Knowledge and Innovation Agenda 2016-2019

Health~Holland, Pro~Motion

Shared challenges, smart solutions for Vital functioning citizens in a healthy economy

Top Sector Life Sciences & Health, The Hague, 11 June 2015
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Preface

This Knowledge and Innovation Agenda (K&I Agenda) describes the sector’s strategic headlines for the years 2016-2019. The starting point of this K&I Agenda was our Top Sector’s Knowledge and Innovation contract 2012 and Implementation Plan. These documents were combined with the sector’s progressive insight and lessons learned since 2012. From February 2015 onwards three draft versions of the Agenda were published on our website and a consultation meeting with key stakeholders was held to obtain feedback. The outcomes of all these consultations were incorporated in this final version of the K&I Agenda. Moreover, this Agenda has been fully aligned with the LSH-related questions addressed to the scientific community in the Dutch Science Agenda, which will be published at the end of 2015. On behalf all contributors our K&I Agenda will be presented to the Ministry of Economic Affairs (Min. EZ) on 1 June.

The Agenda itself starts off with a management summary. In the first chapter the strategic vision, mission, ambitions and objectives are described in headlines. In essence the Agenda centres around the Top Sector’s core task of facilitating and stimulating operational critical success factor: R&D in public-private partnerships (PPPs), as described in chapter 2.

The Agenda concludes with four appendices where the sector’s R&D initiatives are listed (Appendix I); questions for the Dutch Science Agenda are presented (II); although in essence beyond the scope of this R&D focussed Agenda, an overview of the crucial sector-engagements for the years 2016-2019 is offered (III). Last but not least a list of those who contributed to this Agenda is provided.

This headlines Agenda will be operationalised into detailed Knowledge and Innovation Contracts, in two steps: the first – K&I Contract 2016-2017 – to be presented to the Min. EZ on 1 October 2015. The second in 2017, covering the K&I Contract 2018-2019.

We would like to thank everybody who has contributed to the conception of this Agenda and will contribute to its execution. As the sector’s Board and Office we feel highly privileged with such an inspiring nationwide synergy in a team of ‘the willing’. We certainly hope that this process will fuel our collective path and growth in the coming years, for the benefit of Dutch society, industry and science.

Finally, the sector’s approach, has resulted in a number of successes, showing impact on the broad field of Life Sciences and Health. Via the approach, laid out in this Knowledge and Innovation agenda, Health Holland aims to extend these successes and contribute to the further development of both the economic spin off of the sector and its positive influence on healthcare.

3 See: http://www.wetenschapsagenda.nl/?lang=en
On behalf of the H-H Regiegroep, Sector and Executive Office, The Hague, 11 June 2015,

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Management summary

As one of the nine Dutch Top Sectors, the Top Sector Life Sciences and Health (LSH), operating under the brand name Health-Holland (H-H), is building on a strong value proposition: invest in new evidence-based Life Sciences and Health R&D for vital functioning citizens in a healthy economy.

The life sciences and health sector is immense in terms of stakeholders: it stretches from basic research aimed at obtaining more insight in the aetiology of diseases, to the invention and development of therapeutic approaches to such diseases (vaccines, pharmaceuticals including biologicals as well as medical devices), clinical research to validate the added value of therapeutic innovations, the field of diagnostics (varying from laboratory tests to high class medical equipment for among others sophisticated imaging and targeting), numerous elements included in “care” itself (care systems, applications to deal with consequences of diseases such as and among others Information technology (IT) solutions to enable patients to remain functioning independently) and, last but not least, the permanent challenge of staying healthy by new ways of preventing disease and disability.

This being the case it is clearly impossible to steer the entire LSH Top Sector field in all its elements via H-H. This in combination with the scarcity of available resources means that choices must be made. The major choice made, is about our role: we will focus on stimulating and facilitating stakeholders and partners and their activities in the sector in public-private partnerships on topics initiated by enterprises that contribute to societal challenges. We will do this by bringing together parties and supporting projects and activities that may serve as examples, by sharing insights in factors that influence success and failure and, subsequently, influencing the agenda setting of stakeholders.

Within this context, H-H will continue to focus on supporting initiatives and partnerships in the regions to build further on already successful approaches. It will also help the regions to collaborate nationally and find the synergy that enhances their strategic mass in the European and global arenas. Likewise we will support academia and the eight university medical centres, which belong to the top in the world, in terms of science/life sciences and healthcare/medical care.

Our Knowledge and Innovation Agenda H-H 2016-2019 demonstrates the sector’s vitality and ambitions and sets out the joint strategy for the coming years to fulfil this proposition. The focus of this Agenda is on innovation, scientific research and development (R&D) to fuel society, the economy and science. Successful execution of this Agenda relies on the Dutch traditions of cooperation, synergy and shared values both within the sector, as well as in partnership with other Top Sectors.

The Netherlands has a strong reputation and branding for its powerful medical research and health(care) system. In the coming period, the Top Sector will build further to
enhance its recognition as an international frontrunner in the field of LSH. Cooperatively we will extend its role as a global player with an innovative industry base and excellent collaborative and integrative R&D capacities in the chain from discovery, to design and deployment of products, services, concepts and (sub)systems. With this strong basis in mind, H-H has three societal key objectives for economic perspectives in the coming years. These are based on today’s global challenge of an increasingly ageing population, non-communicable (chronic) diseases and a resulting disability burden in a still fragile but seemingly recovering economy:

1. **Maintain health and functioning, focus on prevention (including personalised primary prevention and prognostic pathways)** – assist people to remain vital and functioning without medical needs or supportive care situations (among others by development of contexts that support people to primarily make the right preventive lifestyle and behavioural choices, based on personalised precise prognostics and demographics to minimize risks deprived from the food production chain and the environment and stimulate healthy living by urban [re]design);

2. **Maximise effect, minimise burden** – if disease or disability occurs, support people to maintain and/or regain vitality and functioning as much and as fast as possible (among others by developing optimal personalised precise diagnostic tools and secondary and tertiary prevention tools and treatment);

3. **Manage health and disease outside the hospital** – if disease and/or disability persist, enable people to adapt, self-manage and function at their best in their living environment and society at large (among others by the development and implementation of personalised, precise technological applications and solutions).

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- Facilitating engagements and operational critical success factors of the sector as a whole as well as R&D initiatives and executions are obviously based on our collective strategic sector-headlines;
- Objectives and key issues have evolved qualitatively and quantitatively over the years,
  - based on SMART formulated, value-based performance indicators and perceptions on satisfaction indicators of our stakeholders and partners;
  - both indicators systematically monitored by transparent facts and figures;
Based on improved insights arising from monitored outcomes the strategic headlines are re-evaluated and, when and where necessary, adequately adjusted in 2017, with respect to the K&I Contract 2018-2019, and at the end of 2019 in the context of the next strategic period of the Top Sector.

These aforementioned three objectives form episodes in the continuum of health, in which the journey of a person is followed, providing appropriate and (cost)-effective solutions, aimed at the provision of an optimal functioning and quality of life across his or her lifespan. These objectives are dealt with in sector-specific and cross-sector R&D initiatives and our goal is to facilitate these in concentrated public private partnerships (PPPs), where science, industry, government and society integrate resources, funding and knowledge. These initiatives are embedded in three programmatic H-H Pillars:

**Pillar I.** **Fundamental Life Sciences Research** focused on early personalised diagnosis, and prevention (vaccines) and cure (including precision medicine⁴) of complex diseases with huge individual and societal burden such as cancer, cardiovascular disease, respiratory disease, neurodegenerative disease (dementia), metabolic disorders (diabetes, heart and kidney failure), infectious diseases, neurological and psychiatric pathology and movement disabilities (arthrosis, rheumatoid arthritis);

**Pillar II.** **Applied and Practice-Based Health and Functioning Science Research** focused on interventions that preserve and improve a healthy lifestyle, behaviour and functioning, lifespan, especially during major life events (divorce, falls, bereavement, surgery). Interventions that are preferably easy to handle, self-managed and preventive or, where unavoidable, provide optimal care;

**Pillar III.** **Built Environment, ICT infrastructure and Concept and Systems Development** focused on future-proof prevention enabling built environments and (bio)information technology, medical solutions and health(care) system development, preferably validated in a living lab context and in support of activities within the other pillars.

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- A total of 4 (of which 2 crossovers) or more larger and long lasting R&D PPPs are established in 2017 at the latest and 8 (of which 4 crossovers) or more in 2019 on subjects of societal, scientific and industrial relevance in which the best researchers work hand in hand with first-class public and private valorisation experts and (potential) end users and SMEs;
- A total of 10 (of which 4 in crossovers) R&D initiatives have been started, either to explore interesting new avenues of discovery or validate

innovative developments of evidence-based best LSH practices, products, services, concepts and (sub)systems;

- A total of 4 (2017) and 8 (2019) health (export) deals are developed with the aim of connecting where possible technical and sociocultural innovation to facilitate push of developed and validated innovations and their pull towards (de-)implementation in health(care) and health(care) related settings, national and international;
- The two National Icons are successfully involved in R&D initiatives of their choice;
- Exchange of information on R&D focal areas of the different stakeholders and PPPs has led to synergy and interconnection and, where necessary, downscaling of duplication of initiatives and to new national and international partners and partnerships in PPPs;
- A monitoring system – including values based performance indicators and thresholds of R&D success – for evaluation of the sector facilitative engagements and operational critical success factors are established in 2016 and implemented in 2017 and the outcomes are evaluated by the H-H governance and sector representatives on a yearly base from 2017 onwards.

The sector’s approach, has resulted in a number of successes, showing impact on the broad field of Life Sciences and Health. Via the approach, laid out in this Knowledge and Innovation agenda, Health Holland aims to extend these successes and contribute to the further development of both the economic spin off of the sector and its positive influence on healthcare.

All in all, the Dutch Top Sector LSH operating under the H-H banner, will be there to support and assist the sector in all its variations. H-H aims to facilitate the economic perspectives of the sector which have an important societal impact, stimulate international cooperation, export and new business models. It will use its key assets, its R&D, life sciences and health(care) system, and systems reform, to achieve these goals.
1. Introduction

Kick start

Based on societal challenges and national RD&I strongholds the Min. EZ launched the ‘Bedrijfslevenbeleid’ (Business Policy) in 2010 in order to boost economy via RD&I in the post-economic crisis. Nine Topsectors, one of which was the Topsector H~H, were identified based on the sector’s synergies and a combination of evident (inter)national ‘industrial potential’, ‘scientific excellence’, and ‘societal importance’.

H~H got its kick-start from successful Life Sciences Top Institutes such as Top Institute Pharma, CTMM, BMM, parts of NGI and IMDI. Besides these prominent Life Sciences institutes, the Health part of the sector is recognised for its longstanding worldwide prominent position, as can be seen from recent figures of the European Health Consumer Index (EHCI). LSH as a whole also has a much appreciated scientific position in the EU based on its prominent and successful contributions in IMI, Horizon 2020 and other European initiatives and instruments (ESFRI, JPIs, JTIs, etc.). The Dutch fundamental and applied research in LSH specialisms such as cardiology, neurosciences, oncology, surgery, etc. ranks in Europe’s top 3. Also our mobile Health\(^5\), Pharmaceutical and Medical Technology and Devices R&D are world class. Other H~H entrepreneurial national and international successes based on scientific excellence should also be taken in account, like the two government’ appointed National Icons and their programmes of Organoids (Hans Clevers) and Bioneedles (Gijsbert van de Wijdeven). Other notable successes are Uniqure with Glybera (first approved gene therapy), and Philips with HIFU (‘non’-invasive surgery), Prosensa and BioMarin (with a potential treatment for Duchenne muscular dystrophy), AM-Pharma with Pfizer in kidney disease, Galapagos (inflammation therapies), influential 3R initiatives (reduction of animal experiments), ParkinsonNet (systems and networks approach), Buurtzorg (neighbourhood integrated care approach), Centres for Child Health (preventive approach), the European Lead factory in Oss\(^6\) (screening centre for new drugs), etc. These inspiring examples form but a few of all the H~H successes, successes that ought to be continued and expanded through this agenda. Likewise these examples are to be seen as instructive for the sector’s new R&D initiatives.

Health-Holland

H~H published its vision, mission, ambitions and objectives as the Top Sector LSH in 2012. In essence these strategic headlines are still up to date.

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\(^5\) See: http://mhealtheconomics.com/eu-countries-mhealth-app-market-ranking-2015/
\(^6\) See: http://www.europeanleadfactory.eu/
1.1 Vision

H-H envisions a thriving Dutch LSH Sector that, through R&D excellence, develops health-related technological, biomedical, and sociocultural innovations that contribute to vital functioning and quality of life of all citizens, as well as affordability and productivity within the prevention, cure and care cycle. Innovations that, most importantly, create business value in the Netherlands as well as abroad.

1.2 Mission

H-H’s mission is therefore to invest in new evidence-based Life Sciences and Health R&D for *vital functioning citizens in a healthy economy*.

![Diagram](image)

*Figure 1. Comprehensive overview of H-H vision and ambitions for the Dutch society.*
1.3 Ambitions

The grand ambitions in our society (see Figure 1) where we, as H-H, want to contribute through national and international R&D are to

- improve functional performance and perceived health-related quality of life of citizens;
- create – new – successful and innovative private and public relationships, networks and businesses, national and international, with openings to foreign markets as well;
- support affordability of the health(care) system and delivery of value-based health(care) solutions through objective measurement of outcomes;
- increase productivity by curbing healthcare labour years and support gaining productive years in all sectors;
- realise all of these based on the highest ethical and moral standards regarding minorities, – involvement, privacy, safety and animal welfare.

