VTT

The tipping point

What kind of future do we want?

beyond the obvious

According to experts, we are living critical times. Our living environment is close to reaching potential tipping points after which there is no return to the way things were before. To be able to avoid such developments, both in terms of biodiversity loss and climate change, we must look further into the future. Therefore, in this publication, we are envisioning the world in 80 years' time and asking what we should do already today? What we need is a radical change.

If we look back in time the same number of years, we go back to the wartime of the 1940s, to our grandparents and their parents. VTT was also established back then, 80 years ago, to support the wartime Finland and the post-war rebuilding shimmering in our hopes. Over the years, the world has changed enormously, and in this development, the role played by advances in technology and increase in the amount of knowledge has been significant. As, today, the pace of change can be described as exponential, it is impossible to foresee as far ahead. We took up the challenge anyway and discussed with some top experts within their fields what life would look like 80 years from now from the Finnish perspective. Which solutions should we introduce right now to make the desired future happen?

"The best way to create the kind of future you desire is to live it in this moment."

— **Mikko Dufva**
Leading foresight specialist
Sitra

The European Commission has set as its target to reach a carbon neutral economy by 2050. According to our estimate, about a half of the technologies needed for reaching the goal already exist, and the other half need to be invented. Luckily, we have already started to understand how necessary the changes are. We have a lot to do, but, at the same time, we have hope. Finland has the competence and opportunities needed to become a forerunner.

In this vision for VTT's anniversary year, we are painting a radically rosy picture of the future. The purpose of the vision is to spark new ideas and to accelerate turning wishes into actions. We invite you to join us in making this rosy picture of the future a reality.

In Espoo, 27 September 2022
Maaria Nuutinen, Tiina Apilo,
Sofi Kurki and Antti-Jussi Tahvanainen
VTT's Foresight Researchers

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(Discussion in Finnish)

Introduction

For as long as 80 years, VTT has been playing a significant role in catalysing renewal and ensuring the functioning of society with the help of innovation. We hope this will still be true 80 years from now, in 2102. But what will life in Finland, as part of the global world, look like at that point? In 80 years, technological development will go forward and change our society in unanticipated ways. As people, we will still need the same things as our ancestors in the distant past: food, warmth, security and other people.

The starting point for this vision is that in 80 years' time our everyday life is meaningful and safe, we live in a clean and diverse environment, and we can enjoy life without endangering our health or the future of the planet or mankind. In today's world, riddled with crises, this vision may seem like an impossible dream. We want to underscore, however, that, to a large extent, the solutions already exist – and when there is will, the remaining solutions can be developed.

The next transition that will make us produce technologies for mitigating climate change is our relationship with nature coming to a crisis. We are already witnessing how the climate is changing radically. The systemic change has begun, changing the climate all around the world. According to the IPCC climate report, the present steps are not sufficient to limit the global warming to 1.5 °C. Effective emission reductions will already be needed during the next decade.

As far as the future is concerned, this means that, in 2102, we will be living in a world with a different climate. In the past, threat scenarios have generated action and policies aimed at change. Now, the intensification of extreme weather conditions may push societies to making faster reforms. As a result, in 2102, we will have a better understanding of nature as a system. We can make quick turns at a societal level and simply change the way we do things. We believe that, over the coming decades, we have succeeded in adjusting ourselves to the changed climate system.

80 years may seem like a long time, but many of today's children and young people will still be alive then. In other words,

"No single futuristic invention is as important as today's political decisions and investments that will continue to affect future generations in 80 years' time."

— **Shadia Rask**
Research Manager, Finnish Institute for Health and Welfare (THL)

the foundations of health in 80 years' time are laid by the decisions and actions we take today, such as supporting children and young people to lead a healthy life. This way they can raise a healthy, next generation and will also remain healthy when they grow old.

Food will maintain its role as a culturally important element of a good life in the future, but the factors related to producing food will change fundamentally over the next 80 years. A better understanding of the impact of food on well-being and health, new ways of producing food and a personified approach to food consumption will bring new tastes on our plates and constitute a foundation for healthy ways of living.

