



Diversity

I Introduction

The first part of this book presented a joint and unified vision. In Part II, each sector and “cross-link” tells its own story, providing its own take on the future of the life sciences and the role of PPPs. The food, health, chemicals & energy and agricultural sectors are all impacted by the life sciences, but in different ways. These sectors differ in size, dynamics and the (type of) companies and institutions within them. Technology, education, valorization and social aspects span all sectors of the life sciences but differ in focus: development, teaching, commercial potential and social acceptance.

Each of the following chapters has been written by experts from the sectors or cross-links themselves, with input from and endorsement by their colleagues. Each chapter presents its own perspective and can be read independently. The teams have read each other’s drafts and commented on them. They have joined in sometimes heated debate on each other’s views. The various interpretations, expectations and opinions reflect the rich diversity of the life sciences. However, there is broad consensus on the outlines and on many of the details of the way forwards, and all agree that these perspectives constitute a strong basis for further cooperation across the life sciences field. That is what we mean by “united in diversity”.

Let us briefly introduce you to each of the chapters.

Chapter II: Food. In the Food chapter, a picture of 2020 is painted in which the life sciences have enabled the development of healthy food and have made food supply more sustainable. In 2020, we understand “healthy” much more than we do now; we understand what makes us healthy, the factory that is our digestive tract and the gatekeeper function of our mouth. We target food products accordingly and are able to make sufficient health claims on these products. In that future, food production is based even more on advanced science than it is now. The role of

PPPs in that future is substantial, and PPPs increasingly extend into Europe. Clear national ambitions for the food sector have been defined – health and sustainability – and the sector and government are steadfast in their pursuit of these goals. The government in 2020 provides structural support for this pursuit, and SMEs have become more actively involved in innovation.

Chapter III: Health. The Health chapter argues that a sustainable healthcare system and an economically viable health sector go hand in hand, and that (life sciences) innovations are key to both. Taking the Netherlands’ strengths and limitations as starting points, the authors of this chapter look towards a future where healthcare demand increases and delivery adjusts accordingly. A future where the life sciences enable innovations that meet patient needs and delivery requirements. A future where all stakeholders cooperate and innovate in an international open innovation structure and where the innovation and entrepreneurial climate in the Netherlands is favorable. The public-private innovation infrastructure plays an important role in this future, bringing clear focus, a healthy pipeline, strong support and true partnership. Such partnership extends into Europe and receives structural backing from the Dutch government.

Chapter IV: Chemicals & energy. In the Chemicals & energy chapter, the building of a sustainable bio-based economy for the Netherlands is described, an economy in which biomass is a primary source of energy, chemicals and materials. The bio-based economy is the way towards energy security and environmental sustainability, and brings with it considerable economic opportunity. This transition requires technological innovations in several areas, and the life sciences field is one of the critical enablers. This transition also requires collaboration: collaboration in research, technology development and piloting and testing facilities at a shared innovation

campus/center. PPPs play an important role in this collaborative transition. PPPs increasingly consolidate and cooperate on an international scale, and receive long-term support. Key to this transition are (1) a portfolio of opportunities ranging from intimate academic-industrial collaboration to proactive Venture Capital Funds for seed capital, and early as well as later venturing, and (2) secure access to sustainable local and global biomass.

Chapter V: Agriculture. The Agriculture chapter paints a picture of 2020 in which the world is standing up to the challenges of feeding its citizens, maintaining the health of animals and humans, supplying energy and basic resources and sustaining the environment. In facing these challenges, agriculture plays a critical role by the primary production of (healthy) food and base material for energy, chemicals and materials, while interacting sustainably with its environment. Achieving this future relies on life sciences innovations and builds on the strong knowledge base and industry that already exist today. This means safeguarding and expanding the strong knowledge infrastructure of the sector. It requires focus and mass on competitive and distinguishing technology in several fields. It requires stakeholders to come together in an open innovation system with public-private partnerships. And finally, it requires technology that is sustainable and acceptable to society.

Chapter VI: Technology. In the Technology chapter, the road to the future is paved by enabling technologies (from the life sciences and other areas) which fuel the development of new products, processes and services in sectors such as food, health, energy & chemicals and agriculture. The Netherlands can build on an already strong infrastructure of enabling technologies, like proteomics, metabolomics, systems biology, bioinformatics, microscopy, bionanotechnology and biobanking. The road towards this future is one of coordination, with a nationwide body of technology

centers. It is a road of cooperation, where technology centers work closely together with the sectors and the PPPs therein. It is a road of convergence, where technologies increasingly come together and are combined. Finally, it is a road of stability, with dedicated structural funding that enables expert communities and necessary infrastructures to be built.

Chapter VII: Education & training. In the Education & training chapter, a way forward for life sciences education is sketched. The crucial functions of education and the diversity of the life sciences and its application are central to this vision. Education not only empowers academia, industry and government with what may be their most important asset – educated professionals – but also creates informed citizens who can make life sciences choices in everyday life, like using green energy or buying a certain food product. This chapter describes a future where primary and secondary life sciences education brings examples from student's everyday life into the classroom. A future where higher education in life sciences consists of a top-quality, diversified curriculum with solid fundamental research training and strong market orientation that continues into lifelong learning. A future enabled by structural funding for life sciences higher education, by valuing top education similar to top research, and by involving the professional field in the life sciences curriculum.

Chapter VIII: Valorization. The Valorization chapter provides an outlook for 2020 where the results of life sciences research are optimally exploited in creating new products, processes, services and commercial activities that see to our needs. This outlook takes into account the many stages and ways of valorization, but with a focus on the role of universities, in particular in direct technology transfer to existing or new companies – a key activity in valorization that requires much attention. The future is one where academic institutes see valorization as their third mission,

receive dedicated funding for valorization activities and have professional technology transfer offices. Where resources such as Seed Funds are readily available for entrepreneurs who pick up IP from academia. Where industry and universities have long-term strategic relationships, and where policy, like tax benefits or public procurement, stimulate valorization throughout.

Chapter IX: Social aspects. In the Social aspects chapter, an independent committee stresses that social research must accompany (life sciences) innovation, and the committee draws conclusions for future directions. Science and society mutually influence each other. New developments bring new social questions, and innovations only

find use when embraced by society. In this chapter, it is argued that early-stage exploration of the social aspects of innovations is indispensable for a strong life sciences field. This is done through Ethical, Legal and Social Aspect (ELSA) research, which uncovers the plurality in life sciences discussions and anticipates the field's impact. ELSA activities include facilitating the right checks and balances between stakeholders and organizing interactions with and between them. It is argued that sufficient social research requires a budget of about 3-5% of that of the life sciences, and that ELSA research and scholarly activities demand different modes of organization, both embedded in and independent from PPPs.

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