1.4 Objectives

Society’s demand for affordable, high-quality health(care) However, today’s global vulnerabilities, of an increasingly ageing population, non-communicable (chronic) diseases and a resulting disability burden in a fragile economy, form a major additional challenge in this respect. Via its R&D the LSH sector, united in H-H, is highly dedicated to contribute to the establishment of the aforementioned ambitions and at the same time work on the realization of its huge economic potential. The sector’s opportunities are depicted in figure 2 summarizing its approaches based on the three basic elements in healthcare: prevention, care and cure.
Figure 2. Three H-H-objectives (upper panel), societal aims (middle) and H-H contributions (lower)¹.

1. **Maintain health and functioning, focus on prevention (including personalised primary prevention and prognostic pathways)** – assist people to stay vital and functioning without medical needs or supportive care situations (among others by development of contexts that support people to primarily make the right preventive lifestyle and behavioural choices, based on personalised precise prognostics and...
demographics to minimize risks deprived from the food production chain and the environment and stimulate healthy living by urban [re]design);

2. **Maximise effect, minimise burden** – if disease or disability occurs, support people to maintain and/or regain vitality and functioning as much and as fast as possible (among others by developing optimal personalised precise diagnostic tools and secondary and tertiary prevention tools and treatment);

3. **Manage health and disease outside the hospital** – if disease and/or disability persist, enable people to adapt, self-manage and function at their best in their living environment and society at large (among others by the development and implementation of personalised precise technological applications and solutions).

### 1.5 Key issues

Within the context of the three societal objectives, H-H pays special attention to three key issues that were raised during the October 2014 meeting of the Min. VWS and H-H. These are: Dementia, antimicrobial resistance (AMR) and eHealth, besides the issues of Rules and legislations and (New) Revenue models. Besides these, our two H-H related national Icons Hans Clevers and Gijsbert van de Wijdeven and their respective programmes of Organoids and Bioneedles will receive our full support and encouragement.

### 1.6 Success indicators

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- Facilitating engagements and operational critical success factors of the sector as a whole as well as R&D initiatives and executions are obviously based on our collective strategic sector-headlines;
- Objectives and key issues have evolved qualitatively and quantitatively over the years,
  - based on SMART formulated, value-based performance indicators and perceptions on satisfaction indicators of our stakeholders and partners;
  - both indicators systematically monitored by transparent facts and figures;
Based on improved insights arising from monitored outcomes the strategic headlines are re-evaluated and, when and where necessary, adequately adjusted in 2017, with respect to the K&I Contract 2018-2019, and at the end of 2019 in the context of the next strategic period of the Top Sector.

Along the lines of the strategic headlines in this chapter we will describe our operational critical success factors in the next chapter.
2. Operational critical success factors

With the strategic headlines mentioned in Chapter 1 of this agenda at the top of our mind our operational critical success factors will be described in this Chapter.

2.1 Research and Development initiatives

In recent years the Dutch R&D landscape has changed considerably. The large *Fonds Economische Structuurversterking* (FES) subsidised, LSH-oriented PPPs, such as the Top Institutes TI Pharma, CTMM, BMM and parts of NGI, all came to a conclusion under the denominator ‘Top Institutes’ in the period 2014-2016 and transited into the Top Sectors’ robust ongoing national and international PPPs. The transition from FES to TKI investments has, however, also led in the meantime to new, relatively small R&D initiatives (including many PPPs *avant la lettre*), due to the reduction in available funds lowering the total funding budget from about 200 M€ FES funding per year to an initial potential of 20 M€ TKI funding. Consequently, H~H identified many – in most cases – small PPPs in the Dutch regions, for which TKI allowance could be obtained, with their total concern of a budget of 16 M€ (for which a total of 4 M€ TKI allowance was collected) in 2014.

2.2 Public-private partnerships

To broaden our R&D scope and impact we increased our effort to facilitate ‘running’ and new promising start-up LSH and LSH-related R&D initiatives, especially PPPs, in the regions. The aim is to collect together with the regions and their stakeholders twice the amount of TKI allowance from the current € 40 M€ to € 80 M€ per year within the next four years. This will generate over € 20 M€ of TKI cash for the Top Sector, of which most will be ploughed back to those who earned the allowance in the first place, mostly to the R&D initiatives in the regions and, of course, to the integrated national and international PPPs.

At the same time the strategy of H~H is to balance the trend towards small R&D initiatives with the sector’s ambitions for larger programmatic PPPs, all in three overarching Pillars of significant societal, scientific and industrial interest. Each of these R&D initiatives will fit in one or more of our initial previously published roadmaps⁷, a fit that is not detailed here for the sake of clarity of this Agenda. More importantly, these initiatives will have to have the sufficient potential impact nationally and internationally due to the world-class reputation of the partners involved, be it starters or known experts. To that end H~H will also facilitate (new) connections in order to team up in several PPPs overarching two or even the three Pillars and with those in other Top Sectors in so-called *Crossover PPPs*.

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2.3 Three Health-Holland Pillars

All H-H R&D initiatives are dealt with in sector-specific and cross-sector R&D initiatives and linked to the objectives and key issues mentioned in Chapter 1. The initiatives are embedded in the following three programmatic pillars (see Figure 3):

![Health-Holland R&D Initiatives](image)

Figure 3. Comprehensive overview of the three related R&D Pillars of H-H.

**Pillar I. Fundamental Life sciences Research** focused on early personalised diagnosis, and prevention (vaccines) and cure (including precision medicine) of complex diseases with huge individual and societal burden such as cancer, cardiovascular disease, respiratory disease (COPD), neurodegenerative disease (dementia), metabolic disorders (diabetes, heart and kidney failure), infectious diseases, neurological and psychiatric pathology and movement disabilities (arthrosis, rheumatoid arthritis);

**Pillar II. Applied and Practice-Based Health and Functioning Science Research** focused on interventions that preserve and improve a healthy lifestyle, behaviour and functioning, lifespan, especially during major life events (divorce, falls, bereavement, surgery). Interventions that are preferably easy to handle, self-managed and preventive or, where unavoidable, provide optimal care;
Pillar III. **Built Environment, ICT infrastructure and Concept and Systems Development** focused on future proof prevention enabling built environments and (bio)information and communication technologies acting as by supporting cooperation across settings, with interfaces tailored to the various (end) users and providing effective tools for cost-effective medical solutions and health(care) system development, preferably validated in a *living lab* context (like for instance the Min. “VWS-proeftuinen” [test beds] \(^8\)) and in support of activities within the other pillars.

H-H will aim to initiate and facilitate the organisation and operations of R&D initiatives through matching a science-based technology push with a market and sociocultural demands based pull in a sustainable knowledge and innovation infrastructure. Here we give a brief overview of the R&D/PPPs initiatives, whereas in Appendix I all of these are one by one described in headlines.

### 2.4 Intra-sector engagement

In the coming years the sector’s latest development will speed up the process of transition from the currently successful R&D nationwide LSH infrastructure – like the European Lead factory; ELF – into an even more successful future-proof facilitating infrastructure. In recent years new strong national and international R&D combinations have emerged, mostly from out of the sector’s self-organisation. Next to the Transition of Top Institutes, EIT Health, OncoXL, the Innovative Medical Devices Initiative (IMDI), the Institute for Human Organ and Disease Model Technology (hDMT) are also relatively fresh high-impact PPPs and examples with outstanding international standing. A considerable number of new initiatives is under construction: AntiMicrobacterial Resistance (AMR), Bacterial Vaccine technology (Bac-Vactory, Regenerative Medicine Across Borders (RegMedXB), Regenerative Medicine Center Utrecht, Cardio XXL, Oral and Dental Health, Cognitive Functioning in Health and Disease (including Dementia) are all situated in Pillar I. Maintaining Mental Health, Portable Artificial Kidney, Global Innovation Centre for Child Health and an elegant but probably also somewhat redundant battery of eHealth and lifestyle and behaviour initiatives such as Healthy Lifestyle Innovations, Lifestyle approach, Personal Health Check consortium (PGC), Fit for Work, Data-driven innovation for personalised health, Personalised Nutrition and Health (PN&H) constitute other potentially robust R&D initiatives from metabolic, psychosocial and intervention (e.g. pharma) lifespan knowledge\(^9\) that will probably develop as Pillar II PPPs in 2015-2017, eventually along the lines of processes of the co-creation and integration of OncoXL. With respect to Pillar III, consolidating R&D initiatives for a supportive infrastructure, several

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\(^9\) Here the Directorate of Sports of Min. VWS and its Top Team is highly interested to team up and cooperate, especially with respect to crossover of pharmacologic metabolic enhancement from pharma in sports and, for instance, cachectic elderly/chronic disease patients.
Built Environment and ICT infrastructure initiatives are of interest mainly in conjunction with other Top Sectors (see below).

## 2.5 Inter-sector engagement

LSH was historically successful in highly specialised and “own” compartmented domains such as anatomy, biology, chemistry, pathology, physics, psychology and pharmaceutical sciences. R&D progress in the more recent decennia has been based on interdisciplinary approaches such as psychoneuroimmunology. An important next step in R&D is considered to be inter-sector collaboration. Therefore H-H will facilitate our sector – experts and institutes – to team up with other Top Sectors to combine knowledge bases in so called ‘crossover’ PPPs. Pillars I and II will also hold crossover PPPs with the fellow Top Sectors AgroFood (*Intestinal Microbiomics*/*Gut Health*), Chemical (*AMR and Alternatives for Animal Testing, 3/4R*) combined with explorations concerning their Pillars *Personalised health and Understanding the building blocks of Life*, Creative Industry (CLICKNL; *Create Health*), HTSM (*Impulse II and Healthy Lifestyle Innovations*) and Logistics (*Healthcare logistics*). Pillar III will hold at least two Top Sector overarching crossover PPPs: firstly a PPP *ICT/Bioinformatics* with the enabling technology of ICT and several Top Sectors, among which HTSM, CLICKNL and AgroFood. Second, this Pillar III strives to realise a PPP *Built environment* with Top Sectors CLICKNL, Energy and HTSM. Besides all of these, cooperation on fundamental systems approaches will be facilitated, from health literacy development\(^{10}\) and HTA/MTA, up to value case building\(^{11}\) and population health systems (Min. VWS-“Proeftuinen” [test beds]).

Besides these intra- and inter-sector initiatives the self-organising regions will start up new or develop existing PPPs in one or more of these three Pillars. H-H is more than willing to facilitate and support all of these developments.

## 2.6 National Icons

Apart from the intra- and inter-sector engagement, H-H will pay attention and provide support for the two government’ appointed National Icons, Hans Clevers and Gijsbert van de Wijdeven, and their respective programmes of *Organoids* and *Bioneedles*. During the process of construction of both K&I H-H Contracts timely, in-depth analysis of their needs and wishes will be instructive here.

## 2.7 Execution of PPPs

R&D initiatives in PPPs and crossover PPPs are executed mostly by the initiating coalitions, consisting for instance of industry and R&D institutes and organisations in the

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\(^{10}\) See: http://nnlm.gov/outreach/consumer/hlthlit.html

\(^{11}\) See: http://www.ihi.org/communities/blogs/_layouts/ihi/community/blog/itemview.aspx?List=84e15604-08bf-4317-8323-cf66485b7c0&ID=13
regions. These coalitions preferably combine efforts with (virtual) nationwide institutes of cooperation like *Centres of Research Excellence* (CoRES; stemming from the national Innovative Medical Devices Initiative coordinated by ZonMw and university medical centres in cooperation with technical universities) or more regionally oriented *centres of expertise* (CoEs; universities of applied sciences)\(^{12}\) and *Centres of Innovative Craftsmanship* (CoICs; intermediate vocational education)\(^{13}\). By doing so a synergy is created and critical mass invested in (crossover) PPPs – via NFU and universities of applied sciences – and, ultimately, the foreseen (de-)implementation by or in the Life Sciences and Health sector. In consequence this contributes to the strategy outlined in the Human Capital Agenda of the Top Sector – via NPHF.

### 2.7.1 Netherlands Federation of University Medical Centres

Dutch University Medical Centres (UMCs), collaborating under the Netherlands Federation of University Medical Centres (NFU), are operationally and, for the most, also organisationally integrated organisations of medical faculties of universities and academic hospitals. The eight UMCs in the Netherlands comprise a considerable part of the life sciences and health sector in the country and all possess positions in the top-20 list of many European academic and research rankings. Last year the NFU formulated a position paper ‘The NFU and EU health research beyond 2020’\(^{14}\). With sustainable health as a main goal for the UMCs and the strengths of the UMCs in the areas of healthy ageing, enabling technologies, personalised care, eHealth & mHealth and Research infrastructures, the critical success factors of both NFU and H~H will be easily met. The NFU position paper provides input towards EU Horizon 2020, but is also formulated in anticipation of common R&D LSH themes that would be included in this Agenda. Both the NFU and H~H wish to combine efforts in further alignment of their Agenda’s and the subsequent activities. UMCs need partners in all phases of generating, disseminating and translating knowledge into sustainable solutions and will benefit from both facilitative engagements, including engagements towards funding, of H~H. In the upcoming months towards the K&I Contract 2016-2017 prime examples of PPPs will be visualised.

### 2.7.2 Universities of Applied Sciences

For the contribution of universities of applied sciences (UAS) to the Innovation Agenda, qualitative research has been performed among their stakeholders in the ecosystem of Health. The researchers identified a number of opportunities for public-private partnerships, especially in the field of strengthening the innovation culture in health organisations (best related to Pillar III) and increasing self-management (empowerment) of individuals (Pillar II). UAS and their partners will shape the content of those PPPs in the second half of 2015 and align these with the H~H Innovation Contract 2016-2017. Furthermore, UAS are interested and equipped to contribute to other PPPs under Pillar II and III of the Innovation Agenda.

