götaland, Stockholm County Council, STUNS, SVCA, SwedenBIO, Umeå University, University of Gothenburg and Uppsala University.

An important ambition is to involve even more actors, mainly from industry. The ability of the actors to influence the program is guaranteed by representation in Governing Board (also named “styrelse” in Letters of Intent) and Advisory Board (also named “programråd” in Letters of Intent). When the programme evolves, representation of the two boards will be revised in order to mirror the development. Actors that will benefit directly from the SIO programme are specified under each initiative. Programme governance is described in section 3 below.

# 3 Coordination of SIO-programme

The basic idea behind SIO Chronic Diseases is to take national responsibility for the development of sustainable research and innovation structures and processes for the life science sector in Sweden. Theses ambitions will be reflected in the organization and programme management.

## 3.1 Organization and leadership

SIO Chronic Diseases will have an organization that combines a clear structure for both strategic and executive decision making with mechanisms for ensuring the necessary flexibility for renewal in a fast moving area. The proposed organization also ensures continuous evaluation to distinguish successful initiatives that will be prioritized.

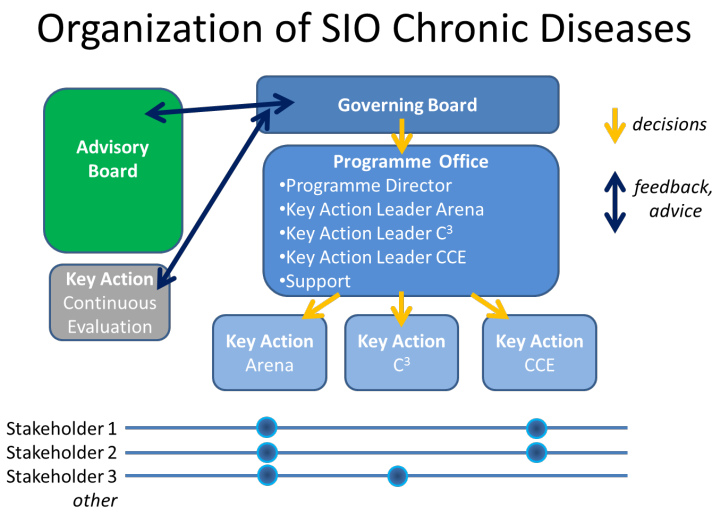


*Fig. 1: Organization of SIO Chronic Diseases*

The different organizational units within SIO Chronic Diseases are described below, as well as their corresponding roles and responsibilities.

SIO Chronic Diseases: **Governing Board**

This is the decision body of SIO Chronic Diseases, responsible for successful realization of the programme as outlined in this application.

The Governing Board will consist of 9-11 members, mainly from industry and the health care sector, but also from academia. The selection of Board members is performed to ensure strong strategic and business skills. Moreover, they are selected to guarantee a coooperative and non-excluding attitude and influence by key stakeholders reflecting the diversity of the Swedish life science area. The Governing Board will meet once in spring and twice during autumn of 2014 and when deemed necessary . The interval between subsequent board meetings is up to the discretion of the board itself, with three meetings per year as a minimum. The Board will at the first meeting establish their Board Work Procedures which will steer the actions of the Board and its individual members throughout this SIO-programme. The Board will also during their two first meetings establish the “CEO Instruction”, i.e. the governing Instruction to the Programme Director. It is proposed that the Governing Board will be chaired by a representative of Karolinska Institute.

The following representatives have agreed to be members of the Govering Board (see also enclosed CVs): Thomas Anderzon, Director, Strategic Initiatives, GE Healthcare; Maria Anvret, Prof., Senior Advisor, The Sahlgrenska Academy, University of Gothenburg; Erik Forsberg, CEO, Uppsala Bio; Martin Ingvar, Vice-Rector, Karolinska Institute; Bodil Rosvall Jönsson, Head of Department Economic Development and Innovation, Region Skåne; Örjan

Norberg, CEO, Lund Life Science Incubator; Erik Renström, Prof., Lund University; Eva Sjökvist Saers, CEO, Managing Director, Apoteket Produktion och Laboratorier; Kaj Stenlöf, Operations Manager, Gothia Forum; and Karin Wåhlander, VP Physician CVMD Translational Medicine Unit, Early Clinical Development, AstraZeneca. The Board will be complemented with additional competences, particulary representatives with an international background.

The Governing board will provide the framework for SIO Chronic Diseases and make strategic decisions on selecting calls for project applications that will be recommended for launching by VINNOVA. It is the responsibility of the Governing Board to ensure progression of SIO Chronic Diseases as outlined in this application and, if necessary, decide on modifications. The Governing Board will give strategic input to the Programme Office. To ascertain broad and international input the Governing Board will also interact with the Advisory Board.

SIO Chronic Diseases: **Advisory Board**

The Advisory Board is aiming at becoming a council for national cooperation in life science and is securing strong industrial as well as investor, health care and research competence. It will ensure broad input to the Governing Board in order to promote strategic discussions and decisions relevant to SIO Chronic Diseases and Swedish life science enterprises in general. The international representation in this group is vital to provide an opportunity for benchmarking with life science/biotech sectors in other countries. The Advisory Board will provide systematic feedback to the Governing Board on the performance of the programme. It is also expected to provide ideas for project calls and other activities in SIO Chronic Diseases, as well as provide general input on how to strengthen the Swedish life science sector to the Governing Board.

The Advisory Board will organize an annual national conference for all major stakeholders in the life science sector. The aim is to further develop and intensify coordination and cooperation through strategic discussions.

The following representatives have agreed to be members of the Advisory Board (see also enclosed CVs/Bios): Catharina Barkman, Director of Innovation, Stockholm County Council), Stockholm County Council; Elisabeth Björk, VP, Global Medicines Development Unit Head, AstraZeneca; Peter Egardt, County Governor, Province of Uppsala/STUNS; Hans Enocson, President and CEO for the Nordic and Baltic Region, GE Healthcare; Per Eriksson, Vice-Chancellor, Lund University; Chris Heister, County Governor, County Administrative Board of Stockholm; Ann-Sofi Lodin, Regional Director, Region Västra Götaland; Karl-Eric Magnusson, Prof. , Linköping University/Umeå University; Karin Markides, Vice-Chancellor, Chalmers; and Jonas Rastad, Regional Director, Region Skåne. The Board will be complemented with additional competences, particulary representatives with an international background and with a background from industry. For instance, discussions are held with representatives from Elekta och Getinge.