In 2102, we will be leading meaningful lives; we will spend time with our loved ones and use our time on matters that are important to us and the community around us. Work has not disappeared from our daily life, but the ways and forms of working have changed.

In VTT's anniversary year, our security is being challenged from many directions. We are weighed down by the very tense geo-political and security political situation, the worrying climate and environmental issues, the fluctuating global economy and the difficult-to-predict threats brought about by technological development. In our vision, digitalization plays a key role in ensuring security.

To achieve this radically rosy future described above, what we need over the next 80 years is cooperation in solving the challenges, and research and development. We hope that our vision will inspire all of you to take concerted action towards the desired future.

As background for the vision, we interviewed several Finnish experts, **to whom we want to extend our warm thanks.**

"A vision creates momentum for change. A good vision appeals not only to reason but also to emotions, and it challenges the assumptions of the future we have today. A vision reaches a little further from what we consider possible under present circumstances."

— **Pauli Komonen**
Senior Scientist, Strategic Foresight
VTT

THEME 1: ENVIRONMENT

Zero waste, low-emission world

In 2102, we know how to deal with extreme weather phenomena. But will people stop destroying nature? In 80 years' time, people's relationship with nature will be characterised by ecosystem thinking, the idea of natural technology and the central role of nature being used as a living surface material in the built environment. In fact, all human activities are coming closer to how nature works.

Nature also serves as inspiration for developing technologies. Over the past 80 years, one of the key enablers of learning

from nature have been increasingly advanced computational technologies, such as quantum computing, which have made it possible to simulate evolution. And most important of all, we understand the meaning of biodiversity since we have encountered nature loss and tipping points related to specific species. They have taught us to value nature as we value our fellow human beings – we no longer just take what we want from nature, but we also give back to nature. Therefore, we will have a more natural relationship with nature than we have today.

“In 80 years’ time, energy production will be carbon negative. And not only carbon negative but enhancing – not burdening – the state of the environment in other respects as well.”

— **Antti Arasto**
Vice President, Industrial energy and hydrogen, VTT

Where we are now going through the early stages of the energy transition, in 2102, we are producing clean energy. Energy is not produced using a single key technology, but by combining various cleaner technologies. Wind power, efficient solar energy, locally micro-generated fusion energy and their balancing and storage in easy-to-transfer hydrogen have become the backbones of a clean energy system.

Along the way, a large share of people have understood that we need a zero-emission future. Determined policies and replacing fossil raw materials with bio-based alternatives have advanced our understanding. Carbon sequestration has served as a bridge to zero-emission technologies. In 80 years’ time, energy production has been carbon negative for a long while, which has improved the state of the environment in many ways. At the same time, the efficiency of energy use has been

“In 2102, every action taken must enhance the state of the environment.”

— **Mikko Dufva**
Leading foresight specialist
Sitra

improved continuously. We have understood that we need to consume less energy and use it in a smarter way.

Advances in technology and changes related to lifestyle, such as putting emphasis on vegetarian food, have enabled reducing the land area needed for food production and its even distribution in the proximity of settlements around the world. As the challenge of clean energy has been solved, and sea water can be used for irrigation, food can be produced by means of vertical farming, for instance, regardless of the place. The strict division between the urban environment and nature has disappeared, and nature has become a central element of the urban environment. Small-scale food production also plays a role as a factor that enhances the communal spirit and maintains resilience. The new cultivated plant species produce nutrient-rich food more efficiently and with a very small environmental load.

More intelligent infrastructure and smarter production methods make it possible to produce things people need in a less wasteful manner. In 2102, everything is circulated. For example, synthetic biology makes it possible to produce circular economy products that earlier required oil out of carbon dioxide and waste streams. Waste, in the way we currently understand the word, will disappear as we have learned to understand the value of all materials. Technologies enabling the recycling of waste develop, making processing of waste into raw materials possible.