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12 See: http://www.imdi.nl/  
13 See: http://www.publiekprivaatsamenwerken.nl/home  
2.7.3 National PHF Federation for Health

The contribution of the National PHF Federation for Health (NPHF) to this K&I Agenda will focus on the formulation of an even broader own R&D and (de-)implementation Agenda taking health rather than disease as the leitmotif for the production of new knowledge and technologies. To realise a sustainable healthcare system, the NPHF foresees that we have no choice but to change the way we think about care and health. Preventing illnesses, and promoting individual and collective health will be the cornerstone of the future healthcare system. In other words a paradigm shift is needed, which is actually getting momentum at the local level in the Netherlands. The NPHF unites over more than 50 organisations that connect and combine their expertise for boosting this paradigm shift in practice, making it mainstream. By the end of 2015, the NPHF will have explored the mutual interest amongst its members and stakeholders for a (crossover) PPP focusing on the exploration of these newly emerging local health systems, most notably how new constellations of citizens, professions, organisations and financiers are emerging. This area is potentially of international interest and will help strengthen the Dutch LSH.

2.8 Success indicators

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- A total of 4 (of which 2 crossovers) or more larger and long lasting R&D PPPs are established in 2017 at the latest and 8 (of which 4 crossovers) or more in 2019 on subjects of societal, scientific and industrial relevance in which the best researchers work hand in hand with first-class public and private valorisation experts and (potential) end users and SMEs;
- A total of 10 (of which 4 in crossovers) R&D initiatives have been started, either to explore interesting new avenues of discovery or validate innovative developments of evidence-based best LSH practices, products, services, concepts and (sub)systems;
- A total of 4 (2017) and 8 (2019) health (export) deals are developed with the aim of connecting where possible technical and sociocultural innovation to facilitate push of developed and validated innovations and their pull towards (de-)implementation in health(care) and health(care) related settings, national and international;
- The two National Icons are successfully involved in R&D initiatives of their choice;
- Exchange of information on R&D focal areas of the different stakeholders and PPPs has led to synergy and interconnection and, where necessary, downscaling of duplication of initiatives and to new national and international partners and partnerships in PPPs;
- A monitoring system – including values based performance indicators and thresholds of R&D success – for evaluation of the sector facilitative
engagements and operational critical success factors are established in 2016 and implemented in 2017 and the outcomes are evaluated by the H-H governance and sector representatives on a yearly base from 2017 onwards.
Appendix I. Overview of Health-Holland R&D (PPPs)

The R&D overview in this appendix holds, as of today 31 May 2015, regional and national and international initiatives all bottom up from the sector’s self-organisation, mostly in the form of PPPs, from to be started up until already full blown and running. In the coming months, H-H will facilitate and support their self-organisation and support (start of) executions during the development of the K&I Contract 2016-2017 later this year. After that H-H will offer support to this self-organisation where and when needed to establish R&D coalitions, programmes, funding and/or PPPs. In the facilitation of all of these initiatives by of H-H particular attention will be paid to connecting initiatives, within the sector as well as between sectors. With respect to the K&l Contract 2016-2017 a content template for PPP descriptions will be offered to facilitate the coalitions. This content may hold the following issues: (working) title and, if applicable, acronym; ambition; the R&D challenge; supposed solution pathway(s) and coalition involved.

Figure I.1 shows an overview of the PPP landscape anno 2015, where LSH is directly involved, mapped along the prevention-cure-care value chain and the 10 initial LSH roadmaps (for the LSH roadmaps, see the 2012 K&l Contract).

![Figure I.1. PPP-Landscape LSH (Draft; > 1 M€).](image-url)
Pillar I: Fundamental Research Life Sciences PPPs

European Lead Factory
Launched in 2013 and completely operational within 1.5 years, the European Lead Factory (ELF) is a pan-European drug discovery project, and a flagship open innovation resource for academia (n=13), public organisations, large pharma companies (EFPIA; 7), and SMEs (10). TI Pharma runs the Programme Office for an international consortium of 30 partners, with funding from the Innovative Medicine Initiative (IMI; 196 M€ total budget of which 80 M€ from IMI, 34 M€ invested in the Netherlands; 150 employees) and in-kind contribution from various partners, offering facilities that are open to non-contractual partners. Academics and SMEs enjoy access to an 'industry-like' discovery platform - one that encourages active participation. The ELF has already had 41 target proposals accepted and more than 8 quantified hit lists have been delivered. ELF is currently actively seeking high-quality biology targets. The goal is to provide target contributors with ultra-high throughput screening and a list of high-quality hit compounds, and opportunities for collaboration. It means substantial cost savings and a very productive exchange of ideas. New chemistry scaffolds are also being sought. A 300,000-item compound collection has already been contributed by European Federation of Pharmaceutical Industries and Associations (EFPIA) consortium members, and a key project goal is to add a further 200,000 innovative compounds, carefully selected from academia and SMEs for novelty, drug-like properties, diversity and synthetic tractability. This will result in a Joint European Compound Collection that will be used to screen against biology targets. The research leading to these results has received support from the IMI Joint Undertaking composed of a financial contribution from the EU's Seventh Framework Programme and EFPIA companies' in-kind contribution. Latest developments, of many, consist of the contribution of the first 50,000 public compounds to the library and the first qualified hit series were received, for instance, by Dutch SMEs and knowledge institutes like NTRC and NKI respectively.

Transition Top Institutes
A transition budget of 15 M€ was provided by the Min. EZ and Min. VWS for LSH to secure the continuation of the best projects and best practices in valorisation and networking of the Top Institutes and NGI. In consultation with our partners part of the budget was allocated towards the following consortia activities:

- By the scientific committee of CTMM 7 promising PPP projects out of 14 were selected for continuation with a total Ministry EA budget of 5 M€. Also the ZonMw 2TREAT call was oriented to give support to these high potential projects;

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15 See: http://www.europeanleadfactory.eu/
16 See: http://www.tipharma.com/pharmaceutical-news.html?tx_ttnews%5Btt_news%5D=663&cHash=4181283078d3f8f0a08c304368c2d34
18 See: http://www.tipharma.com/pharmaceutical-news.html?tx_ttnews%5Btt_news%5D=559&cHash=254c2e000ce391688b2d10f29cd92b
For matching EU projects 3 M€ was provided by the Min. VWS and reserved for TI Pharma and CTMM. Several initiatives are underway.

After termination of the FES budget stimulated PPP programs, the Top Institutes IPharma and CTMM, have joined forces and are in the process of merger. The new institute will continue using their expertise to enable the execution of Dutch research in the LSH sector, within the European context, on a not for profit basis.

**EIT Health**

Dutch partners play a prominent role in the European EIT Health consortium\(^{19}\) that was awarded the KIC status in December 2014 by the European Institute of Innovation and Technology.

The “KIC-Health” unites major players from research, higher education and business, and aims at accelerating entrepreneurship and innovation in healthy living and active ageing, providing Europe’s top talents with new opportunities and resources to the benefit of all citizens. Its activities will be confined to application of research outcomes in new products and services, stimulating entrepreneurship and international collaboration. In 7 years KIC-Health wants to create 165 start-ups and launch another 160 new services and products, include 1 million students in educational online programmes, and incubate approximately 340 new business ideas. Linking up to the activities of this consortium provides the Dutch H-H sector with a unique opportunity to strengthen its international position, building on its own strengths in science and business creation.

**Onco XL**

From within the LSH-Regiegroep the initiative arose to set up a large, world class PPP on oncology, provisionally called Onco XL, in The Netherlands. In Onco XL top-researchers will participate in a virtual institute with first-class valorization facilities, backed by KWF and the government. Onco XL is bound to combine the best practices of the Vlaams Instituut voor Biotechnologie (VIB) and lessons learned from NGI. The aim is a sizeable institute with a budget of around 75-100 M€ per year for at least 10 years hosting 600-1000 top-researchers. It is expected that already during the year 2015 this exciting new initiative can start.

**Institute for human Organ and Disease Model technology**

The Institute for human Organ and Disease Model technology (hDMT) is a precompetitive non-profit technology foundation. The aim of hDMT is to develop and encourage the use of in vitro human organ and disease model systems on a chip for multiple purposes by combining expertise and facilities from different disciplines and multiple organisations. This will primarily meet the need for representative human test model systems and as an additional goal it will also reduce the use of animal experiments. hDMT is a public-private

consortium of eight founding partners. hDMT will consolidate expertise in the Netherlands and collaborate with experts from abroad in this area to develop complementary international programmes that will lead to new insights in human disease, and to new treatments and diagnostic tests.

**Antimicrobial Resistance (AMR)**
A growing concern is the increasing ineffectiveness of today’s antibiotics. One of Min. VWS’ priorities is to find solutions to the AMR issue, among others the development of suitable alternatives. Currently a sizeable PPP is being discussed, where existing fundamental, translational and clinical research from several institutes and enterprises are combined with developing new business models for antimicrobials, and where the development of new sets rules and regulations around this subject forms an integral part of the program. Min VWS engages the integration of such a PPP in the broader context of One Health, because of the direct linkage of AMR to issues as preparedness to (re)emerging diseases, vaccine development, increased resilience and robustness of animals and humans, and minimizing risks associated with food production and consumption and the environment. The Roadmap One health originally addresses the wider framework on prevention and preparedness to infectious diseases and will be covered by the Netherlands Centre for One Health (NCOH)20. For the PPP on AMR LSH has reserved 1.5-2 M€. Further funding to initiate the whole for a solid start should be found in resources (cash and/or in-kind) from knowledge institutes, government and companies into a launching budget and formation of this PPP.

**Bacterial Vaccine technology (Bac-Vactory)**
The use of vaccines represents a cost-effective strategy to address emerging, global human and animal health problems. A PPP has been initiated which combines extensive know-how on bacterial pathogenesis and innovative bio-delivery systems with state-of-the-art technological advances on the identification of novel vaccine candidates and immunomodulating compounds. By using an interdisciplinary ‘One Health’ approach with public and private partners, the optimal integration and use of complementary knowledge and expertise is ensured, which will be applied for accelerating the translation of this knowledge into effective vaccines for humans and animals. A research application, called “Bac-Vactory”, was submitted for granting in the STW Perspectief Program and should deliver the first financial support to kick-off this PPP.

**RegMedXB**
Members of the LSH-Regiegroep are exploring the possibility to initiate the largest European initiative on regenerative medicine (RegMedXB), regenerative medicine across borders). The centre of gravity of this initiative would be along the Dutch/Belgian border,

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20 See: [www.ncoh.nl](http://www.ncoh.nl)
whereby a leading role would be played by the local provinces. At the basis stands a recently signed contract for collaboration between the province of Vlaams Brabant and the Dutch province of Limburg where the parties commit to collaborate in the field of regenerative medicine. Ideally the collaboration would comprise the Dutch provinces Limburg and Brabant and Vlaams Brabant (possibly extended to Vlaanderen). This would involve Universities like Maastricht, Eindhoven and Leuven. The infrastructure could be extended to other participants, depending on funding opportunities and expertise (the first explorative discussions have taken place already). In addition to building a knowledge infrastructure an important aspect will be to create critical mass by focusing strongly on start-ups and connecting to the large industrial players in these regions. The initiative aims at a budget of 250 M€ plus over a 10-year period.

**Regenerative Medicine Center Utrecht**

Regenerative Medicine Utrecht (RMU)\(^1\) is an internationally leading cluster for regenerative medicine and stem cell research. The mission of the RMU is to inspire innovation and integration of biomedical research, technology and clinical care with the goal to develop novel regenerative/stem cell treatments for patients. RMU consists of more than 60 principle investigators and their labs (total research staff 200fte) and offers a wide range of training and educational programmes at the bachelor, master and PhD-level. In the past years, several new regenerative medicine treatments were brought to the clinic by RMU along the translational lines of the Utrecht Mobility Clinic and the Center for Circulatory Health. Further over 90m€ in funding has been acquired, including many high esteem grants such as FP7, Horizon2020, ERC consolidator/advanced, Vidi, and Vici. The RMU is one of the major pillars in the strategic alliance between Utrecht University, University Medical Centre Utrecht and Eindhoven University of Technology (TU/e), hence connecting top scientists, expertise and education at a national level. In 2015 the Hubrecht Institute for Developmental Biology and Stem Cell Research will double in size with the addition of a new research building. The RMU program will open a new center in the same building, which will house many researchers, shared equipment and a state of the art biofabrication facility. This Regenerative Medicine Center Utrecht that opens in September 2015 will bring together a majority of the RMU investigators under one roof, operating in a flex-space and with a culture of cooperation and openness also to other researchers from academia and the industry. Public Private Partnerships will be encouraged. It is anticipated that the daily interaction between fundamental scientists, engineers and clinicians (both human and veterinary) will stimulate creativity and new approaches to bringing regenerative medicine in the form of personalized care rapidly to the patients.

\(^1\) See: [www.RMUtrecht.org](http://www.RMUtrecht.org)
Cardio XXL
This year, the Dutch Heart Foundation (DHF) and the Netherlands Heart Institute (NHI) will explore the feasibility of a particular cardiovascular network organisation (within the branch known under the name Cardio XXL) which will increase valorisation opportunities for excellent cardiovascular researchers. Combining the strong network and facilities of the NHI, current valorisation initiatives, and the recently formed outstanding DHF-supported research consortia from CVON (Dutch Cardiovascular Research Initiative) may offer a unique setting to accelerate the process of bringing research findings to the clinic.