SIO Chronic Diseases: **Programme Office**

A **Programme Director** responsible for execution and development of SIO Chronic Diseases as outlined in this application will be appointed. The Programme Director is also responsible for following the “CEO Instruction” and thus for providing the information required for the Governing and Advisory Boards, as well as for the Follow-up Research Team. The Programme Director together with the Governing Board will legally secure that all rules and regulations are followed, including VINNOVAs general terms and conditions for grants, the specific terms and conditions as given together with a successful application etc.

The Programme Director should:

- Have a background and international/national experience that enables an understanding of the conditions under which the different parts of the value chain operate; i.e. the incentives for the Swedish life science industry (biotech, medtech, pharmaceutical), the health care

system, academic research institutions and other organizations, including innovation systems, incubators, biobanks and venture capitalists
- Have managerial skills that allow utilization of existing structures in the value chain and to make these work more effectively in a coordinated manner
- Possess proven strong executive skills suitable in complex industrial, clinical and academic collaboration projects

**The Programme Office.** The Programme is lead by the Programme Director. The Programme Director is ultimately responsible for the coordination of the programme and is aided by the different key actions leaders; together they constitute the Programme Office. This team should prepare drafts for calls for projects within SIO Chronic Diseases. The Office executes the decided activities (as outlined in this application or as decided by the Governing Board) and is expected to identify potential problems and make necessary adjustments to fulfil the goals. Any changes that involve a strategic reorientation should be handed to the Governing Board for analysis and decision.
The Programme Office prepares Governing Board and Advisory Board meetings, with special focus on identifying call areas and on preparing suggestions for calls within the programme (ideas for calls can come from all three proposed initiatives). It should also provide requested information and background material to the Governing and Advisory Boards, as well as to the Follow-up Research Team. The Programme Office, i.e. the operative management of SIO Chronic Diseases, will be established at Lund University.

SIO Chronic Diseases: **Key Actions**
The activities within SIO Chronic Diseases are organized in Key actions, each with an appointed leader. Each Key Action Leader is responsible for delivering to the Programme Director, to VINNOVA or to others as decided. Each Key Action Leader will act as Project Leader/Participant, or other as agreed with VINNOVA and the Programme Director before start of the SIO programme. Key Actions are pursued in a matrix organization that enables the inclusion of all relevant stakeholders and the collected best competence (national and international) that is made available to all relevant partners on a national level.
The work withinKey Actions will be subdivided into clear projects, with time plans, deliverables and milestones that support expected deliverables and facilitate a transparent evaluation process. This clear project evaluation will form the basis for which activities should be prioritized during future development of SIO Chronic Diseases. The Key actions the Arena, $C^3$ and CCE will be led by Lund University, Karolinska Institute and LIF, respectively.

SIO Chronic Diseases: **Follow-up Research Team**
This team is reporting  to the Governing Board. Its tasks are described in section 4.6.

## 3.2 Project plan for the coordination of the SIO-programme

An Interim Action group consisting of the group responsible for completing this application will start, lead and execute SIO Chronic Diseases until a Programme Director and Key Action Leaders have been appointed. A tentative work plan for establishing the SIO programme is presented in Table 2 below.

| Who | When | Action/deliverable |
|---|---|---|
| **Interim Action Group** | May – ? | • Sets dates for first Governing Board and Advisory Board meetings<br>• Advertises for Programme Director<br>• Develops finalized drafts for activites during 2014<br>• Presents planned activites at the 2nd Governing Board Meeting<br>• Finished draft for 1st Call for projects<br>• Formation of Programme Office<br>• 1st Advisory Board Meeting with 2nd Governing Board Meeting<br>• Situation analysis 2014 |
| **Governing Board** | June - Sept 2014 | • 1st Reconstituting Board Meeting<br>• Guidelines for the 1st Advisory Board Meeting Aug 2014 – identify issues to be addressed in the Situation Analysis<br>• Feedback on Key Action plans for 2014 |
| | | • 2nd Governing Board Meeting with 1st Advisory Board Meeting<br>• Decides 1st Call for Projects<br>• Appoints Programme Director, Key Action Leaders and Follow up team |
| | Nov 2014 | • 3rd Governing Board Meeting<br>• Decision on Strategic Plan for 2015 |
| **Programme Office (Programme Director & Key Action Leaders)** | Sept.-Oct 2014 | • Gather Key Action Leaders and establish routines for the Programme Office<br>• Participate in 2nd Governing Board meeting/1st Advisory Board meeting<br>• Prepare 3rd Governing Board Nov 2014<br>• Develop a draft strategic plan for the programme<br>• Deveop a draft plan for activities during 2015 |
| **Advisory Board** | Sept 2014 | • 1st Advisory Board Meeting<br>• Provide feedback to Situation Analysis |
| **Key Action Leaders** | Sept- Okt 2014 | • Team up with Programme Director |

During the startup period the Governing Board will formulate a strategic plan and propose further development of proposed initiatives. The subsequent process of managing SIO Chronic Diseases can be visualized by the annual cycle below.

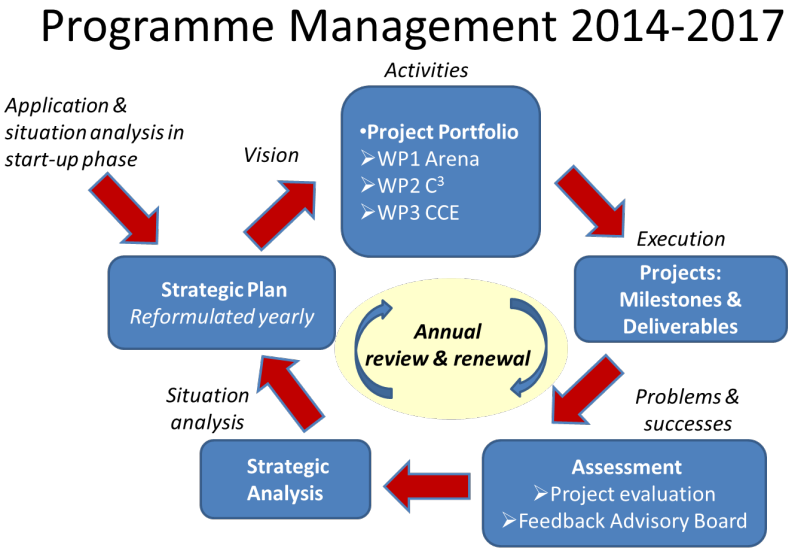


*Fig. 2: The annual cycle of managingSIO Chronic Diseases.*

A tentative time line for coordinating SIO Chronic Diseases in 2015 is presented in table 3 below. This annual cycle will be repeated each year.