Space has been freed up for untouched and restored nature primarily through reforms made in agriculture. Of all systems of human activity, agriculture has transformed the most, since the early decades of the 2000s already concretely demonstrated the limits of to what extent industrial practices can be employed within the sector.

Agriculture has acted as a forerunner by introducing operating models based on systemic understanding to other sectors as well. The concept of fields has changed. Traditional field cultivation still exists, but fields are no longer used for large-scale animal feed production, since animal feed can be cultivated using bioreactors and the side streams from their food production.

This has left as much as half of the current field area available for other uses. The impacts of cultivation, hunting and fishing no longer burden nature, and the biodiversity loss has been stopped. The reform in agriculture has also contributed to other necessary changes. Erosion has decreased, and the destruction of rain forests has stopped, since soybean farming for forage no longer acts as a financial incentive for clearing forests. Areas earlier cleared for farming are also being reforested. In the 2100s, the humankind is capable of living within the planetary boundaries of the Earth.

“The approaching tipping points and the extreme weather phenomena will very quickly change the way people see things.”

— **Kerttu Kotakorpi**
Meteorologist, Finnish Broadcasting Company YLE, non-fiction writer

KEYS TO THE SOLUTION

How can we learn to live so that the globe will also do well?

- The tangible threat of climate change acts as the primary driver in changing our production and consumption habits.
- We make a transition to a circular economy and reduce material growth.
- To enable the transition, we invest in social, environmental scientific and technological research, and quickly apply the results of research in practice.
- The inclusion of all citizens is of primary importance in ensuring the impact of decisions.
- We will start replacing the infrastructure currently built upon oil-based and petrochemical processes.

THEME 2: EVERYDAY LIFE

Our everyday life is meaningful

Could our present consumption-centric way of life and economy be just a dark chapter in human history? What if, over the next 80 years, we have succeeded in breaking the pattern of economic inequality, and a good life would be within everyone's reach, both in Finland and elsewhere in the world? Detaching oneself from consumerism is already becoming a trend among some representatives of the younger generation. Young people consider it handier and smarter to borrow or rent things than to buy them. However,

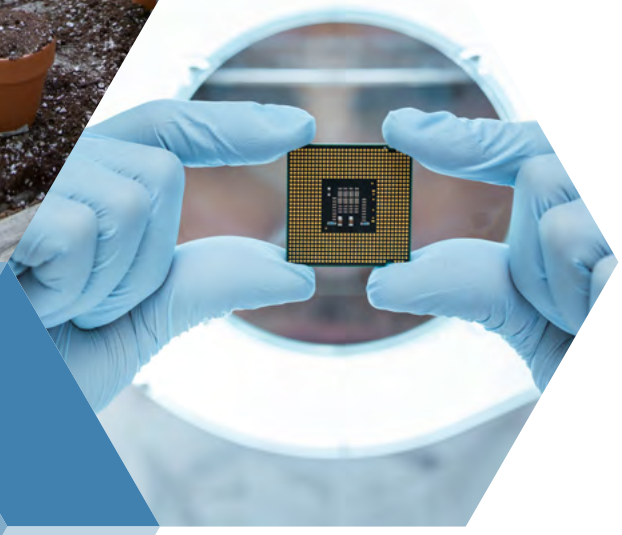
the youth culture is not uniform when it comes to what people find desirable. Still, the awareness of the necessary transition seems to be getting stronger.

Companies also play an important role in the process. 80 years from now, companies can no longer produce consumer durables not intended to be transferred from one generation to the next. In other words, companies have not only identified and accepted their societal significance, but they have also started putting it into practice. Social responsibility – along with economic and environmental responsibility – is part of the activities of every successful company. This is also reflected upon the work and its meaning in people's everyday lives. Interaction and cooperation are at the heart of everything, and the economy does not dominate over other areas of human activity.

"The definition of a good life has changed and become more diversified."