Oral and dental health
Substantial improvements in oral health have been made over the past few decades. However, lower socioeconomic groups have benefitted less than average, and there are indications that the improvements in dental health have halted in the last decade and are possibly even reversed. Evidence is accumulating that poor oral health impairs general health, in terms of cardiovascular disease, various types of cancer and diseases of the central nervous system (e.g. Alzheimer disease). Oro-facial and dental research in the Netherlands covers topics over the entire spectrum from fundamental to translational. These studies are concentrated in the three dental faculties (Amsterdam, Groningen and Nijmegen) and at TNO. Currently public-private partnerships (PPPs) are bilateral with individual academic groups in the three dental faculties collaborating with oral care companies, as well as in larger consortia such as the Oral Health Theme in the Top Institute for Food and Nutrition (TIFN). Future research initiatives will encompass further elucidating the role of oral health in general health, a search for personalised predictors for both health and disease of the oral tissues, and clinical trials to test novel agents (e.g. in toothpastes) and devices (e.g. implants). Various potentially interested private partners are being approached and formats for collaborations are being discussed.

Cognitive Functioning in Health and Disease
Brain and Cognition research aims to understand how individuals behave, from the molecular and cellular level all the way up to neurocognitive performance in interaction with a continuously changing society. This knowledge is essential for health, well-being and healthy citizenship, and has great potential in terms of cost reduction and economic prosperity. Diseases of the nervous system in general and neurodegenerative and mental disorders in particular, represent public health challenges of staggering proportions. The costs are rocketing and the number of people affected keeps rising\textsuperscript{22}. We are at an exciting crossroads though. New experimental methods very rapidly increase our understanding of how the brain develops early in life and how our mental functioning is supported or threatened. Likewise, degenerative processes during life are better understood and this bears the promise of earlier diagnosis and better treatment. New opportunities also evolve from better management of homecare and lifestyle, emphasising and optimising the personal input of the patients and their environment in

\textsuperscript{22} J. Olesen et al., The economic cost of brain disorders in Europe. Eur J Neurol 19: 155-162, 2012
maintaining independence. The market responds with monitoring and feedback devices, training protocols, apps, serious games, and other e-health interventions\textsuperscript{23}. The Netherlands is even world leader on e-mental-Health\textsuperscript{24}. Yet, there is clearly a need for more knowledge on human motivation, communication, information processing and learning for these tools to be effective in healthy and affected individuals alike. Research and innovation cannot go ahead without those concerned being involved. Involving patients and their caregivers will tap into a hitherto insufficiently used source of resilience, at the same time relieving the taboo on mental disorders in particular. The Brain and Cognition field is ready to contribute to these developments, through public-private collaborations. The Netherlands is at the forefront of the field, highly productive, and well organised via the National Initiative Brain and Cognition\textsuperscript{25}, bringing together an unsurpassed interdisciplinarity. Exemplary are the research and development programs concerning dementia (Deltaplan Dementie\textsuperscript{26}) and Mental Healthcare\textsuperscript{27}. The Netherlands is very much connected with the international efforts such as ROAMER, JPND and NEURON. A Good Practice example for partnering with industry is the Industry Alliance Office Amsterdam\textsuperscript{28}. In the coming years this potential, and the partners and funding potential involved, will be consolidated more firmly around scientific innovations for health applications.

**Pillar II: Applied and Practice-Based Research PPPs**

*Innovative Medical Devices Initiative the Netherlands*

Innovative Medical Devices Initiative the Netherlands (IMDI.NL) stands for technology as the transition engine towards sustainable healthcare in ageing societies. To achieve this, eight large Centres of Research Excellence (IMDI CoREs) have been formed that combine the strength of the university medical centres (UMCs), Technical Universities (TUs), industry and healthcare focussed on themes in which the Netherlands is acknowledged in the world as frontrunner, such as medical imaging, minimal invasive medical instrumentation (named MDII, IDII, Institute Quantivision, CMI NEN, NIMIT), homecare technology and eHealth (named NEUROCONTROL, CCTR and SPRINT). In the period 2016-2019 IMDI.NL continues its focus on developing technology in diagnostic, prognostic, preventive and therapeutic areas, supporting self-reliance of people, allowing professional care to be performed closer to home, and enabling better quality care while saving required labour and costs. The project portfolio of the IMDI CoREs will be further expanded with projects aimed specifically at achieving social as well as financial return of investment, such as Health Impact Bonds and investments by structural investors in Dutch societal goals such as pension funds, banks and healthcare insurers. Besides the

\textsuperscript{23} See: \url{http://www.smarthealth.nl/2015/05/13/the-netherlands-douze-points-voor-ehealth/}  
\textsuperscript{24} http://www.oecd-ilibrary.org/social-issues-migration-health/making-mental-health-count_9789264208445-en  
\textsuperscript{25} See: \url{www.hersenenencognitie.nl/Cognition Research, Prospects & Impact}  
\textsuperscript{26} See: \url{www.deltaplandementie.nl}  
\textsuperscript{27} See: \url{http://www.nvvp.net/website/onderwerpen/detail/wetenschappelijk-onderzoek}  
\textsuperscript{28} See: \url{http://www.nca-iao.com/}
aforementioned research themes, a priority area is the organisation of the knowledge infrastructure itself to scale up medical technological research aimed at sustainable care so as to continually improve true multi-disciplinary collaboration between care, academia and business, support the network of fundamental, applied and implementation research, and contribute to a greater responsiveness for the needs from healthcare, public health and business.

**Maintaining mental health**

Our society has become more and more demanding in terms of emotional stability and high cognitive functioning for citizens to fulfil their social and economic competence. To achieve this required level of mental competence, preventative action and early and effective treatment of mental illness is essential. This requires a shift from treating psychiatric disorders towards preventing them. Personalised medicine and personalised mental healthcare, including new strategies applying hormone treatment, food supplements, immune modulation therapy, cognitive enhancers and (digital) cognitive training will enhance effectiveness of treatment. Partners in Dutch mental healthcare will cooperate with other H-H PPP initiatives in 2015 to construct a definitive long-term research programme in 2016.

**Portable Artificial Kidney**

Patients suffering from End-Stage Kidney Disease require a kidney replacement therapy. Those who cannot receive a transplant – due to incompatibility or shortage of donor kidneys – are treated by dialysis. The vast majority are dependent on haemodialysis, a treatment where the blood is purified by an artificial kidney in a dedicated dialysis clinic. Although the treatment extends life it poses a heavy burden on the patient’s health and well-being. Patients spend on average three days per week on dialysis, traveling to and from their dialysis unit, spending 4 hours on the machine and afterwards recovering from the dialysis session. This has a major impact on the patient’s health and social life and many patients on haemodialysis experience a feeling of encroachment. The Portable Artificial Kidney Programme of the Dutch Kidney Foundation aims to develop a portable dialysis machine that enables patients to dialyse outside the hospital and be independent. The portable artificial kidney will bring more freedom for patients, better health condition and save costs for healthcare infrastructure. The programme comprises multiple projects involving UMC Utrecht, Utrecht University, Maastricht UMC+, Maastricht University, University of Twente, TNO Shared Research programme and several life sciences companies in the Netherlands (Interface BIOmaterials, Interdos Pharma, LABO BV, LifeTec Group and Nanodialysis BV) and abroad (Debiotech SA, Switzerland and AWAK Technologies Inc, Singapore).
Global Innovation Centre for Child Health

Youth health in the Netherlands is well known throughout the world: Dutch children and young people are among the happiest and healthiest globally. The Netherlands has a high quality youth healthcare system with a unique chain approach from preconception to 23 years, a broad prevention focus and many technological innovations in youth healthcare. TNO as a leading knowledge institute will start the Global Innovation Centre for Child Health. Organisations and stakeholders who all share their involvement in innovating and improving child health can benefit from this initiative and contribute. The centre will streamline these initiatives and deal with the rapid changes in child healthcare around the world. During the coming months TNO will develop a business plan for starting this initiative in January 2016.

Healthy Lifestyle Innovations

The Healthy Lifestyle Innovations Partnership Programme aims to develop knowledge and innovative e-coaching solutions that empower people to adopt a healthier lifestyle. Now, human coaches are available to those with a medical condition and for (top) sport. The programme does not seek to replace these human coaches, but to make healthy lifestyle coaching available to far more people lifespan in an affordable way by a high level of automation. The focus lies on the lifestyle and metabolic aspects of sleeping well, stress and relaxation, healthy consumption and sufficient physical activity. The e-coaches will change the way people live into more healthy behaviours (e.g., intake of healthier food, going to bed earlier, less stress and more physical exercise) in a sustainable way. Unobtrusive monitoring of the coached person’s behaviour and bodily signals, should contribute to a thorough understanding of the coached persons situation and a feeling of being thoughtfully guided.

Lifespan approach

The lifespan approach (e.g. family approach) is a new and promising next step in the area of healthy lifestyle interventions, already seen by health insurance companies and municipal authorities. To strengthen the scientific effectiveness and implementation evidence of this approach, the Netherlands Institute of Sport and Physical Activity (NISB) has already explored focal points and knowledge gaps, which will be addressed by multiple key players in the area of research (TNO, universities and UAS), business (e.g. health insurance companies) and practice (KNGF, municipals). The Dutch certification system Effectief Actief houses evidence-based sport and physical activity interventions to improve a healthy lifestyle and increase sports participation. To enlarge the number of evidence-based approaches, which can subsequently be implemented nationwide, additional research is needed among powerful and promising interventions. An example

29 http://www.youthpolicy.nl/yp/Youth-Policy/Youth-Policy-subjects/Family-and-parenting-support/Family-and-parenting-support-Health-services
of a cost effective is the evidence-based lifestyle intervention *Beweegkuur*. A key feature of Beweegkuur is the effective local structures realised through partnerships within primary care. Therefore, nationwide implementation of this programme will pave the way for new target groups with health issues to improve a healthy lifestyle and functioning. Exercise is beneficial for physical and mental health and can improve the quality of life for people in all stages of dementia. Therefore, to provide optimal care within residential care facilities, current research outcomes by VU University Amsterdam, University of Groningen and NISB should be translated to nationwide implementation strategies.

**Personal Health Check consortium (PGC)**

As part of a broadly supported public-private effort medical professional associations (general practitioners, occupational health doctors) in cooperation with members of the SGF (Heart Foundation, Kidney Foundation, Diabetes Fund & Lung Fund) and NIPED recently launched The Personal Health Check, an innovative e-Health platform for Personal Prevention. Positioned as the scientific answer to multiple disease specific tests and non-validated health checks, the PHC is available for all Dutch citizens since February 2015. The approach aims at reducing the chronic disease burden through prevention and early detection of cardiometabolic, kidney disease, COPD, Common Mental Disorders and cancer through health-profiling, and personal medical and lifestyle advice. A programme of ongoing research and further development is an essential part of this PPP initiative for the purpose of continuous enhancement of its effectiveness and applicability.

**Work participation as clinical outcome**

Work participation is part of daily functioning and quality of life. Staying at work is important for employees with chronic disease and their employers, guaranteeing respectively an income and a productive staff. On a national level, working people are tax payers and contribute to the GBP. This is why work participation as a clinical outcome is essential for patients, companies and society. In the curative sector more and more attention is paid to the work of patients, accompanied by many questions. On a political level connection of activities related to the Min. SZW and Min. EZ demand all the more stronger connections. Where more and more research is combining ARBO curative aspects, a financial incentive for work participation as a clinical outcome is lacking. Work as a clinical outcome can be more explored, also as an export product of the Dutch innovative healthcare, with new initiatives in line with programs as Fit for Work and Target@Work.

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31 See: [www.persoonlijkgezondheidscheck.nl](http://www.persoonlijkgezondheidscheck.nl)
33 See: [https://webmail.zonmw.nl/owa/redir.aspx?SURL=Fbm-rNMOd3GQwUFWR8r_sBhrb6UTFtdeApjcbGjzKqdsLkWhx2j5CgAdADB0AHAQgQAvAC8AdwB3AHcALgBjAGUAbgb0AHIddQBlAHcAZQByAGsAZwBHIAoAbwbuAGQAAaAIBIAGkAZAAaUG4AdAwAHQAYQByAGcAZQB0AEAdwBvAHIAawAHUAAuQBDAHYAbwBIAHlAaQBuUAgcALwBzAQAdQB1AHlAZwByAGBAZQBwAA...&URL=http%3a%2f%2fwww.centrumwerkgezondheid.nl%2ftarget%40work%2fuitvoering%2furstuurgroep](https://webmail.zonmw.nl/owa/redir.aspx?SURL=Fbm-rNMOd3GQwUFWR8r_sBhrb6UTFtdeApjcbGjzKqdsLkWhx2j5CgAdADB0AHAQgQAvAC8AdwB3AHcALgBjAGUAbgb0AHIddQBlAHcAZQByAGsAZwBHIAoAbwbuAGQAAaAIBIAGkAZAAaUG4AdAwAHQAYQByAGcAZQB0AEAdwBvAHIAawAHUAAuQBDAHYAbwBIAHlAaQBuUAgcALwBzAQAdQB1AHlAZwByAGBAZQBwAA...&URL=http%3a%2f%2fwww.centrumwerkgezondheid.nl%2ftarget%40work%2fuitvoering%2furstuurgroep)
Data-driven innovation for personalised health

TNO and partners are working together in the Amsterdam Metropolitan Area to improve and sustain personalised health support via data-driven innovation. Within Almere a number of opportunities for PPPs have been identified by the municipality and TNO, together with local business and education partners. In the coming period, partners are defining the innovation programme for the urban transition towards improved personalised health and a city supporting a healthy lifestyle. The basis for this programme is to use big data in the co-creation and implementation of innovations. The Big Data Value Center (BDVC) is a unique open innovation platform with a physical location in Almere. The BDVC has been established by the Economic Development Board Almere in collaboration with TNO, SURFsara, eScience Center, Amsterdam Economic Board and Economic Board Utrecht. In the BDVC, we create more value out of (big) data. Together with experts from public and private organisations, companies can experiment with their own and other datasets in a safe and inspirational place. The experiments result in new or improved business cases. The BDVC collaborate with DTL. Better Together in North Amsterdam (BSiN) is a regional innovation programme focused on the development and implementation of integrated health and social care service delivery in the district of Amsterdam-Noord. The essence of BSiN is a multi-level approach (client, professional, organisation, financial) intertwined with action research. The aim is to verifiably improve self-sufficiency and health and social participation of residents with multiple and complex problems. In BSiN, the Krijtmolenalliantie (KMA), an alliance of 10 providers of welfare, social security, primary and secondary healthcare, nursing care, institutional care, and home care, together with TNO collaborate with the Achmea insurance company and the City of Amsterdam. The future need for care based on validated prognostic modelling of functioning combined with a vision on future health (care) provides a basis for timely preparation for research in future professional needs, requirements, education, system changes, implementation of interventions, community health organisation etc. This should be organised in ‘living labs’.