| Who | When | Action/deliverable |
|---|---|---|
| **Governing Board** | Q1 2015 | • 4th Governing Board Meeting (optional) |
| | Q2 2015 | • 5th Governing Board Meeting |
| | Q3 2015 | • 6th Governing Board Meeting |
| | Q4 2015 | • 7th Governing Board Meeting<br>• Decision on Strategic Plan for 2016 |
| **Programme Director** | Q1 2015 | • Decision detailed plan of activities 2015, including plan for evaluation |
| | Q2 2015 | |
| | Q3 2015 | • Coordinate project and programme evaluation |
| | Q4 2015 | • Develop a draft strategic plan for 2016 |
| **Programme Office** | Q1 2015 | • Prepare activities in Key Actions for 2015 |
| | Q2 2015 | • Coordinate execution of activities |
| | Q3 2015 | • Coordinate follow-up of activities |
| | Q4 2015 | • Provide Advisory Board with material for evaluation |
| **Advisory Board** | Q1 2015 | |
| | Q2 2015 | • 2nd Advisory Board meeting |
| | Q3 2015 | |
| | Q4 2015 | • 3rd Advisory Board meeting |
| **Key action leaders** | Q1 2015 | • Execution of projects according to agreed milestones |
| | Q2 2015 | • Execution of projects according to agreed milestones |
| | Q3 2015 | • Execution of projects according to agreed milestones<br>• Develop draft plan for activities in 2016 |
| | Q4 2015 | • Execution of projects according to agreed milestones |

## 3.3 Budget for coordination of the SIO Programme

### 3.3.1 Budget for startup phase

The startup period of SIO Chronic Diseases is planned for the time point of decision until December 31st 2014. The tentative work plan for the startup period is presented in table 2 in section 3.2. Planned costs for the startup period are summarized in Table 4 below.

| Budget post | Year 2014 |
|---|---:|
| Salary[1] | 1 100 000 |
| Service[2] | 55 000 |
| Indirect costs[3] | 210 000 |
| Travel | 25 000 |
| Other | 45 000 |
| **TOTAL COSTS** | **1 435 000** |
| VINNOVA Financing | 975 000 |
| Other Financing[4] | 460 000 |
| **TOTAL FINANCING** | **1 435 000** |

Notes:

[1] Director, Key Action Leaders, Administrative support, representatives in the Governing Board and Advisory Board

[2] Communication, Monitoring and continuous evaluation

[3] Rent, office supply, etc.

[4] Karolinska Institute, Lund University and LIF and other actors.

### 3.3.2 Budget for operating the SIO-programme

The plan for managing SIO Chronic Diseases is presented in table 3 in section 3.2. The budget for operating the SIO programme is as follows (Table 5):

| **Budget post** | **Yearly cost** |
|---|---:|
| Salary[1] | 4 300 000 |
| Service[2] | 320 000 |
| Indirect costs | 840 000 |
| Travel | 40 000 |
| Other[3] | 180 000 |
| **TOTAL COSTS** | **5 680 000** |
| VINNOVA Financing | 3 000 000 |
| Other Financing[4] | 2 680 000 |
| **TOTAL FINANCING** | **5 680 000** |

Notes:

[1] Director, Key Action Leaders, Administrative support, representatives in the Governing Board and Advisory Board

[2] Communication, Monitoring and continuous evaluation

[3] Rent, office supply, etc.

[4] Karolinska Institute, Lund University, LIF and other actors.

# 4 Proposed actions and activities in the SIO programme

## 4.1 Existing actions and activities to be used within the SIO-programme

There are several existing and planned programmes and research infrastructure entities and initiatives such as the SFOs, the Project 4D, InnoLife and other H2020 and SIO initiatives, BIO-X, life science incubators, tech transfer organizations and innovation offices, SciLifeLab, investigations such as Starka Tillsammans (Investigation of clinical research, SOU 2013:87) and related actitivites. These are just a few examples, several of which are already highlighted in previous sections, addressing important needs in the life science sector, and having an impact on how the current SIO programme is structured.

A key strategic direction of the SIO programme is to build on these already existing and planned support structures, initiatives and recommendations for life science development and growth. It is considered to be of particular importance that recommended actions do not add complextity to an already fragmented life science sector. On the contrary, it is a long-term objective that recommended actions will reduce hurdles and provide important incentives to both academic, health care and industrial partners to engage in developing ideas and products addressing important medical needs and health challenges facing society today and tomorrow.

It is our firm belief that the SIO programme organization (see Section 3) and staff will provide a unique and visionary leadership that has the ability of fostering a climate of cooperation and coordination in bringing key and cutting edge competences, capabilities and resources together with a view of stimulating industrial growth and ultimately improving health. Several ongoing life science initiatives in Sweden and Scandinavia are clearly linked to the SIO programme (other SIO programmes and agendas, such as MedTech4Health, Digital Health and Our Health – An Agenda for Health Promotion and Prevention Innovations Adapted to Today's Society, InnoLife, VINNOVA K3 projects, such as Step up and Drug Discovery & Development Resource and Competence Network, SciLifeInnovation, IMI etc.) and it will be one of the tasks of the SIO programme Leadership to coordinate with the aim to become the key coordinator identifying demands, opportunities and needs for improvements in order to optimize SIO actions in relation to other relevant life science programmes and to keep a close liason with these initiatives.

## 4.2 Summary of actions

Table 6 presents a summary of activities that should be financed by the SIO programme.

| Action | Description | Targeted groups | Duration (start/end) | VINNOVA financing | Other financing |
|---|---|---|---|---|---|
| The Arena | A national platform for triple helix interaction | Industry, health care, academia | 2015-2016 | 1 580 000 | 1 580 000 |
| $C^3$ Competences, Capabilities & Capital | A national elite platform and accelerator for life science incubation and growth | Industry, health care, academia | 2015-2016 | 44 000 000 | 44 000 000 |
| Centers of Clinical Excellence | A hub for clinical competence, research, biobanks and patient registries, within one therapy area | Industry, health care, academia | 2015-2016 | 5 000 000 | 5 000 000 |
| Monitoring and Continuous Evaluation | Documentation of knowledge gained from the diabetes pilot case | Industry, health care, academia | 2015-2016 | 400 000 | 400 000 |

## 4.3 Action 1: *The Arena – A platform for interaction*

### 4.3.1 Description

The operational model of the global life science industry has changed from having most activities in-house to externalizing a significant part of research activities. Alliances with leading external organizations are created to reduce risk, improve flexibility and increase the flow of new concepts for treatment, management, diagnosis or prevention of major health challenges into the pipeline.