— **Shadia Rask**
Research Manager, Finnish Institute for Health and Welfare (THL)

When we tackle the sustainability challenges today and over the coming decades, 80 years from now, we will be able to enjoy life with a clean conscience. Leading a socially and environmentally responsible life is within everyone's reach and does not require any special effort. Before this could be achieved, we had to successfully detach ourselves from the vortex of consumerism; we do not need to buy new things to feel satisfied. Consuming goods is no longer the cornerstone of economic growth, nor a value in itself or something we do for entertainment. In fact, we have already forgotten the whole word. Things are produced to meet certain needs, and their lifecycle has been optimised. The circulation of all goods has been planned and arranged. There are many kinds of services based on virtual technologies we can use to enrich our lives and find new experiences.



What will the daily life be like when technology has become an integral part of life? Technology makes everyday life easier, enriches our lives and solves challenges worldwide. Technology is a good servant for people, and it enables a good life. The first decades of the millennium were an age of technological leaps, which enabled creating solutions to climate change. This era was also revolutionary in terms of the relationship between humans and technology: a balance was found between the roles of technology and humanity.

Technology serves people in a natural and reliable manner. The struggle with various applications and interfaces is a thing of the past. Technology operates in the background, making our everyday life easy and pleasant, without us even noticing its presence. Burdening and hazardous tasks are performed by automation, artificial intelligence, machines and robots. There is still a place in society for those doing creative work, both experts in their field and those enjoying doing things with their hands. We can still push, challenge and strain ourselves both mentally and physically, and enjoy a good rest afterwards.

“Humans have the brain of a herd animal. Being able to help others is rewarding to us. We also have the need for self-fulfilment. And then, people are curious by nature – we want to invent novel things.”

— **Minna Huotilainen**
Professor and brain researcher
University of Helsinki

“People are different. Not all of us yearn for a sense of greater meaning, and there are different ways by which we can express ourselves. Some of us want to work with our hands, and we are talking about the return of craftsmanship.”

— **Mikael Wahlström**
Research Team Leader
VTT

We have relearned the skill of doing nothing. Time is no longer money. Cultural diversity gave us a model for this. We cherish biodiversity, and nature provides us with a healing environment for relaxation and practising our hobbies. One way of drawing well-being from nature and cherishing biodiversity that we use in our daily life is a virtual connection to nature. All this, combined with strengthened communality, has contributed to significant reduction in the occurrence of mental disorders, and burnout is no longer our everyday companion.

KEYS TO THE SOLUTION

How to successfully provide a framework for enjoying everyday life with a clean conscience?

- We replace consumerism that burdens nature and wastes natural resources with immaterial services and products with an optimised lifecycle, whose circulation back to the system has been arranged.
- We make technology an integral part of our environment; it ensures that we can make our everyday choices easily and in a manner that benefits us and other people.
- We relearn that, every now and then, we can spend time doing nothing.

THEME 3: HEALTH

Everyone can afford good health

What will a good life be like in the future? The health and well-being of the Finnish population has improved very rapidly over the past decades. For example, the life expectancy increased by as much as 10 years between the 1970s and 2010s. To avoid a turn into a worse direction, we need to introduce innovations that enable a healthy life for everyone in 2102. We must develop solutions to such issues as nursing shortage, increase in obesity and loneliness among the working age population, problems caused by alcohol and substance use, deteriorating physical condition of young

“When monitoring the health of the population, issues like ethnic and cultural diversity, gender diversity and family diversity are taken into account better than earlier.”

— **Shadia Rask**
Research Manager, Finnish Institute for Health and Welfare (THL)

people, and the increase in symptoms of depression and anxiety. The direction can be reversed with help of new technologies and increased information.

In 2102, we have learned to value health to such an extent that, for both individuals and society, nurturing health is the first priority. We have turned the focus of our thinking from expensive healthcare to less expensive proactive and holistic promotion and maintenance of health. This way, we can afford to take care of everyone's health. Health is not examined from the perspective of an individual but from the perspective of the well-being of communities. We have succeeded in stopping biodiversity loss and the ensuing loss of microbial diversity, since we understand how important it is for the human health that nature does well. Humans are part of nature, both physically and mentally.