Personalised Nutrition and Health (PN&H)

This PPP programme is a joint TNO/DLO initiative to develop innovative systems for consumer empowerment in personalised nutrition and health by using personalised feedback through employing smart and easy do-it-yourself measurements. The ultimate goal is to enhance the health and wellbeing of society by empowering consumers to choose and maintain an optimal personalised diet & lifestyle. The big societal challenge is how to change and especially maintain healthy behaviour. This programme will combine knowledge and know-how from different institutes and private partners to link personal measurements of health to behavioural change in practice.
Crossover R&D initiatives with other Top Sectors

Logical partners for LSH are the Top Sectors AgriFood, Chemistry and the Creative Industry (Cl), HTSM, and Logistics, as well as the enabling technology of ICT. The following initiatives have been taken to form so-called incubator PPPs with the aim to explore areas of mutual interest and with the intention to grow to sizeable PPPs in the future:

Pillar I. and Chemistry: Fundamental Research Life Sciences PPPs

With the Top Sector Chemistry discussions are ongoing, in line with the ZonMw programme “Meer Kennis met Minder Dieren”\(^{34}\), to include in their 1 M€ ‘Chemistry of Life’ programme topics like Antimicrobial Resistance (see below) and an elaborated science and business-driven search for Alternatives for Animal Testing (3R; or even “4R” when including a 4\(^{th}\) R – Return of ‘Investment’ – for the unobstructed collective use of knowledge stemming from a minimum of animal experiments of the highest scientific quality and relevance as well as the optimal use through systematic reviews of the knowledge revenues of all animal experiments carried out historically. Such reviews lead to more knowledge, better knowledge, better quality science and better translation).

Other ideas under discussion with the Chemistry sector are e.g. centred around the theme of health/homeostasis and health/breach in homeostasis. In this proposal, Chemistry know-how (analysis detection and miniaturization) and life sciences (patients/clinical parameters/high end established analyses) could be combined.

Pillar I. and HTSM: Fundamental Research Life Sciences PPPs and Pillar II. Applied and Practice-Based Research PPPs

With HTSM, STW, Min. VWS, ZonMw and cooperating health foundations (SGF) LSH is developing a translational call of about 10 M€ as a follow up of the IMPULS1 call of about 2 years ago. The health foundations will be in the driver’s seat for steering the programme that will be part of the ZonMw proposition financial contribution to the LSH budget of 2016-2017, with a surplus by LSH of 1.5-2 M€.

Pillar I and HTSM: TNO – Van ‘t Hoff programme

Optical spectroscopy is commonly regarded as the next revolutionary advance in medicine. TNO initiated the van ‘t Hoff Programme to mitigate the cost and risk factors of advance discovery in this emerging field. The programme brings together key stakeholders from research organisations, equipment and product manufacturers, hospitals and foundations. Each partner in this open innovation ecosystem contributes specific knowledge and expertise to achieve a common goal: optimising the use of optical spectrometry in a patient setting. Risks, costs, facilities and data are shared between all participants. New partners join the collaboration each year. Through many iterations of

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\(^{34}\) See: http://www.zonmw.nl/nl/programmas/programma-detail/meer-kennis-met-minder-dieren/algemeen/
testing in both laboratory and real-world environments, the programme contributes a significant amount of information to the partners who can tap into the potential of this new technology. The van ‘t Hoff programme provides a foundation, outlining the basic principles of how the technology works, and each individual partner is able to use those principles for application in their development process.

**Pillar II. and AgroFood: Applied and Practice-Based Research PPPs**

With AgriFood, apart from the future cooperation in NCOH, a joint effort is being realised in the area of intestinal microbiomics, also known as gut health, as part of the European Joint Programme Initiative ‘Healthy Diet for a Healthy Life (JPI-HDHL)’, of which ZonMw is the coordinator. Recently the Call for Proposal was opened. The main objective of this Joint Action is to support multidisciplinary transnational research consortia using innovative and scientific approaches to increase knowledge on:

- The short- and long-term functional effects of diet, dietary patterns and dietary constituents on human intestinal microbiota;
- The functional impact of diet-related variations in the intestinal microbiota on human health and/or the development of non-communicable chronic diseases.

LSH provides 500 K€ and ZonMw/ALW from EU matching funds another 700 K€. By doing so, 2-3 Dutch projects can be funded. The timeline is such that by the end of 2015 the projects can be started.

**Pillar II. and CLICKNL: Applied and Practice-Based Research PPPs**

Together with relevant stakeholders a joint programme has been drafted between CLICKNL and LSH to optimise the use of e-health for people suffering from dementia and their (informal) caregivers. The combined budget is at least 1.5 M€ (500 K€ from LSH, 250 K€ from CI, plus matching funds by public and private partners, including universities of applied sciences) and should be seen as an initiative to boost the creative and impactful use of e-health tools to prevent functional decline, loneliness and to allow people to live for longer in their comfortable living context. This programme starts in 2015. The long-term ambition is a long-lasting PPP between both initiating Top Sectors. To this end a coalition, programming and funding will be explored and, based on the exploration results, continuation of the PPP will be decided upon in 2016-2017.

**Pillar II. and AgroFood: Applied and Practice-Based Research PPPs**

Monitoring Food Intake between AgriFood and LSH. To be able to understand and change human eating behaviour and its effect on health, we need to be able to measure food intake. This implies measuring what we eat, how much, when and in which circumstances. However, measuring food intake is notoriously difficult, especially in ambulatory conditions. The standard approach using questionnaires only gives partial and rather unreliable results. This research programme addresses what the elements are
of a framework for (1) measuring, (2) analysing and (3) changing food intake. The main ICT challenge is to integrate and interpret the data from a diversity of signals and to translate this into actionable information for end users.

_Pillars I, II, III & ICT, ClickNL, AgroFood, HTSM: TNO - Healthy Living_

To be able to understand and improve the (experienced) health status of an individual, and allow people to function and participate to their full potential, TNO is active in a variety of PPPs across (Top) Sectors, bridging the three H-H pillars. The main goal is to realise improved personalised health through personalised, preventive, predictive and participatory lifestyle support and healthcare therapy/treatment. Focus areas are the safe collection and application of big data, personalised food, prognostic complexity and human enhancement. In their PPPs, TNO and public and private partners join forces to create better support and outcome for children, the elderly and workers, especially those groups that face multiple and/or complex challenges in life. Through combinations of technological and social innovations, the PPPs want to make healthcare costs manageable and empower people to take control over their own health data, and to live a healthy life, independently in their own familiar surroundings, for as long as possible.
Pillar III: Built environment and ICT infrastructure PPPs

**Built environment**

The built environment is an omnipresent factor and contributes directly and indirectly to our abilities to train, grow and function in, adapt to and cope with society. The built environment comprises different scale levels, which interact, catalyse or oppose vital functioning in a healthy economy. It has become apparent through different PPPs that investments in interventions in the physical and social environment (e.g. domotics and social centres) have increased vitality and participation of inhabitants. TNO has developed several instruments (such as Urban Strategy, ‘Zorg dashboard’, Societal Cost Benefit Analysis) that help to assess the effects of interventions at various scale levels. There is a need to expand and formalise the emerging evidence base about the impact of age-friendly, ICT-enriched built environments on quality of life and independence. There are several PPPs in place, led by TNO where partners from different domains (health insurance funds, pension funds, housing corporations, real estate developers, building contractors, suppliers of building materials and several SMEs) work together and in which vital functioning, participation in society and prevention play a crucial role. It is the ambition that in the region of Utrecht full living labs are organised in cooperation with the knowledge institutes, and that these train policy makers and students in new ways of thinking through education and dissemination. TNO, RIVM, Utrecht University, HU University of Applied Sciences Utrecht, KNMI, University Medical Center Utrecht and Deltares work together in the Knowledge Centre Healthy Urban Living in Utrecht (KC HUL). This valorisation centre provides integrated knowledge and in public partnerships develops a geospatial information infrastructure for (re)design and investments in healthy urban environments. It bridges the gap between communities working in different fields like healthcare, welfare, self-organisation, environmental quality, housing and spatial planning. Together with these partners and others (SMEs). It is expected that these PPP will grow from 1.0 M€ in 2016 to 10 M€ in 2019, where the developed knowledge can be used not just in the Netherlands, but also serve as a basis for export.

*End user participation in creating an preventive healthcare environment in urban area’s*

In the last decade, and increasingly since the financial crisis, the focus has shifted towards more global master plans and allowing bottom-up approaches in urban development. We see a growing focus on the living lab: a design approach that places the user in the centre of the design. Regions, cities, medical surroundings and houses are important research domains as living labs for preventive healthcare on the boundaries of real estate, big data and behaviour. The research will focus on explanations of participation of the different actors in the process. It takes quadruple helix as the starting point, where the user is centred by industry, academia, and the government. In the coming months the Stichting Kennis Gebiedsontwikkeling (SKG) will work further
on a PPP consortium for ‘living lab’ research on this health theme, with a programme budget of around 0.1 - 0.3 M€ a year for five years and at least 50% in-kind contributions. Within Delft University of Technology a student research lab will start in September 2015 with a focus on end-user participation. This project will be connected to the theme in the lab. It will be done in close connection to the consortium partners from practice. With frontrunner municipalities, private investors, housing corporations and design companies. Platform Gebiedsontwikkeling.nu will be used to monitor and share relevant insights.

**ICT (Bio) Informatics**

Key to any success in the LSH, but also other sectors, is to build up and secure a strong and supportive infrastructure, integrated in the ICT infrastructure foreseen by the enabling technology of ICT. Critical for LSH are effective solutions to enable leveraging of the opportunities provided by the digitisation of health(care). ICT platforms are crucial elements supporting and enabling people engagement at first, and at the same time providing collaborative digital health and pathology solutions across settings, ranging from home, to extramural and intramural. ICT platforms are also enablers of people or patient engagement. Also critical for LSH are high-end enabling technologies, like next-generation sequencing, proteomics, metabolomics, systems biology, bio-imaging, and bioinformatics as organised within the DTL platform, but also typical LSH infrastructures such as well-organised biobanks and medical banks, such as Parelsnoer, DACO and LROi, and cohorts, among others, LifeLines, and ERGO. Biobanks are the backbone for longitudinal studies in health; the Netherlands provide relevant data and expertise to the European biobank community. LSH aligns with the national NFU programs on population biobanks (LifeLines; n>167,000) and clinical biobanks (Parelsnoer; 14 disease, all UMCs). Through BBMRI-NL and DTL/ELIXIR-NL these are firmly embedded in the European ESFRI infrastructure. Besides these an impulse cutting across settings along the ‘continuum of health’, supported by appropriate ICT and outcome measures – with respect to value based healthcare – will be explored. Currently, LSH is involved (in)directly in the following activities:

- The Dutch Techcentre for Life Sciences (DTL) has been set up by a broad and growing public-private partnership to establish a unique and multidisciplinary research infrastructure of Dutch top-quality expert groups and service providers that have well-sustained and open research facilities (research and service *hotels*) in the above mentioned high-end technology areas. DTL collaborates with the UMCs (NFU) and others to closely involve population and clinical biobanks of international value, such as assembled in initiatives as Parelsnoer, BBMRI, LifeLines, DICA, DACO, LROi and ERGO. DTL is therefore building the expertise and infrastructure backbone for a nationwide and highly accessible *NL-Health Research Infrastructure*. 
• Core to the DTL agenda is the development of a common data infrastructure that connects all distributed facilities and resources, and that enables big data analytics and data integration through common standards and international (FAIR) data stewardship guidelines. These steps involve experienced data and ICT partners such as SURF and NLeSC, the NFU-led Data4lifesciences programme and the DTL-led Dutch node in ELIXIR, the European bioinformatics infrastructure with the tagline ‘data for life’.

• At the data and ICT level LSH strongly aligns with the ICT Roadmap and based upon its own strong data and ICT challenges, LSH will actively contribute to realisation of a cross-sector ICT and bioinformatics research and innovation programme. The goal is to drive development of next generation ICT and data solutions in close collaboration with the excellent Dutch ICT and bioinformatics field. DTL assists in shaping the broader life sciences and health related part of the COMMIT2DATA programme, and crossovers are being made to other life sciences related sectors that require a similar enabling technology and common data infrastructure.