The blockbuster model of drug discovery is replaced by efforts to target new agents to specific subsets of diseases. This approach will most likely lead to improved treatment outcomes and thus clinical and societal value creation. Patient stratification requires better access to biobanks, to which the life science industry today have limited access. Academia in Sweden, on the other hand, is in a unique position to facilitate stratification of diabetes and related diseases, due to its access to clinical material and some of the best biobanks in the world, not least so in diabetes. It should be noted that biobanks containing patient material are owned by public health authorities, while biobanks with material from healthy individuals can be owned by academia.

An emphasis on individualized treatment also highlights the need for development of new tools to facilitate everyday life for individuals with chronic diseases, e.g. diabetes. This harmonize with the evolving e-health paradigm that engages the patient as an active partner in defining the ideal treatment for him/her. This will create a demand for new products for diagnosis, self-monitoring and management of disease. New technology will also assist the individual in pursuing lifestyle changes that minimize the risk of secondary complications, with reduced costs for health care and improved quality of life.

The propositions is to facilitate academia-industry-health care interaction, which will (1) increase the flow of academic projects with innovation potential to industry and the health care sector; (2) perfect development of technical aids; and (3) facilitate the industry's setup of early clinical studies aiming at individualized treatment, e.g. based on genomic markers, other biomarkers and signaling pathways. The use of a range of biomarkers will improve the discovery and development processes for both drugs and devices, by significantly reducing cost and risk, and will lead to improved treatment outcomes, and thus clinical and societal value creation.

Today there is no continuous and structured national platform for interaction and early knowledge sharing between academia, industry and the health care system with a specific focus, such as diabetes. All these actors have prevention of diabetes and best possible care and treatment of diabetes patients as their ultimate goal. Bringing these actors together in meetings focused on unmet medical needs should benefit the activities of all these actors. Meetings focusing on specific topics that are not only related to diabetes itself is proposed, but also to associated conditions such as obesity and cardiovascular complications, e.g. retinopathy, nephropathy, neuropathy, atherosclerosis etc. In order to facilitate early collaboration between academia, industry and the health care system, a national interaction platform – The Arena – is proposed, regularly gathering different expertise with a specific insight and interest in diabetes, as a roadmap for interaction within life science.

The Arena will become a venue where academic and industrial researchers can get initial feedback on their ideas and early concepts and find partners for further evaluation and development. The Arena should also serve as a platform where the commercial sector can find relevant academic groups to perform early human validation studies and where clinical trial units for academic or commercial projects can be found. A common understanding of unmet needs and how these can be addressed will be obtained. The Arena will facilitate maturation of strong research performed in Sweden and attract industry to early academic innovation projects in order to maximize value creation.

Meetings will cover commercial, legal, clinical and scientific issues. The scope of the meeting is inspired by LUDC's previous efforts in this area (IDEA Summit; http://www.ideasummit2013.se/), which gathered representatives of leading international academic diabetes centres and industry. The concept will be adapted to perfectly match the needs of industrial life science partners in Sweden.

The meeting programme will include both plenary discussions and room for more private discussions as part of forming new collaborations. Academia will provide insight into the latest Swedish diabetes research, including early stage pipeline research and publications at universities. The meetings will emphasize networking activities and include elements of speed dating, online booking of meetings with individuals participating.

A virtual web-based portal will effectively communicate diabetes research to stakeholders and stimulate new collaborations between academia and society in order to generate strong research, innovation and new companies. It will serve as a single entry point to the Swedish diabetes research area and will gather research and researchers, also from other disciplines with connection to the diabetes area, including medtech, e-health, food etc. The portal will always be open and available for information, contact and matchmaking.

### 4.3.2 Expected results and effects

Expected results:

- Facilitated first contact between industry, the health care system and academia
- The creation of trust between all parties, as well as facilitating exchange of knowledge that is useful for all partners involved
- Increased number of scientific concepts evaluated for their commercial potential.
- Increased number of clinical trials in the diabetes area
- Collaborations will be generated in the crosstalk between academia, industry and the health care system as areas of common interest are identified
- Increased number of projects that are suitable for further development in the VINNOVA Verification for Growth, BIO-X, or other existing incubator programs
- A roadmap for interaction in life science that add value for all actors

Expected effects:

- Better and safer treatments
- Increased number of devices enhancing self-monitoring, lifestyle changes and treatment
- More research and innovation solving unmet medical needs reach the patient
- Increased number of attractive ideas being developed into start-up companies or collaborations with industry
- Lower attrition rate of industrial life science projects
- Shorter time to market
- Increased visibility, attractiveness and competitiveness of Swedish research in a global market place
- New jobs and career opportunities for researchers from academia as well as industry

### 4.3.3 Time plan and budget

Day conferences

Planned meetings will be arranged with the aim to decide contents of web portal and programme and legal aspects, as well as meeting formats. The web portal can be set up and launched Oct-Nov 2014. In Year 2015-2016 biannual (spring and autumn) meetings will be arranged.

The first meeting will take place in Lund/Malmö in the spring of 2015. The meetings may subsequently rotate between strong academic diabetes centres. In order to attract global life

science industry, the proposition is that the symposia can alternate between locations in Sweden and important international hubs for diabetes research, e.g. Boston and/or Munich.

Before the meetings it is important to handle issues of confidentiality in order to facilitate discussions. Prior to the first meeting, general rules of conduct, what type of information that can be handled in the plenary sessions and a system for handling more confidential information, e.g. with on-site CDAs, will be agreed on.

We also propose to organize an AIMday with specific focus on diabetes. AIMday presents, just as the Arena, opportunities for academic scientists and companies to make contact and exchange knowledge. But whereas the Arena is an open platform for continues interaction, which will stimulate the birth of new ideas/concepts, AIMday is a partnership tool where companies and other organizations are invited to submit specific issues formulated as specific questions, which are discussed by a panel of academic scientists.