Maintaining health has been made easy and convenient. Our needs of mobility, communality and connection to nature have been taken well into account in social structures and environmental planning. It supports people's

health in all ages that everyday life is easy, and people are understood as entities. Increased understanding of factors affecting health and the importance of health motivate larger numbers of people to take good care of themselves.

We do not need to actively seek new health information, since we all receive health feeds suitably tailored to our needs. The functions, structures, systems, buildings and staff earlier needed for diagnosing illnesses and providing primary health care have been replaced with automatic monitoring of vital functions and automatic corrections to treatment programmes. We are informed about unwanted changes in our body at an early stage and potential need for treatment. For example, in matters like measuring the blood pressure, booking a medical appointment or updating drug doses technology can replace the physician or nurse, so that they will have more time to encounter the patients – in other words, for duties that technology cannot manage.

Serious illnesses are treated making use of systems automatically regulating medication, such as insulin pumps with adaptive dosing, and therapies using nanobots. The new treatment methods have taught us to accept things the necessary discussions on the ethicality of which had not really even started 80 years earlier. Therefore, pain medication, for example, may be administered without us even noticing it.

“Various vital functions, emotional states and levels of alertness can be measured unnoticeably using wearable sensors and sensors integrated into the surroundings. We can already measure heartbeat and breathing rate without a physical contact with the help of a radar developed at VTT.”

— **Teemu Ahmaniemi**
Research Team Leader
VTT

Physical healthcare has been successfully automated to a great extent. We no longer need large, expensive hospitals, but specialised medical care is brought close to people. Robots can perform demanding operations in small separate certified treatment facilities brought to your neighbourhood. They can also be transferred to, for example, a scene of an accident or a sparsely populated area, if necessary. Overall, the number of corrective therapies has dropped radically due to foresight, gene-based risk assessments and early intervention in particular. When monitoring the health of the population and using artificial intelligence, issues like ethnic and cultural diversity, gender diversity and family diversity are also taken into account better than earlier. Understanding of the individual differences and elimination of all kinds of discrimination improves the quality of treatment and the patients' personal experience of treatment.

When a person becomes ill, everyone has access to precision medicines the suitability and efficiency of which can be predicted based on data. Furthermore, it is possible to quickly develop drugs and vaccines for new illnesses and diseases. High computing capacity and quantum computing enable rapid searches for tailored solutions. In addition, we have learned to create more effective drugs and vaccines by using the complex systems discovered in nature as a source of inspiration and by simulating them.

80 years from now, we generally talk about brain health and about training and taking care of our brain in the same way as we today discuss gyms and training programmes when referring to building up our other muscles. Alongside physical healthcare, we have also shifted the focus of mental healthcare to proactive approaches, which has reduced the need for expensive therapies. We have learned to take advantage of the division of labour between humans and automation. For example, we can use AI to help decide which treatment is needed. Mental disorders can be identified, for example, based on the emotional reactions people have when using certain applications. Or deviations in memory or attention can be spotted before the person realises that they are ill and the illness becomes advanced and difficult to treat. We have succeeded in clearing the stigma that surrounds mental disorders and the stigmatisation experienced by those who become ill.

KEYS TO THE SOLUTION

How to advance from treating illnesses to promoting health?

- We invest in proactive healthcare.
- We support mental and physical health as part of decision-making in all sectors.
- We solve issues related to the proprietary and user rights to data so that they can be combined to support the well-being of individuals.
- We take care of biodiversity.
- We promote taking diversity and individual differences into consideration in healthcare.

THEME 4: FOOD

Eating together

In human history, we have gone from one food crisis to another and always found solutions to them. Now, we are headed for a new food and health crisis accelerated by climate change. To overcome it, we need to introduce disruptive technologies and radically change our habits. In 2102, we cannot continue producing and consuming food in the same way we are now.