**DICA**

The Dutch Institute for Clinical Auditing\(^\text{35}\) is a non-profit organisation originating from the medical professional organisations. Working closely together with all the national stakeholders in healthcare, DICA collects and delivers quality information to and from medical professionals and institutes. During the past eight years a solid ICT structure has been developed with all the necessary legal preconditions regarding ownership and privacy. With a nationwide acceptance and implementation significant improvements in healthcare have already been realised. At this moment DICA is active in 20 fields of healthcare covering benign as well as malignant conditions. Fields of interest (expanding with other diseases, implementing implant registries, combining with PROMs and functional testing, facilitating scientific work, etc.) and realised improvements are rapidly increasing. At this moment DICA implements the combination of quality data with relevant financial data for institutes. With a nationwide implementation this could save 3 B\(\text{€}\) per year. Not only are the solid ICT structure and legal preconditions an outstanding basis for the connection with other databases and initiatives, but they also form a preset for international extension making worldwide comparisons available in the near future. The first steps in this exciting new era have already been set.

**Transition budget for Top Institutes:**

Part of the aforementioned transition budget of 15 M\(\text{€}\) was, again in consultation with our partners, allocated towards the following activities:

\(^{35}\) See: [www.clinicalaudit.nl](http://www.clinicalaudit.nl)
• For securing and further developing the data infrastructure the Mondriaan and TraIT projects will be continued with a budget of 4 M€. The CTMM Translational Research IT (TraIT) project is developing and implementing a long-lasting IT infrastructure for translational research projects in the Netherlands that will facilitate the collection, storage, analysis, and archiving of data generated in the biomedical research projects. Likewise the TI Pharma project Mondriaan aims to create a national data network containing healthcare and research databases to fuel pharmaceutical research in the Netherlands;
• An additional budget is reserved by the Min. VWS for initiating and organising LSH business development activities that connect to the funding sources of the EU, like H2020 and others. Plans to this end are currently being made.
Appendix II Integration in the Dutch Science Agenda

Clustering of questions
H-H’s principal stakeholders were approached to raise questions for the Dutch Science Agenda (DSA). The Top Sector therefore clustered these into questions with a fit in one or more of the following R&D categories:

1. **smart therapy**, where the focus is mainly on prevention, cure and technical innovations
2. **smart care**, where the focus is obviously on care and societal innovations
3. **smart infrastructures**, where the focus is on enabling technologies and general infrastructures.

In addition, many questions dealt with rules and regulations for which we made an additional category, thereby marking the importance of this subject in the H-H sector. Below the main questions are listed. Except for the question related to rules and regulations, all the other questions are dealt with in our K&I Agenda, and hence fit completely with the DSA.

1.1 **General**
- Hoe realiseren we een gezondheidszorg die persoonlijk, predictief, preventief en participatief is, zodat we met personalized health komen tot een hogere effectiviteit en lagere kosten?
- Hoe kunnen we de juiste kennis genereren die nodig is om behandeling op maat mogelijk te maken voor iedereen en voor iedere ziekte?
- Hoe gaan we om met interferentie/stapeling van geneesmiddelen?
- Hoe kunnen we sociale en economische innovaties (regionaal) beter integreren?
- Wat is het effect van de 24 uurs economie op stress, gezondheid en meer algemeen op de kwaliteit van leven?
- Hoe richt je een stad in waarmee de kwaliteit van leven van de bewoners wordt bevorderd?

1.2 **Smart Therapy**
- Hoe ontwikkelen we precision medicine voor alle patiënten met kanker in Nederland?
- Hoe kan precision medicine van het lab naar de klinische praktijk gebracht worden?
- Wat kan de Nederlandse life sciences sector doen aan nieuwe diagnose en behandeling van neglected tropical diseases?
- Wat is er nog nodig om tot een draagbare kunstnier te komen?
- Hoe kunnen we zeldzame ziekten beter en sneller behandelen?
Hoe zorgen we ervoor dat infectieziekten ook in de toekomst bestreden kunnen worden met nieuwe generaties antibiotica?

Hoe voorkomen we de overdracht van (infectie)ziekten tussen dier en mens (zoöonose, one health concept)?

Hoe kunnen patroonherkenningssystemen ook voor andere dan medische doeleinden worden uitgerold?

Hoe kunnen we ervoor zorgen dat geneesmiddelen kosteneffectiever ontwikkeld kunnen worden?

Hoe verbeteren we het voedingspatroon en (mental) health van mensen met customized nutrition?

Hoe draagt het microbioom bij aan gezondheid en hoe kunnen we dit beïnvloeden richting preventie en genezing?

Kunnen we onze afweer beter afstellen zodat we beter tegen ziekten bestand zijn?

Hoe gaat de kennis van ons genoom bijdragen aan betere behandeling en preventie van ziekten?

Hoe kunnen we gezond functionerend ouder worden?

Hoe ontwikkelen we minimaal/niet-invasieve technieken en interventies t.b.v. diagnose, preventie, cure en care?

Hoe kunnen we gezond functioneren verbeteren door beschadigd weefsel/organen te herstellen of vervangen m.b.v. regeneratieve medicijnen/technieken?

1.3 Smart Care

Hoe organiseren we de integrale zorg voor alle 65-plussers in Nederland (dus maximale elektronische communicatie tussen alle zorgverleners inclusief sensor-mediated informatie op voor ouderen begrijpelijke en bedienbare wijze)?

Hoe bevorderen we het herstel van patiënten door een betere pre-operatieve voorbereiding (beweging + voedingsgedrag)?

Hoe kan de effectiviteit en doelmatigheid van e/m-health instrumenten verbeterd worden, die ingezet worden om mensen met bv. dementie te ondersteunen om langer zelfstandig thuis te blijven wonen?

Welke kansen bieden wearables en robotica voor een preventieve gezondheidszorg en hoe zorgen we dat dit toegankelijk wordt voor iedereen?

Hoe kan de effectiviteit en doelmatigheid van aanpassingen in de woonomgeving, die zelfstandig blijven wonen ondersteunen in geval van de beperkingen van veroudering, verbeterd worden?

Hoe verbeteren we gezondheid, preventie en zorg?

Hoe kan de zorg- en marktvraag rondom antibiotica beter op elkaar worden afgestemd?

Hoe kunnen we de zorgsector beter internationaal profileren?
1.4 **Smart Infrastructure**

- Hoe transformeren we grote (multi-centre) datasets (alle -omics + imaging) naar bruikbare kennis in de life sciences?
- Hoe kunnen we geneesmiddelenontwikkeling met behulp van big data versnellen?
- Welke ICT informatie- en communicatiesystemen en *medical devices* verhogen de effectiviteit en doelmatigheid van de regionale (ambulante) samenwerking tussen medisch specialistische zorg, zorg rond de thuissituatie en zelfzorg rond chronische ziektebeelden?
- Welke gevalideerde systemen moeten ontwikkeld worden om zoveel mogelijk dierproeven te vervangen?

1.5 **Smart Rules- and Regulations**

- Wat zijn de effecten van nieuwe regulatoire processen op versnelde toegang voor patiënten tot innovatieve behandelingen en hoe kan dit verder verbeterd worden?
- Op welke manier kan vroegtijdiger toegankelijkheid van innovatieve geneesmiddelen gecreëerd worden voor patiënten?
- Wat zijn de positieve en negatieve consequenties als straks iedere baby bij de geboorte zijn of haar genen paspoort krijgt?
- Welke hindernissen moeten we wegnemen om de implementatie van nuttige innovaties te verbeteren?

1.6 **Success indicators**

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- Questions raised in this agenda and especially those included in the overall DSA are addressed in the planning of the sector’s R&D initiatives and facilitative engagements and operational critical success factors, be it in the K&I Contract 2016-2017 and/or in that of 2018-2019.
Appendix III  Facilitating engagements

1. Facilitative engagements

With the strategic headlines mentioned in Chapter 1 and of this agenda at the top of our minds, our facilitative engagements will be described in this second chapter.

1.1 End user and SME involvement

*Added value*

The involvement and participation of end users in R&D is increasingly advocated by experts and appreciated by clients and patients. Despite its challenges on processes and procedures and the professional and organisational complexity of this phenomenon, H-H is convinced of its added value and will explore its alignment with responsible research and innovation initiatives\[^{36}\]. Besides these, the sector’s ambition to contribute to evidence-based medicine, where, according to 2005’ Sicily Statement\[^{37}\], patients decide for their interventions, would make a future-proof R&D impossible without end user involvement. ParkinsonNet\[^{38}\] is an excellent Dutch example in this respect.

*Health continuum*

The aim is to involve end users in all our facilitating engagements, operational critical success factors and governance, be it citizens – either as clients or patients or via patient organisations – or SMEs. A critical role is foreseen for ICT solutions that ensure access to information and enable collaboration across health(care) settings: the health continuum. A good example here is the collaboration between Philips and RadboudUMC, managing COPD patients across settings leveraging Philips' cloud-based HealthSuite Digital Platform\[^{39}\].

*Act as one*

Equally important is the facilitation of the academic sector, as well as the entrepreneurial environment, organised in their branch organisations and regional operations. Within this framework, we will bring together SMEs/entrepreneurs and life sciences/health experts with clients and patients and facilitate their collaboration. Together we will detect synergy and enable the Dutch scientific and entrepreneurial scene to act as one thereby strengthening the Dutch position in a European and global context. The aforementioned activities will be explained in more detail in the H-H K&I Contract 2016-2017.

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\[^{37}\] Dowes *et al.*, 2005

\[^{38}\] See: [http://www.parkinsonnet.nl/](http://www.parkinsonnet.nl/)

1.2 Focus on the regions

Crucial and indispensable
The OESD and more so the CPB are quite clear and complimentary when it comes to the contribution of the regions in the Dutch Knowledge and infrastructure: crucial and indispensable. Besides this it was mentioned that there is room for improvement. This also holds true for the regional LSH R&D.

Regional (synergy) development
H-H will collaborate with regional clusters to facilitate their regional and interregional collaboration to create synergy, to interconnect public and private partners, via the consolidation of critical mass in R&D via start-ups and PPPs. As such, the regions will be supported to further expand their collaboration with citizen cooperations, R&D institutes and higher education partners and institutions, SMEs, public health and primary, secondary and tertiary care facilities, including university medical centres (UMCs), universities of applied sciences (UASs), “Regional Training Centres” (ROCs) and, where applicable, the Min. VWS “Proeftuinen” (Test beds), mostly under the guiding direction of economic boards that integrate the regional societal and economic challenges in profitable R&D see Figure III.2)

Figure III.2. Overview of the collaborating R&D partners in the H-H regions.

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40 OESD 2005; CPB, 2015
41 See: http://www.nfu.nl/english/about-the-ntu/
42 See: http://www.vereniginghogeschoolen.nl/english
43 See: http://www.roc.nl/
Strategic support

H-H will support the extension of strategic plans by the regions in 2015-2016 and in 2017-2018. In addition H-H will co-finance these (new) R&D initiatives where possible using the self-earned TKI allowance. These (developing) regional PPPs will be major strongholds of the Dutch and regional H-H ambitions. Relevant examples – out of many in all the regions – are given by the Amsterdam Economic Board that took up Urban Vitality and the Province Noord-Brabant that in its ‘Governance Agreement 2015-2019’ describes the construction and deployment of Brabant-wide living labs for development, testing and implementation of innovations in care. Last but not least, H-H will support the exchange of R&D among regions and at the same time avoid possible duplication. Within the regional context, R&D initiatives originating from the Dutch Caribbean and supported by the Dutch Government will deserve attention and will be facilitated on the same base.

Regional human capital

Another important element is the HCA, and H-H, in coalition with the other Top Sectors, will assist and motivate the involvement of our regional ‘satellites’ and their partners – one of which is the regional RegioPlus entity – to invest and implement the advices stemming from the HCA.

R&D circulation

The H-H regions already have taken the initiative to collaborate with adjacent regions over the regional borders, from under the umbrella Zorginnovatie.nl, and also to connect internationally. Examples of the latter include HANNN and its partnership for Healthy Ageing and, more recently, the leading involvement of Dutch core partners (Medical Delta, Groningen and Maastricht UMCs, Eindhoven University of Technology, Achmea and Philips) in EIT Health as well as the exploration of the regenerative medicine across borders initiative (RegMedXB), the largest European initiative on regenerative medicine along the Dutch/Belgian border.