Web portal

Complementing the symposia, a web-based portal, administered by Lund University, will facilitate interactions between partners active in diabetes research and will be a tool for communication with other disciplines. This portal will provide the visitor with a clear overview of all actors in translational diabetes research and thereby facilitate direct communication with the most appropriate partner. Administrators will make use of their insight in the field and act in a proactive manner to suggest contacts between partners. The website will serve as a billboard for other innovation activities and meetings in Sweden.

Once the Diabetes Arena has proven ability to attract industry and stimulate collaborations, national as well as international, it can be expanded to other indications. Continued evaluation of the Diabetes Arena will support implementation in other areas.

Budget

| **Budget Post** | **Q4 2014** | **Year 2015** | **Year 2016** |
|---|---:|---:|---:|
| Project organization | 250 000 | 1 000 000 | 1 000 000 |
| Meetings | 100 000 | 400 000 | 400 000 |
| Web Portal Administration | 50 000 | 200 000 | 60 000 |
| Other Costs | 50 000 | 50 000 | 50 000 |
| **TOTAL COSTS** | **450 000** | **1 650 000** | **1 510 000** |
| VINNOVA Financing | 225 000 | 825 000 | 755 000 |
| Other Financing | 225 000 | 825 000 | 755 000 |
| **TOTAL FINANCING** | **450 000** | **1 650 000** | **1 510 000** |

Notes: Some activities can start already in 2014. Part of the budget for project organization is also included in the budget for the start up phase and in the budget for operating the programme in 3.3.

The Arena will be directed by a board consisting of 9 members representing major stakeholders. A representative of the hosting organization will be chairing the board. The board will meet 4 times/year.

A smaller executive board with 3-4 persons that makes decisions between board meetings and reports to the board will be assigned.

LUDC will be responsible for updating the web portal and will be the first point of contact for external visitors.

### 4.3.4 Targeted groups

Pharmaceutical, biotech and medtech industry, the health care system and academia, including all actors involved in activities aiming for development of novel strategies for prevention, diagnosis, management and/or treatment of diabetes and related complications.

### 4.3.5 Communication and knowledge transfer

Reports, information material, web sites, articles in press, targeted activities and specific events.

## 4.4 Action 2: *Competences, Capabilities and Capital (C3): A National Elite Platform and Accelerator for Life Science Incubation and Growth*

### 4.4.1 Description

Sweden belongs to the international elite when looking at the innovation scoreboard, but the picture is less impressive when considering the growth of small biotech companies and the number of new viable businesses being started. Though, the country does not seem to be able to capitalize on the excellent research environment and innovation performance and translate them into viable and successful startups. There is a"missing link" between research and development opportunities and access to markets, capital and thriving life science companies.

***Competences, Capabilities and Capital ($C^3$)***: With the objective of creating successful high growth companies, Sweden must capitalize on all the outstanding competences available in the country. It is necessary to create a national, as well as cross-border "eco-system" characterized by high quality research, a positive investment climate attracting large companies and entreprenuers, competent technology transfer organizations and incubators capable of assisting in catalyzing rapid progression of projects and growth of small companies. Establishing cross-region and cross-border networks of competences and capabilities is vital for early life science projects and SMEs with a view of propagating a faster commercial growth.

The global economic crisis in combination with high risks, increasing costs and regulatory demands in drug and medtech development have led to a significant reduction in venture capital for life science projects. This is particularly true in Sweden. Many new ideas are not developed because of lack of funding for critical early validation studies (preclinical and early clinical validation, PoC). Early projects emanting from academic research are rarely mature enough to attract funding from industry or investors. In addition, academic researchers often also lack the incentives to develop an idea further to a stage where it will generate attention by investors. A key factor preventing both academic and small company researchers to successfully develop new ideas is the lack of critical scientific, regulatory and industrial competences. There is therefore a "Valley of Death" characterized by lack of competences, capabilities and capital facing many fundamental discoveries that may have significant commercial potential.

The current basic financing (in blue boxes) of the various phases of discovery and development of new drugs and medtech products is outlined below. The so called "Valley of Death" covers the preclinical verification/PoC phase and the phase leading up to, and including, clinical PoC. With a view of improving the success rate of academic research ideas progressing into the development phase the first recommendation is that public funding in the early verification phase is strengthened, which could involve private and corporate funding as well, and, second, that a public-private initiative is established bridging the subsequent phases of the Valley of Death (red boxes).

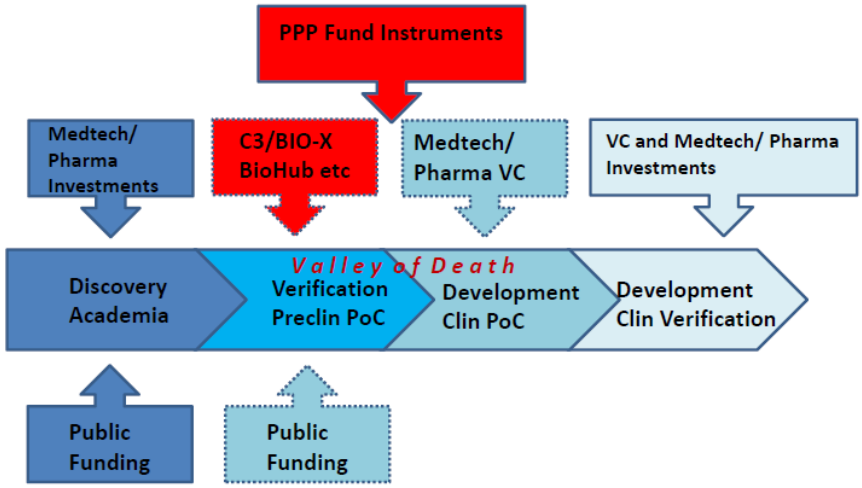


*Fig. 3: Current and proposed financing of the various phases of discovery and development of new drugs and medtech.*

***Public-Private Partnership***: One proposition is to investigate the possibility of establishing novel financial instruments in the form of a public-private partnership (PPP) which can also include institutional investors. The novel PPP will have a longer investment perspective compared to traditional venture capital. The European Investment Fund (EIF), the venture capital fund HealthCap, ALMI Invest and other VC funds are positive regarding the concept of creating such a financial instrument and in participating in further discussions. Other potential investment partners, private as well as institutional, will be identified for this initiative. The dialogue will also be extended towards the SIO-programme MedTech4Health because one of its key actions is "Bridging the Valley of Death".