We have already generated innovations that can potentially reform the food system, but we are still lacking

“To start with, if we culture animal or plant cells in bioreactors, it is totally different from anything we have eaten before. It may be that we turn it into a steak, just as we would do with beef.”

— **Emilia Nordlund**
Research Manager
VTT

many solutions. How can we ensure that, in the future, there will be enough food for the whole world population? What kind of a cultural evolution will we experience over the next 80 years?

In 2102, we get together to enjoy good food which looks about the same as it does today. Even the dishes and some of the preparation methods have remained about the same, even though animal-based meat and milk products are consumed in significantly smaller quantities than today. Eating animals involves new ethical issues as well, since meat replacements, such as cell-cultured meat, can no longer be distinguished from animal meat.

Instead, what food is made of has changed radically in 80 years. Food production has expanded from fields to factories, people's home yards and balconies. Fields are no longer used for growing animal feed, but the purpose of agriculture is to provide good food, ecosystem services and pleasure. We use technologies like cell-cultivation and vertical farming, which are not dependent on

environmental conditions or climate. Food is produced in closed systems that can be placed anywhere on the globe – or even on another planet. Different techniques, such as fermentation, and new sources of protein, such as algae and microbes, have become a permanent part of our diet.

In cooking, we have a deeper understanding of the ingredients and production processes. We consider the food coming from primary production as the raw material of life. We also understand that food has a more direct connection to nature. We know how to use natural resources in food production effectively but in an environmentally friendly manner; for example, carbon dioxide can be used as raw material for food production.

In 2102, we no longer physically walk into supermarkets to buy food. Instead, our food is acquired by technology: we all have a digital assistant that takes care of grocery shopping, while also serving as a nutritional

“If I think about my grandmother Hilja, who milked cows every morning and night and held them almost as dear to her heart as her grandchildren, she would certainly find it shocking to see how today’s intensive animal farming works.”

— **Minna Huotilainen**
Professor and brain researcher
University of Helsinki

“It’s an absurd idea that, in the future, we would need to walk into a hall made of sheet metal to do our grocery shopping and be expected to make smart consumption choices.”

— **Lauri Reuter**
Founder & Partner, Ph.D., Biotechnology
Nordic Foodtech VC

therapist. By 2102, we have taken a major leap away from inappropriate diets. Good food is always healthy and partly tailored to personal taste, regardless of where someone lives or how wealthy they are.

Cooking is no longer one of those mandatory everyday chores we must endure, but it is seen as a hobby, a source of experiences and a means of expressing creativity. All apartments do not have a kitchen since food is not prepared at home on a daily basis. However, there are places like shared kitchens available for those interested in cooking. Cooking has survived various revolutions in the course of human history. Maybe it is a permanent part of human culture?

KEYS TO THE SOLUTION

How to produce tasty food that is good for us and the environment?

- We understand the holistic meaning of food for our well-being.
- We boldly seek new technological solutions to be able to produce enough food for the entire global population without destroying the planet.
- We develop tools that will make it easy for us to choose the specific nutrients best suited for us.
- Instead of navigating through the supermarket food jungle, we transfer to using a tailored food service.
- We tap the opportunities offered by synthetic biology.
- We stop growing animal feed in the fields.

THEME 5: SAFETY AND SECURITY

Security is the prerequisite of a digital society

Challenges related to food, health, livelihoods and the environment can be solved. Digitalisation, reaching everywhere, plays a significant role behind these solutions. Digital security is the prerequisite of a functioning future society. In other words, could finding solutions to digital security raise the use of technology in our lives to a new level?

By 2102, digitalisation has not only made the functions related to our mobility, living and working smart, but it has

also helped us cross the human-machine divide and enabled the creation of entire parallel realities.