1.3 Internationalisation

Orange carpet

During the coming four years H-H will assist the sector through its regions and national PPPs to further build a more or less permanent international R&D cooperation, networks and circulation system (see Figure III.3; named by Neelie Kroes the Orange Carpet). This could involve people – for its talented (to be) R&D experts and institutes – or

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45 See: http://www.hva.nl/over-de-hva/profiel/speerpunten/content/urban-vitality/urban-vitality.html
47 See: http://www.regioplus.nl/home
48 For an overview of the Dutch LSH regions and their focus, see: www.zorginnovatie.nl
49 See: http://www.hannn.eu/
50 See: http://eit.europa.eu/eit-community/eit-health
technology – products, services, concepts and (sub)systems – or both. Scaling and starting up and fostering international exchange of R&D would serve three purposes:

A. **Export**: for R&D cooperation, (first) foreign market introduction and entry, and extra economic revenues and R&D valorisation for – scale- and start-up – small up to big enterprises and the nation;

B. **Import**: mainly for opening up, building and strengthening international R&D networks and strengthening the PPPs and the national LSH system. Likewise for attracting foreign investment, expertise and – scale and start-up – companies;

C. **Image and reputation building** of the Sustainable Urban Delta as a whole and H-H in particular.

*Figure III. 3. Dutch H-H landscape of R&D circulation, national and international.*
Dutch LSH Alliance
The Dutch LSH Alliance\textsuperscript{51} – a coalition of nine platforms: FHI, TFHC, FME, MedtechPartners\textsuperscript{52}, Firevaned, Holland HealthTech, HollandBIO, Nefarma, and Nefemed – provides grand-sector support for its internationalisation strategy, activities and network cooperation. The detailed rolling agenda \textit{International Agenda 2012}\textsuperscript{53} is still instructive as it notes H-H business priorities\textsuperscript{54} and priority countries\textsuperscript{55}. Besides this Agenda, an \textit{International Action Plan} was agreed upon during the successful Top: Zorg Export late December 2014, after which the Dutch Minister for Health (Edith Schippers) informed parliament about the headlines\textsuperscript{56}. The detailed Action Plan will be published by the end of June 2015\textsuperscript{57}. Amongst other activities, yearly economic missions will be arranged\textsuperscript{58}, where members of the Dutch royal family and the Ministers of Health, Economic Affairs, Foreign Affairs will head up the group. Besides these, the Min. EZ and RVO support focussed technology matchmaking missions abroad\textsuperscript{59}. In line with the Agenda and Action Plan the H-H Top team and the Dutch Alliance strive to select 3 to 5 top priority countries to focus on, in which all the aspects of this K&I agenda will be handled in conjunction with the Economic Departments, Health Attachés, and Innovation Attachés of the Royal Dutch Embassies.

International Centres of Excellence
The Task Force Healthcare, platform for the Dutch LSH sector with its mission \textit{To improve international healthcare with the use of Dutch expertise and innovation}, has set up various “working groups” for internationalisation per country. The working group’s primary aim is to build bilateral relationships between H-H and the country concerned and its LSH sector within the context of R&D, business development and healthcare improvement. The working groups are open for any Dutch LSH organisation interested in deepening their business or international activities in these countries. The working groups serve as structural \textit{centres of excellence} and a \textit{central point of contact} to facilitate R&D sharing and cooperation and all working groups develop an agenda from under the Dutch proposition. Currently six working groups are active, focused on respectively China, India, Indonesia, Middle East, Russia and (South) Africa. Pending the coming strategic period (2016-2019) further developments of these and other opportunities will be explored with the sector partners and, where and when possible, facilitated and supported by H-H in their execution.

\textsuperscript{51} Representing over 900 companies, including NGO’s and R&D institutes.
\textsuperscript{52} See: http://www.medtechpartners.nl/?portfolio=hulpmiddelen-gewenst
\textsuperscript{53} See: International Agenda Life Sciences & Health, 2012
\textsuperscript{54} Per region/country a comprehensive summary sheet is provided including a background, previous activities, indication of business opportunities and an outlook.
\textsuperscript{55} Top 10-listed priority areas/countries are Africa, China, Germany, the Gulf-region, India, Indonesia, Russia, South America, Turkey and USA (note: these 10 regions equal to 24 countries).
\textsuperscript{56} See: Kamerbrieft 725052 133226-IZ
\textsuperscript{57} Hereto a new ‘working group’ under the auspices of the Top Team H-H was assigned consisting of representatives from the Ministries Health/ Foreign Affairs/Economic Affairs, Netherlands Enterprise Agency and the Dutch LSH Alliance.
\textsuperscript{58} See: Reisagenda wens Topsectoren 2015
\textsuperscript{59} See: http://www.rvo.nl/tmm
Test bed
If it is successful with respect to the aforementioned objectives, H-H may maintain and even expand its world-leading position in LSH R&D and consequently foster societal and economic impact worldwide. At the same time international relationships with other world-class regions are key to introducing more state-of-the-art technology in our own LSH system and also for learning from each other. These relationships build on a multi-layered, long-term approach connecting governments, R&D and health(care) institutes and (new) businesses. For example, by positioning the Netherlands as the European test-bed for foreign LSH (start up and established) companies, we achieve two goals in one: attracting new business and investments, while simultaneously absorbing the latest technologies and innovations in our LSH system.

Europe
The Dutch unique selling points in the LSH field are topics in which the sector can also contribute to the European R&D agenda. By doing so the sector further increases its visibility in Brussels, strengthens collaboration between Europe’s Member States and the European Commission and consequently ensures that Europe makes optimal use of Dutch expertise in this field. Horizon 2020 is an important source of income for R&D of LSH and EU-funded projects form a solid base for long-lasting successful cooperation. H-H as a sector is effective in general in gaining grants (on average 1 € invested by the Dutch, 3.8 €’s are returned by acquired grants from the EU). Top scores were recently once again presented by the EU to the Dutch for Personalised health project coordination. SYRCLE is another example of a unique Dutch selling point, as it is the only expertise centre worldwide focusing on education, coaching and development of methodology and tools of systematic reviews of animal studies. In line with the LSH Innovation Contract 2012, H-H will support the sector partners with their R&D initiatives – like for instance ELF and EIT Health – in their participation in Joint Programming Initiatives, ESFRI roadmaps and EIPs, especially that of Active and Healthy Ageing.

European Translational Research
The Netherlands is actively involved in European Infrastructure for Translational Medicine (EATRIS), the European consortium on translational research in medicines. The vast majority of the UMCs in the Netherlands, as well as BPRC, INTRAVACC and CVI are members of this consortium. EATRIS supports academia, SMEs and large companies in translational medicine by opening up the expertise and facilities of its associated institutes. Additionally, charitable and public funding bodies such as Reumafonds and ZonMw are using EATRIS to optimise their translational research portfolios. This results in

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60 Like from the UK, concerning the introduction of TeleHealth in 2008-2009. See: http://www.bmj.com/content/346/bmj.f1035
62 See: https://www.radboudumc.nl/Research/Organisationofresearch/Departments/cdl/SYRCLE/Pages/AboutSYRCLE.aspx and http://tabularasa.nl/beta/wp-content/uploads/2015/05/Systematic-reviews-bij-dierstudies.pdf; SYRCLE has received support from the Min. EZ and from the Min. VWS via ZonMw. More recently and in line with Corporate Social Responsibility, SYRCLE together with the Utrecht University, was also supported by the Min. OCW via NWO for improvement of translational research initiatives.
63 See: http://www.eatris.eu/; The Coordination and Support office of EATRIS is headquartered in Amsterdam thanks to the contribution of the Netherlands government.
projects that have better translational perspectives, thus optimising the potential for patient benefit.

**Product Development Partnership**
The Netherlands is also an important donor of Product Development Partnerships (PDPs) in the EU and globally. During the years 2015-2020 RVO and H-H will jointly be involved in the facilitation and coordination of the PDP Fund III (86.3 M€) from the Ministry of Foreign Affairs (Min. BuZa). This PDP focuses on product development for poverty-related diseases and health problems with a clear need in developing countries and/or by the poorest and most vulnerable populations in the world. Main objective is the advancement of public health rather than commercial gain. In future, this type of PDP will also be funded by the Min. BuZa's Directorate General for International Cooperation (DGIS). H-H facilitates the initiation and development of partnerships with the relevant sector partners.

**IP protection**
Special attention has to be paid via this Agenda for the lack of adequate protection of knowledge that can be commercialized of H-H partners' IP. In general physical products are well protected, but services, treatment concepts and systems approaches, are difficult to protect. An example of the latter is for instance our robust and famous public Child Healthcare and Welfare system that is bound to go international. The H-H governance and Executive Office aims to support the improvement of such protection in coalition with the Min. EZ and the Min. VWS in the years 2015-2016.

1.4 Capital

**Funding**
A large part of the success of H-H relies on synergy, cooperation and R&D inventiveness. Adequate financial support is, however, an absolute prerequisite for success. Yet in recent years it has become increasingly difficult to gradually gain subsidies, funding or investments to put it mildly. This has had a wide range of negative effects for innovation cycles through gaps along the Technology Readiness Level (TRL) process from 1-9, from idea development delays to go to market obstructions.

**Health Deals**
H-H’s PPPs, the primary operational focus of the LSH R&D, will urgently need special attention in the coming years with regard to the exploitation needs of innovations for SMEs and multinationals involved. Therefore, these innovations, when proven to be cost effective, have to be effectively used in diagnoses and prognosis as well as in preventive and therapeutic approaches by professionals and citizens in order to profit from these for their vitality and functioning. H-H will help facilitate economic exploitation and societal uptake and use of innovative R&D revenues through Health Deals. Figure III.4 shows...
H-H’s more recent view within which framework the planned K&I Agenda activities will take place. Up until now, most Top Sector’s efforts were geared towards a push of technological innovations and parallel funding options bringing innovations towards a technology readiness level (TRL) of 7 (left box). The apparent success of this strategy demands for the coming years extra attention from the Top Sector towards its private and public stakeholders and partners responsible for processes and funding that bring innovations towards TRL 9. The sector should therefore help to initiate and organise (de-)implementation of products and services via evidence based sociocultural R&D, in joint processes with the Min. EZ, Min. VWS and probably also Min. Fin. An interdepartmental working group under the supervision of Min. EZ (Petra van Baak) will be asked to assist H-H here. By doing so, it is the Top Sector’s ambition to connect push and pull nationally were possible, for example, via so-called health deals nationally and, added in the interdepartmental group of the RVO and the Dutch LSH Alliance, internationally for health export deals. These health (export) deals should give PPPs and their innovations a bright future perspective from start to finish.

![Diagram](image)

Figure III.4. Overview the process of bringing an idea (TRL 1) via innovation to the ‘market’ (TRL 9).
The K&I Contract 2016-2017 will hold an exploration for tool-development that facilitates the use and uptake of H-H R&D revenues via an instrument as for instance Health (export) Deals. We here provide headlines information on both:

Health Deals:

- Agreements between health (care) stakeholders over new R&D revenues and their optimal valorisation in society, industry and science:
  - Definition of the (set of interdependent) product(s) and/or service(s);
  - Definition of the prerequisites of the set concerning the context and the circumstances where the set is to be implemented and, if applicable, what products and/or services the set substitutes;
  - Value case describing the potential value, including finances, of the set;
  - Evidence base of the set;
  - Necessary involved stakeholders and partners to bring the set to the private and/or public market;

- Process:
  - Preferably starts with the TRL 1 and is anticipatory intensified as the set reaches TRL 7;
- Involved per set:
  - Political and strategic level: Min. VWS and Min. EZ, Industry and ZIN (to imbed the set in the so-called “Zorgstandaard”) at the least;
  - Tactical Level: relevant branch organisations, including end-users branch;
  - Operational level: living lab as a test-bed for the final steps from TRL 7-9 (preferably a Min. VWS-Proeftuin (test bed)).
  - Involve inventor institute and experts

Health Export Deals:

- As in the Health Deals, but accommodated to the requirements of the country of choice to export and valorise the set here.

**TKI allowance**

The first important funding instrument is the **TKI allowance**. This Min. EZ instrument supplies funding for TRL 1-7 R&D efforts within the To Sector with 25% of the private investment in the sector’s existing PPPs in a specific year. It is up to the Top Sector’s governance to distribute its annual amount of TKI allowance in subsequent years, in line with the collectively developed strategy of H-H. The TKI allowance is expected to grow over the next years from around 4 M€ in 2014 to around 10 M€ of TKI budget for the year 2015. It is the Top Sector’s ambition to at least double the total amount of TKI allowance
in 2016. The best-case scenario would be a further growth towards an estimated total TKI amount of 30-40 M€ per year in 2019.

**MIT allowance**
The next important instrument is the MIT allowance for SMEs to support their R&D efforts in start-ups and scale-ups and PPPs they are involved in, again in line with the collective strategy of H-H. In 2015, the H-H MIT budget is about 5 M€. For the years 2016-2019 the MIT budget is expected to grow organically, but also by matching of regional funds and, when and where needed by use of international R&D support (Eureka, Eurostars, SME Instrument Fast Track and Innovation from H2020).

**NWO-ZonMw**
According to earlier governmental agreements, NWO in its position of public national research council will contribute to the Top Sectors with an annual amount of 275 M€ from 2015 onwards. Part of this amount (about 100 M€) will be directed to specific activities to support the (further) development of PPPs. Within the NWO domain, ZonMw is designated as the leading organisation for LSH, taking (potential) crossovers with other aforementioned Top Sectors into account. According to its mission ZonMw supports R&D throughout the full chain of discovery, design and deployment, i.e. from TRL 1-9.

Within the annual 100 M€ mentioned above about 12-15 M€ will be available for LSH. In agreement with the 10 constituent LSH roadmaps – established in the Innovation Contract 2012 – and the (to be) established PPPs, ZonMw will consult with its funding partners to process a concrete budget plan in the K&I Contracts 2016-2017 and 2018-2019, taking the various specific sector and cross-sector interests into account. Potential new developments are PPPs like OncoXL, Functioning and Quality of Life; Cognitive Functioning in Health and Disease; Building blocks of life (Bouwstenen van het leven); Translational research, including medical technology, collaboration across health settings facilitated by ICT; Corporate Social Responsibility (CSR; Maatschappelijk Verantwoord Innoveren). Most of these items will connect to more Top Sectors in crossover PPPs. Successful cross-cutting programmes such as enabling technologies (providing access for researchers to state of the art -omics technologies, biobanks and data collections) and alternatives for animal testing (3R) and knowledge infrastructure (such as synthesis of evidence and systematic reviews of animal studies) need continuation. ZonMw is negotiating with NWO about extra funding possibilities for EU co-funding constructions, as well as with the Min. VWS about extra funding possibilities for translational research, e-health, antimicrobial resistance and dementia.