The overall aim of the project is to create a novel financial instrument that will bridge the Valley of Death facing life science SMEs engaged in research targeting important chronic diseases. This will stimulate growth of existing companies and together with other SIO initiatives it will ultimately lead to an increased flow of innovative projects from academia and small companies. The overall aim will be achieved by (A) investigating the possibility of establishing financial instruments providing early PoC funding of projects with commercial potential; (B) analyzing the legal and financial conditions; (C) investigating the interest of various stakeholders; (D) negotiating participation; and (E) the final implementation of the novel instrument.

The intention is that the PPP fund will complement early stage investments and instead of paying a premium price for an early project, the investors will provide means of covering the costs related to maturing the project to PoC, i.e. the investment capital will go to developing the project and not to early return on investments. By sharing development risks it is believable that large life science and venture capital companies will be willing to increase their involvement in innovative research projects at a much earlier stage of development compared to today. Consequently, this structure not only addresses the funding gap, it also introduces medtech, drug discovery, and industrial development competence at a much earlier stage. The recently announced AstraZeneca BioHub concept is an initiative that may provide an excellent opportunity of aligning investments, competences and capabilities. Incorporated companies or foundations may be formed around individual projects allowing various industrial partners/investors to enter specific projects that fit their R&D portfolio. PULS is another example of an incubator providing both competence and capital. An optimal

organizational structure of a PPP investment instrument will be the focus of the analysis suggested below.

***The C³ Accelerator Platform***: C³ is a national early stage development platform that will accelerate the transition of new life science ideas to start-ups and industry, starting with diabetes as a pilot indication. The C³ Accelerator will use and develop existing successful regional innovation infrastructure and programmes funded by VINNOVA, other public funders and industry rather than build new structures. Cross-region and cross-border cooperation is therefore essential to create teams of expertise with the right market insight and industrial and regulatory know-how.

The C³ Accelerator will primarily be built on:

(a) the current BIO-X programme, which has been thoroughly tested in the Stockholm-Uppsala area. C³ will use experiences gained in the BIO-X programme and develop additional activities that will further enhance Swedish life science SME capability to grow and develop into competitive international companies.

(b) existing incubator programs, TTOs and innovation support structures.

(c) new concepts such as the recently announced AZ BioHub in Mölndal. The BioHub focuses on embedding SMEs within the AZ R&D site offering access to competences and capabilities.

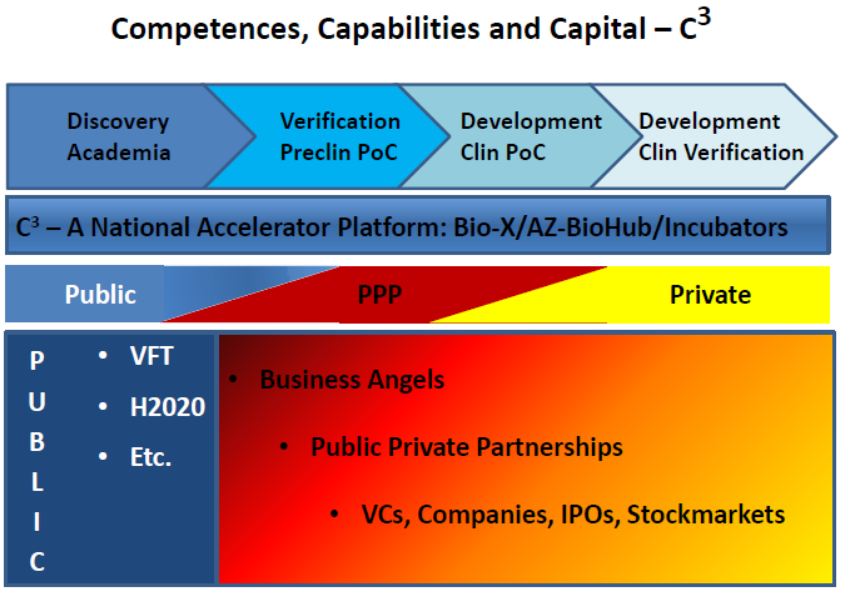


*Fig. 4: The C3 Accelerator platform.*

***A C³ Accelarator project in summary***: The aim of the C³ program is to rapidly take a carefully selected product concept/start-up company to a stage where it can attract commercial interest from the investor community (such as the PPP fund). A C³ project is normally running for 2-3 years with a budget of 8 million, 4 million being provided by the C³ program. The C³ program is not taking any equity in the project/company and the financial support is only paid out when agreed milestones have been reached. The project is supported by competences provided by an extensive network of relevant experts.

The C³ will link existing innovation offices and incubators with a documented know-how in life sciences to the C³ program, thus creating a national network of business coaches, experts and specialist competencies that can be used nationwide. The AstraZeneca BioHub, which aims at supporting small companies at the stage after the seed phase where incubators traditionally operate, will become an important part of the national network.

### 4.4.2 Expected results and effects

By implementing the $C^3$ Accelerator in the SIO-programme as a national early stage development platform for life science growth, VINNOVA is offered an opportunity to harvest the benefit of the considerable investment that has been made over ten years in Uppsala BIO's open innovation program BIO-X and at the same time taking advantage of new industrial initiatives, such as the BioHub. It is also an opportunity to leverage the public investments made in university research and regional business incubators by linking these, as described above, to the $C^3$ program. Establishing a new financial investment structure based on a risk sharing PPP will provide important means of bridging the "Valley of Death" and further stimulating growth.

In addition, the $C^3$ platform can itself be regarded as a scalable and transferable process of implementing innovation initiatives in both national and EU programs.

The expected results of $C^3$ Accelerator during the project period are:

- More competences and funding available to support the innovation of new ways of addressing diabetes. With time other chronic diseases where Sweden has a strong research and business community will be introduced
- Earlier involvement of life science industry and venture capital expertise in innovation projects
- More research/innovative ideas generated from interaction between academia, healthcare and industry
- More innovation projects based on academic research
- A sustainable and risk-sharing investment environment

and more specifically:

- 20-30 proof of concept projects with potential to attract industry or investors after exit from the $C^3$ program are identified
- 10-12 of these projects recruited into the $C^3$ program are offered substantial financing and R&D and business support etc.
- 7-9 proof of concept projects are developed that either form the bases for new SMEs in the incubators or a partnership with existing Swedish international large companies.
- 3 out of the 7-9 proof of concept projects/SMEs, which have high growth potential, will receive additional support including funding and access to a national network of business coaches, experts and specialist competencies.