Thanks to wide distribution of data that measures our behaviour and predicts our needs, our means of transport, homes and offices work seamlessly together as our smart assistants. Our refrigerators make the necessary food orders autonomously, centralised systems manage our weekly appointments and events and arrange the transportation they potentially require, AI assistants make decision-making at work easier, and virtual reality allows us to attend live concerts and art exhibitions with our colleagues and friends sitting on our own sofa or car seat. In the future, we will only focus on what is essential in life: new experiences, work tasks or other matters worth investing our time in.

In 2102, we are also more advanced in a physical sense. First, the use of mind-controlled prosthetics and implants regulating our metabolism was expanded from the early applications used in healthcare in the 2020s to assisting people performing heavy physical tasks at work. Gradually, these applications with superhuman capacities have also found uses in the entertainment and sports industry, where cyborg athletes tuned to the extreme compete against each other following concepts borrowed from motor sports. Advanced data and software platforms have been created to enable the development of robotics and human-machine interface, lag-free control, and immediate remote correction of functional errors. They allow third parties to provide tailored services, such as improved performance or new functionalities, in the form of software updates. The same technology also allows our minds to communicate with different terminal devices and, consequently, with each other. This provides an unprecedentedly efficient channel for conveying both information and emotions.

80 years from now, we are living a large part of our lives in a digital parallel reality, the metaverse. Thanks to the immense increase in computing capacity provided by quantum technology, the development of haptic control devices stimulating our senses and the

constantly increasing data transfer capacity, these metaverses have a realistic feel to them. In many ways, the metaverses have become a reality that we no longer distinguish from our physical reality. We perform many of our daily activities, such as work and having fun, in the digital reality to use our time more efficiently and to save our resources. The metaverse can also give us access to experiences that in physical reality would be out of our reach due to lack of skills, opportunities or fear. In the metaverses, we create new identities for ourselves, but also carry a lot of data on our real identity with us.

As data and the software using it regulate our everyday life, bodies and transportation and provide the elements and infrastructure of the parallel realities, digital security is one of the prerequisites of a functioning society. Our bodily integrity, health, livelihood, property and access to vital resources, such as energy, and communality must be secured in the digital dimension as well.

“The term cyber security will disappear already within the next few years, as it will become an integral part of all security.”

— **Jarno Limnéll**
Professor of Practice, Cyber Security
Aalto University

The safe, democratic and equal society prevailing in 2102 has been achieved by means of open sharing of data. It is difficult for totalitarian systems or unequal class societies to emerge because all people have access to the same data. Open data and the regulation crossing geographical boundaries, which has reached an ideal level over time, and the digital monitoring supervising its implementation are building societies where citizens trust each other, the economy and the political government. Security is manifested by how easily and reliably we can share and receive data, how openly it can be accessed and how efficiently the misuse of data has been prevented. The link to the digital dimension must not break down at any stage because all the services provided by both public and commercial operators rely on automatic identification made easy for the user, and all the systems that support our everyday life have automatic access to our data.

> **"It is interesting to think about what kind of data we will be protecting in the decades to come, when our lives, experiences and property are increasingly in the digital world."**
>
> — **Antti-Jussi Tahvanainen**
> Research Team Leader,
> Corporate Foresight & Strategy, VTT

If building the necessary level of trust requires regulation and supervision, technology is the tool used for implementing it. Efficient quantum cryptography has been developed alongside quantum computing to counterbalance the threats generated by the immense computing power. People use personal digital shields with different settings to individualise their visibility and the use of their own data in the digital reality. Much like the human immune system, AI-based protection software is capable of autonomously identifying the constantly changing malware and cyber attacks and to fend them off.

KEYS TO THE SOLUTION

How to build a safe future society?

- We create regulation and supervision needed to support trust, with technology serving as the tool of implementation.
- We develop quantum cryptography hand in hand with the spread of quantum computing.
- We create the regulation related to the openness of data and its application in close cooperation with the developers and users.
- It must be possible for people to regulate their visibility and the exposure of their data to other users in a flexible and reliable manner.

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Sitra

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University of Helsinki

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VTT

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(Discussion in Finnish)

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