**NRPO SIA**
NRPO SIA has a positive attitude towards de ambition of H-H. In order to explore the opportunities to contribute to the innovation Agenda, NRPO SIA has ongoing discussions with H-H and other stakeholders. The contribution discussed will be in accordance with the NWO arrangements and directed to specific activities to support the development of PPPS in which Universities of Applied Sciences are represented.
**STW**

STW and H-H will explore their existing mutual cooperation in order to provide a concrete plan in the K&I Contracts 2016-2017 and 2018-2019, taking the various specific sector and cross-sector engagements into account.

**SGF**

With nearly 200 M€ each year health foundations contribute to research and innovation in healthcare. They not only focus on fundamental life sciences research for specific diseases, but increasingly on clinical and applied research taking the lead in translating research to innovation and improved cure and care, and working on joint themes on a pan-disease level. Therefore in recent years, health foundations have more actively participated in public private partnerships, and they will continue to do so, from the perspective that implementing innovations in daily practice demands not only technological innovation but also social innovation and organisational innovation. Like the other funding partners of H-H, the health foundations consolidated in the SGF will consider the development of a more concrete budget plan in the K&I Contracts 2016-2017 and 2018-2019.

**Revolving funding via ROI**

In the long run, R&D initiatives will also gain their own revolving ROI from their products and services. This latter option, ROI, heavily depends on the diffusion and uptake of these innovations in society, in the prevention, care and cure settings of the sector. Consequently the Top Sector will try to increase the involvement of (health) insurance companies, real estate funds and pension funds with their capital in the LSH funding options, in order to improve the societal pull towards the innovations of the Top Sector. When successful, the H-H products and services will more easily reach TRL 7-9 and thereby SMEs and multinationals may subsequently provide and sell these on a larger scale in the Netherlands and, more macroeconomic interestingly because of the relatively small domestic market, through export abroad. From such ROI success investments may be of interest in H-H PPPs and their RDI initiatives.

**Funding scenarios**

To stimulate the sector’s R&D financial climate, besides TKI and MIT funding options, H-H will help to construct (competitive) funding scenarios paralleling the phases of the innovation cycle in close cooperation between R&D coalitions and funding organisations. Apart from public financial contributions from the Min. EZ (TKI and MIT, SME-focused [innovation] credits, EUREKA, Eurostars, etc.), the Min. of Education, Culture and Science (Min. OC&W; NWO-ZonMw, STW, NRPO SIA; an annual amount of circa 25 M€ is expected to be available as of 2016.), and Min. VWS, funds can be obtained from ANBIs (Samenwerkende Gezondheidsfondsen64[SGF]) and from multinationals and SMEs. Gradually a R&D initiative should be capable of organising – part of – its own funding and finances, be it from competitive or non-competitive funding or from a stepwise increasing

64 See: http://www.gezondheidsfondsen.nl/
national or international return of investment (ROI) of its economic and societal valorisation of the PPPs portfolio of innovations.

Inventive options

Even more importantly besides joint construction of funding scenarios with the existing budgets, H-H will set out a strategy to find new inventive ways to either raise the R&D funding budgets or to combine budgets on R&D initiatives from traditional and relatively new stakeholders. In view of the first option, H-H will try to facilitate the acquisition of EU funding, as these budgets are rising while national budgets are decreasing and coalitions where Dutch LSH is involved are relatively successful. With respect to the latter option, the recently established cooperation between RVO and H-H with Min. BuZa on a Product Development Partnership (PDP) might be seen as a first attainment here. Raising the budgets for funding opportunities will also be sought by H-H in coalition with other ministries and in private funding alternatives (crowdsourcing and crowdfunding, shared savings), like donations from citizens and/or regional citizen cooperations in conjunction with loans, seed and venture capital and in fiscal arrangements negotiated with the Ministry of Finance (Min. Fin).

1.5 Communication

One sector, one voice, one message

One of the important instruments to facilitate and unite the sector is communication. Smart communication, trusted and incorporated by all stakeholders is therefore one of our focal areas. Our communication strategy aims to connect all stakeholders and partners in the sector and provides one voice via one unified message. It should fulfil its role as to spread the sector’s mission, vision ambitions and objectives and, above all, its collective proposition, achievements and revenues. Consequently communication is a cornerstone for H-H to increase its visibility and liability in the sector, in the nation and abroad. Because of the importance of the “one voice” concept, H-H will cooperate closely with the Dutch LSH Alliance and with all regional, national and, when needed, international LSH-related communication officers.

One orange umbrella

In December 2014 the Top Sector LSH launched its new branding form under the Top Sector’s broad RVO-branding Sustainable Urban Delta: Health-Holland. This was in the presence of the Dutch Minister of Health, Edith Schippers. She immediately showed her enthusiasm and applied this new branding whenever she mentioned the LSH branch. From that same moment on, all sector communications were gradually brought under

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67 At present this a working title that is still being worked on by the Netherlands Enterprise Agency
this orange umbrella. From website to business cards and from stands to the letter paper and presentation templates.

**One website**

In order to facilitate the sector and all its inhabitants regionally, nationally and internationally the H-H website was launched in February 2015 (see: [www.health-holland.com](http://www.health-holland.com)). During the years 2016-2017 this website will be further developed to function as the online support portal and gateway for the entire LSH sector in the Netherlands and our counterparts abroad. One of the most important aims of the portal is to support Dutch SMEs and regions with information on finance, regulations, internationalisation, events, etc. Besides these ‘internal’ aims, the portal will also serve as the display to attract and inform others all over the world about H-H as the place to be for LSH and LSH-related progress and prosperity. To that end the website will constantly be refreshed in close cooperation with our sector partners with the latest news, events and success stories.

**Sharing of news**

In March 2015 the first bi-monthly Health Holland Update, an online news magazine ([https://healthholland.h5mag.com](https://healthholland.h5mag.com)) was launched. Per year H-H will publish four more editions and in 2016 and each year thereafter we will start the year with a *Year in Review* ([www.yearinreview.nl](http://www.yearinreview.nl)) in Health-Holland branding. For 2016-2019 Health-Holland will continue its efforts in communication and will increasingly involve the entire vibrant sector with all of its news.

**Events**

Regional, national and international LSH events where H-H partners will be present, invited or act as the host, may make use of H-H materials. Our communication officers will provide services where and when possible, provided that the *One sector, one voice, one message* strategy is relevant. Events where this strategy is key, can be listed on our website to help attract the proper audience. The sector itself will (co)host a national event each year (for 2016 the *Innovation for Health* event in Rotterdam on 18 February) and an international event every second year, that is 2017 and 2019. On the basis of the Dutch Presidency of the EU during the first 6 months of 2016, H-H will team up with the ministries and Top Sectors in 2015 to consider to eventually involve in international main events (like the *Building the Future of Health* event, to be held in Groningen mid-June 2016[^65].)

[^65]: See: [http://www.buildingthefutureofhealth.eu/](http://www.buildingthefutureofhealth.eu/)
1.6 Valorisation

**Strengths**

Based on the strengths and experiences that have been built up over the past years in programmes such as Biopartner, NGI and the Top Institutes, the valorisation of all types of R&D initiatives, expertise and revenues is available within (academic) Technology Transfer Offices (TTOs) and regionally throughout the country. Likewise, the existing TNO business development network has offered to play a role in the support of technology transfers and bringing innovative technologies to market.

**Transition budget for Top Institutes**

A transition budget of 15 M€ was provided by the Min. of EZ and Min. VWS for H~H to ensure that the best projects and best practices in valorisation and networking from the Top Institutes and NGI could be continued and that there were sufficient matching funds to attract IMI and other European projects to the Netherlands. In dialogue with our partners the budget was allocated to the following activities: for networking and valorisation activities, such as continuation of the successful Venture Challenge and the initiation of the Value Centre, a budget of 800 K€ is available. In the coming years, the Venture Challenge and Value Centre will make their funding sustainable by substituting the (decreasing) transition subsidy for private resources.

**Current state of play**

In recent years the Min. EZ has emphasised entrepreneurship and valorisation through tax initiatives and various stimulation programmes such as SKE and other valorisation programmes. By doing so every university or UMC nowadays provides entrepreneurship facilities such as training and incubation as well as pre-seed loans. Most of these activities are generic and regionally oriented, supporting disciplines available at these institutes. On top of this generic approach, NGI and other life sciences PPPs have built a network of Life sciences Technology Transfer professionals between universities and medical centres. The next step is consolidating this expertise around themes, not ‘just’ scientifically, but also in technology transfer to both private companies and public partners relevant within the health(care) context. A first example of such a National Thematic Technology Transfer Office is OncoXL. Another fine example can be found in the NGI legacy project of the Executive Master of Business Innovation and Entrepreneurship in Life Sciences and health powered by the UMC Utrecht Julius Academy and VIB/FlandersBio⁶⁹.

**Start-ups**

With respect to encouraging and supporting valorisation by means of starting up new companies the Biopartner programme has set an excellent example as national activity providing both financial support and entrepreneurial expertise. Because of the specific difficulties regarding long development times, strict and expensive regulatory

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trajectories, and a heavy science base, setting up life sciences companies generally requires more financial and entrepreneurial support than in many other sectors. The STW Valorisation grant and the former lifesciences@work package of NGI and programmes with activities such as the Venture Challenge and Pre-Seed Grant (budget 15 M€) that offered this support have been instrumental in the early success of many recent start-ups.

**Transition**
Currently, we are in the middle of this transition phase in which companies and regional funds are being mobilised and combined to maintain, embed and improve the valorisation infrastructure that has been demonstrated to be successful, such as the Venture Challenge. At the same time new, revolving models will be set up to replace the start-up grants with soft loans and an initiative especially aimed at firms with growing ambitions, the H-H Value Centre, which will be launched in June 2015.

**Societal valorisation**
Besides the economic valorisation, increasing attention is being given to societal valorisation, for example, by improving patient care through new guidelines for treatments. Involvement of patient organisations in the scientific research and valorisation ensures that benefits for society are made more visible and accessible, citizens are better informed and new treatment will be accepted and implemented faster. As stated before, by supporting an inventive combination or even an integration of push and pull factors H-H (see figure III.4, page 43) with the help of its partners and stakeholders will do its utmost to improve the societal valorisation of R&D initiatives during the strategic period 2016-2019. Initiatives to this end will be explored in the coming months and explained in more detail in the K&I Contracts 2016-2017 and 2018-2019.

**Human Capital Agenda**
A far-reaching societal valorisation challenge concerns the ambitions and objectives described in the HCA. Facilitating an integrative approach of technological and sociocultural LSH innovation is the major condition for realising the H-H ambitions. In terms of the availability of sufficient and adequate human resources, H-H will facilitate the sector to contribute to the realisation of the nine Top Sectors overarching HCA with its joint mission of a Toekomstbeheerende workforce for a flourishing economy. In essence H-H facilitates the sector to contribute here at two levels, in the direction of the workforce for society at large as well as a sector’s workforce via:

- In the long run gradually further improving personalised vital functioning for all, from preconception up to extremely high age, thereby providing a **nationwide resilient, competitive and productive workforce**;
- A qualitatively and quantitatively **adequate future-proof workforce** that fits the general economic and specific sector demands for the life sciences sector and health(care) sector compartment:
Life Sciences sector compartment where competence complexity and variability will become a growing issue due to a further accelerating turnover of innovations that goes hand in hand and with an ageing workforce via an expected necessity of a further postponement of retirement;

Health(care) sector compartment where during the coming years besides ageing and technology-push the entire professional column is bound to change significantly. A renewal that is associated with both technological as well as sociocultural paradigm shifts in the sector in the Netherlands, bearing the potential of forming a sector-wide PPP in itself.

1.7 Success indicators

H-H has been successful in its facilitation and support of the sector over the period 2016-2019 when the following is established:

- End users, SMEs and regulators (where and when appropriate) are involved – from scratch – in all R&D objectives and key issues from 2016 on;
- The regions have developed as integration and condensation centres where …
  - stakeholders and (new) regional, national and international partners cooperate in region-specific R&D initiatives along the line of discovery, design and deployment, guided by appropriate funding scenario;
  - regional partners gradually increase their societal, economic and scientific competitiveness, impact and image regionally and, via a R&D circulation system, nationally and internationally in priority countries;
  - successful execution of the HCA in the region takes place by preventing R&D brain drain, and promoting R&D brain circulation and import;
  - train LSH professionals implementing and properly using new R&D revenues and keeping their education up to date;
- Existing and alternative new public and private (especially hybrid) R&D funding scenario options are explored (2015-2016) and established (2017) with …
  - relevant ministries, provinces and regions and their R&D budgets;
  - specific private funding partners such as health foundations, (health) insurance companies, pension funds and real estate funds and their success pays off (2018-2019);
  - an altogether doubled R&D 2016 budget in 2019 and in such a successful manner that these existing and alternatives options become structural and expand over time because of obvious societal, economic and scientific benefits;
  - successful regional as well as in (inter)national R&D initiatives;
  - converted and/or resulted in R&D revenues;
- exploration for tool-development that facilitates the use and uptake of H-H R&D revenues in health(care);
- A corporate communication strategy and facilitative engagements are
  - implemented and appreciated widely and consequently support the ambitions, objectives and key issues of the sector;
  - help build up the image and reputation of the sector;
- Valorisation is seen in
  - continuation of the successful Venture Challenge;
  - thematic approach for top science, starting with consolidation of the best oncology expertise in OncoXL;
  - improved economic, societal and scientific impact;
  - increased possibilities to team up and combine various public and private valorisation tools;
  - strengthened business development capabilities in the sector
- In the priority countries abroad export of revenues and ROI and import of R&D strengthening expertise to increase the sector’s competitiveness.
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