The expected effects after the project period are:

- Increased growth of existing companies
- International investors attracted by the increased pace of innovation in the diabetes area and subsequently introduced indications
- Increased flow of innovative products reaching the patients
- Continued strong research environment
- Strengthend and more effective national life science innovation systems
- The executed $C^3$ projects/SME's have attracted >500 MSEK investment capital
- many new jobs are created

### 4.4.3 Time plan and budget

The scope of a general $C^3$ Accelerator program can be described by a series of different work packages (WP) and can be modelled on the BIO-X, the envisioned BioHub platform or other relevant incubator platforms available in the $C^3$ network

**Table 8 – C$^3$ Accelerator time- and workplan**

| | |
|---|---|
| **WP1: 36 month**<br>Establising an expert network | In collaboration with e.g. innovations offices and life science incubators, a database of external experts to be used in start up projects is established. |
| **WP2: 9 months**<br>*Problem definition/needs assessment and calls* | Research themes based on needs for prevention, diagnostics and treatments are defined jointly by representatives of academy, health care and industry followed by a call. |
| **WP3: 3 months**<br>*Matching companies/users, researchers and project selection (**Selection**)*<br>*Agreement regarding contracts and project plans* | An advisory board (academy, health care, industry and Vinnova ) selects the most interesting proposals. Supported by business coaches and incubators, external experts, companies, investors, and other relevant actors are invited to work with the selected researchers/proposals. Project plans are formulated and key milstones defined Reaching key milestones will become important to trigger funding. Contracts are negotiated before the start of a project. |
| **WP4: 12-24 months**<br>***Execution** of the project* | Project progression is continuously evaluated and reviewed, Project not complying will be closed. |
| **WP5: 12 months**<br>*Extended business incubation support* (***Acceleration***) | **Activity.** Executed projects with high growth potential are selected by support from the Advisory Board and Vinnova andprepared for further investments and additional expert support |
| **WP 6:** *Financial solution for life science SMEs* | C$^3$ will appoint a project leader with the task to develop and coordinate establishing new PPP financing instruments.<br>Establishing the PPP investment fund is planned to involve:<br>1: Legal analysis of the optimal organizational structure (3 months)<br>2: Probing for participation with prospective partners (3-6 months)<br>3: Negotiation of participation with prospective partners (6 months)<br>4: Formal formation of the novel financial instrument (6 months) |

The budget of C$^3$ Accelerator and establishing the financial instrument follows the work packages as outlined in table 8. A fulltime project manager and project team (consisting of 5-8 members representing major stakeholders and relevant organizations) will lead the effort of the PPP project. Planned costs and revenues for C$^3$ are summarized in Table 9 below.

| Budget posts | Q4 2014 | Year 2015 | Year 2016 |
|---|---|---|---|
| Salaries | 500 000 | 10 000 000 | 11 000 000 |
| External expert support | 200 000 | 3 000 000 | 4 000 000 |
| Project support | - | 20 000 000 | 38 000 000 |
| Other cost | 500 000 | 1 000 000 | 1 000 000 |
| **TOTAL COST** | **1 200 000** | **34 000 000** | **54 000 000** |
| Vinnova financing | 600 000 | 17 000 000 | 27 000 000 |
| Other financing | 600 000 | 17 000 000 | 27 000 000 |
| **TOTAL FINANCING** | **1 200 000** | **34 000 000** | **54 000 000** |

Notes: Some activities can start already in 2014. Part of salaries is also included in the budget for the start up phase and in the budget for operating the programme in 3.3.

### 4.4.4 Targeted groups

The initiative C$^3$ – Competences, Capabilities and Capital addresses major deficiencies in the current life science business environment. Strengthening of financial support in the early proof of concept/verification studies coupled with availability of key competences and capabilities is expected to allow transition of viable ideas and small businesses and start-ups into the next phase where major investments are needed for development and growth. The novel PPP financial instrument that is envisoned to be established will benefit the life science industry and the health sector in general by increasing the amount of available risk funding for SMEs, leading to increased growth of these companies, and increased flow of innovative products reaching the patients.

### 4.4.5 Communication and knowledge transfer

Information about $C^3$ will be dessiminated through partners and existing networks and access to competences and capabilities will be offered as one key component in the process of selecting project and companies in the accelerator program. It is also envisoned that $C^3$ will be highlighted at Arena meetings.

## 4.5 Action 3: *Centers of Clinical Excellence*

### 4.5.1 Description

Clinical studies and research contributes to development of new, safer treatments and help increasing the health care provider's competence. The international competition is fierce in this area and the advantage that Sweden has had is shrinking rapidly; the decline in the number of clinical studies is greater in Sweden than in many comparable countries. Clearly, clinical research can be more effectively integrated in the Swedish health care system than is the case today. SIO Chronic Diseases strive for a health care and research in the absolute international forefront, that together with an attractive life science industry will constitute a collaborative innovative environment leading to an increased pace of development and evaluation of new diagnostic methods and treatments.

It is becoming increasingly clear that several of yesterday's diagnoses in many cases are made up of several sub-diagnoses where each group requires specific treatments. Our growing understanding of genetics and other biomarkers is indeed allowing us to provide better diagnoses, safer drugs and more effective treatments, i.e. personalized medicine. Implementing personalized medicine is a challenge for the health care industry but promises to be a great success for the patients. The implementation of personalized medicine will require effective interactions between industry, the health care clinics and academic researcher.

Explorative clinical studies experience bottlenecks both in academia and industry. Establishment of Centers of Clinical Excellence (CCE) that can meet these challenges by providing hubs for the global research and clinical expertise, in this case in the pilot indication, diabetes. The centers will also be the industry's entry point for access to clinicians, academia, as well as to patient registries and biobanks, which are national infrastructures, managed and financed by public resources in the health care system. In order to make more effective use of these resources, interactions with the life science industry need to be strengthened and developed. This is indeed an essential requirement that can attract both early explorative studies and larger multinational clinical trial programmes to Sweden. The CCE concept also aims at facilitating for the clinic to dedicate and secure time, have access to clinical research knowledge and support regarding start up and execution of clinical studies. CCE should also contribute early "real world data" for newly approved treatments.

From an industry perspective, having a one-point of entry to academic and clinical discussion partners, biobanks and patient registries will enable fast response to trial requests and effective set up and execution of clinical research. The interaction between medical doctors and researchers in all functions will be facilitated so that they can jointly discuss and develop clinical projects. These projects may be early clinical studies where disease mechanisms are evaluated with or without treatment or early phase I and phase IIa trials where reversibility of the disease process is studied with various drugs. This interaction will also ensure that industry, health care and academia will gain insight into unique medical issues at an early stage, as well as contribute to efficient evaluation and implementation of innovations in the health care system.

Academia would in these collaborations benefit from the deep knowledge of the design and standardization of clinical studies, which would facilitate selection of sustainable concepts for

further development. An increased number of clinically verified academic projects that can be offered to industrial partners or the health care system would increase the pace of translation of research results into clinical benefit and thereby strengthen the competitiveness of the life science sector in Sweden.

The possibility of a dialogue between industry, the health care system and academia currently vary in different regions of the country. With the establishment of CCE, the proposition is to strengthen this dialogue via workshops with all stakeholders organized biannually.

CCE will after the pilot not be restricted to the diabetes area but should be a collaborative model for dynamic and open interactions between different stakeholders within life science, which following evaluation can be expanded to other therapy areas.

### 4.5.2 Expected results and effects

Expected results:

- Increase knowledge level within clinical research in Sweden
- Increased understanding of medical needs
- Increased number of clinical studies, initiated by both academia and industry, performed in Sweden
- An attractive climate to conduct clinical trials in Sweden vs other European countries
- More effective use of biobanks and patient registries

Expected effects:

- Better and safer treatments
- More research and innovation solving unmet medical needs reach the patient
- Increased number of attractive ideas being developed into start-up companies, biotechs or collaborations with industry
- Increased competitiveness which generates more industrial investments in the Sweden
- Sweden will be regarded as an attractive country to perform clinical studies/trials in

### 4.5.3 Time plan and budget

A call for CCE within SIO Chronic Diseases will be launched at latest Aug 2014. Three CCEs will be selected by the SIO Chronic Diseases Governing Board depending on the level of commitment to the essence of SIO Chronic Diseases as expressed in this application, existing infrastructure, relevance of expertise of the unit and willingness of co-financing.

Planned costs for the CCE are summarized in table 10 below.

| **Budget post** | **Q4 2014** | **Year 2015** | **Year 2016** |
|---|---|---|---|
| 3x CCE | 1 250 000 | 4 000 000 | 4 000 000 |
| Project organization | 250 000 | 1 000 000 | 1 000 000 |
| **TOTAL COSTS** | **1 500 000** | **5 000 000** | **5 000 000** |
| Vinnova Financing | 750 000 | 2 500 000 | 2 500 000 |
| Others | 750 000 | 2 500 000 | 2 500 000 |
| **Total finansiering** | **1 500 000** | **5 000 000** | **5 000 000** |

Notes: Some activities can start already in 2014. Part of the budget for project organization is also included in the budget for the start up phase and in the budget for operating the programme in 3.3.

Representatives of the selected CCE will meet regularly to coordinate activities and arrange face to face workshops together with the industry, academia, health care providers and patient organizations. To maximize dissemination, these activities are coordinated with other meetings within the SIO Chronic Diseases Arena work package.

### 4.5.4 Targeted groups

Pharma, biotech and medtech industry, contract research organizations, the health care system,academia and patient organizations.

### 4.5.5 Communication and knowledge transfer

Communication with industry will be the trade associations LIF, SwedenBIO and Swedish Medtech as well as individually. Within LIF, there is a Committee for clinical research, which may constitute a possible evaluation board for this initiative. Alternatively, a Task Force focused on diabetes can be set up. LIF will also inform and include current Contract Research Organizations. Each company that is active in the diabetes area will inform their clinical trial headquarter about this initiative and that it should contribute to facilitated access to biobanks and patient registries and a more rapid response and quicker start up and implementation of trials in Sweden.

## 4.6 Action 4: *Monitoring and Continuous Evaluation*

### 4.6.1 Description

The main objectives of this initiative are to support successful implementation of the SIO programme and to facilitate selection of initiatives to be implemented in other disease areas. The initiative includes monitoring, as well as continuous evaluation. It is divided into three parts: (1) Continuous Evaluation: The Follow-Up Research Team will independently assess the development of the programme in relation to expectations, i.e. objectives (focus on processes, not life science). The Follow-Up Research Team will continuously provide feedback to the programme in the form of reports to the Governing Board. Learning will be in focus, not evaluation as such, in order to enable adjustments during the course of the programme. (2) Statistical Analysis/Impact Evaluation: This activity will define a starting point from which the effects (on the life science sector) of the initiatives proposed in SIO Chronic Diseases can be evaluated. Both global trends and national impact will be considered. The analysis reports containing employment data and R&D in the life science sector, generated by VINNOVA, will be used for this. (3) Documentation of seminars, meetings etc: This will be done by the Programme Office.

### *4.6.2* Expected results and effects

Short-term goals to be reached by the end of 2016: Evaluation of activities and expectations in relation to objectives. Ex-ante analysis and ex-post evaluation will pinpoint the prerequisites for, and the characteristics of, a successful SIO programme; effective forms of interaction (in triple helix, between initiatives, between SIO programmes), effects of a successful SIO programme on stakeholders etc.

Long-term effects to be reached by the end of 2020: Evaluation of progress in the life science sector in Sweden will be followed using VINNOVA's sector analyses.

### 4.6.3 Time plan and budget

The budget for Continuous Evaluation is estimated to approx. 0.2 MSEK/year in 2015 and 2016. Consultants must have a background that enables understanding of similar processes, not neccesarily in the life science area. Some activities can start already in 2014. The entire budget for this activity is included in the budget for the start up phase and in the budget for operating the programme (section 3.3).

### 4.6.4 Targeted groups

Governing Board, Advisory Board and Programme Office, as well as VINNOVA, other SIO programmes in the life science area and involved stakeholders.

### 4.6.5 Communication and knowledge transfer

Knowledge generated will be disseminated to targeted groups by distribution of reports and by participation in Governing and Advisory Board meetings.

# 5 Risk analysis for the SIO-programme

| | |
|---|---|
| ***Strenghts***<br>*SIO Chronic Dieseases is built on national cooperation, and its concept generates value for all major life science regions, as well as the nation.* | ***Weaknesses***<br>*The "give and get culture" – a prerequisite for successful implementation of SIO Chronic Dieseases – is not yet established.* |
| ***Opportunities***<br>*SIO Chronic Diseases takes advantage of investments and initiatives with great potential. Sweden will gain critical mass and obtain coordination in the life science sector.* | ***Threats***<br>*Actions are not taken quickly enough to make Sweden competitive.* |