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EDITORIAL

SATW ANNUAL THEME

SUSTAINTY

The COVID-19 pandemic, followed by the destabilization of several regions around the world, has challenged the globalized vision that organizations like the WEF and the WTO once saw as the singular path to development. Today, nationalism increasingly shapes national politics, and the issues of sovereignty and supply security have become central geopolitical concerns. The SATW has made this the focus of its annual theme for 2023 and 2024, addressing various topics such as energy, food, digital technologies, and healthcare, with a particular emphasis on technological sovereignty.

Covering such a vast and complex subject, involving realities as diverse as those found in political, research, industrial, and entrepreneurial sectors, is no easy task. These pages do not aim to provide exhaustive conclusions but rather to contribute to ongoing discussions that will continue for as long as credible solutions have not been found for the pressing issues at hand.

As we navigate a rapidly changing global landscape, it is clear that sovereignty—especially in technology—has emerged as a critical area of focus. From securing supply chains to ensuring data privacy and technological autonomy, the need for national and collective strategies is more evident than ever. This journal seeks to highlight these challenges, provoke thought, and stimulate dialogue as we seek solutions that ensure a sustainable, secure, and sovereign future.

PROF. BENOÎT DUBUIS
PRESIDENT
SWISS ACADEMY OF ENGINEERING
SCIENCES (SATW)

“A diverse mix of voices leads to better discussions, decisions, and outcomes for everyone”

Sundar Pichai
Chief Executive Officer,
Alphabet; Chief Executive
Officer, Google, USA

RETHINKING GLOBALIZATION AND SUPPLY CHAINS BY INTEGRATING THE NOTIONS OF SHORT CIRCUITS AND NATIONAL PREFERENCE.

satw technology for society

SUSTAINTY

“Sustainty” is a term that merges sustainability and sovereignty, emphasizing that for any measure aimed at preserving sovereignty to be viable, it must be long-term and not just a short-term solution. It underscores that true sovereignty can only be maintained through enduring, sustainable practices and decisions over time.

THE KEY SECTORAL EXAMPLES OF FOOD, MEDICINE, AND ENERGY.

1
SUSTAINTY

THE METHODOLOGY

The term "sovereignty" is frequently used, but it often carries a protectionist, inward-looking connotation. However, the current discussion goes beyond mere scarcity, especially in light of the logistical challenges highlighted by the pandemic. The solutions we seek must not only address immediate concerns but also be sustainable, transcending the notion of simply being "acceptable" during times of crisis. This is why the concept of sustainability is crucial—only efforts that are sustainable, long-term, and broadly accepted are truly worth pursuing.

p. 2-3

2
GLOBALISATION

THE RIGHT BALANCE



The COVID-19 pandemic and the rise of geopolitical tensions disrupted what once seemed like established norms, including the belief that globalization would ensure supply security. These events forced a reevaluation of the security of supply and the need for more resilient, localized systems.

What can we learn from the concept of sovereignty in the defense sector?

p. 4-5

3
ENERGY

THE POSTER



Energy is central to discussions on supply security and sovereignty because it underpins economic stability, technological growth, and national security. A reliable, independent energy supply reduces vulnerability to external disruptions like geopolitical tensions. As global energy demands rise, securing long-term access to energy becomes even more critical. Thus, energy is key to both supply security and sovereignty.

p. 6-9

4
FOOD

A CRITICAL RESOURCE



Access to food is central to discussions on supply security and sovereignty, especially in light of crises. Conflicts and geopolitical instability can disrupt global food supply chains, leading to shortages and price volatility. Food security is crucial for national stability, as it directly impacts public health, economic well-being, and social cohesion. Ensuring independent access to food resources reduces reliance on external sources, enhancing resilience in times of crisis and maintaining sovereignty over essential resources.

p. 10-13

5
DRUGS & VACCINES

A PATH TO SELF-RELIANCE



Access to medicines and vaccines is central to discussions on supply security and sovereignty because they are essential to public health and national well-being. A secure and independent supply ensures that a country can respond to health crises without relying on external sources. It reduces vulnerability to disruptions in global supply chains, such as those caused by geopolitical conflicts or pandemics. Ensuring access to critical medications and vaccines is also a matter of national resilience and self-reliance.

p.14-15

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CAN OUR FREEDOM BE CONSTRAINED BY OTHERS? A THREE-STEP METHODOLOGY:

1 MEASURING THE DEGREE OF SOVEREIGNTY

Technological sovereignty can be defined as unfettered access to ALL critical technologies needed to:

- Independently govern a country,
- Enable an independent economy

As examples, we can cite Computers (Semiconductor Technology and Manufacturing), 5G Network Technology, AI and Machine Learning, Synthetic Biology (DNA Sequencing and Synthesis, Cellular Programming), and Blockchain and Smart Contracts.

2020 has given Europe two particularly illustrative alarm signals in terms of economic independence:

first China for masks and personal protective equipment (PPE) and then President Trump with the militarization of American technology.

To measure this degree of sovereignty, we can rely on three key questions:

- Do we have the technology ourselves?
- If not, do we have access to it through several independent countries?
- If not, do we have unlimited, long-term (>5 years) access to it, guaranteed by a monopolistic or oligopolistic supplier in one country (typically China or the United States).

2 ESTABLISHING A STRATEGY

If we have to answer NO to the three questions posed above, then:

- We must do all that is necessary to guarantee a YES to one of the three questions, or
- We become dependent on another state and expose ourselves to economic coercion.

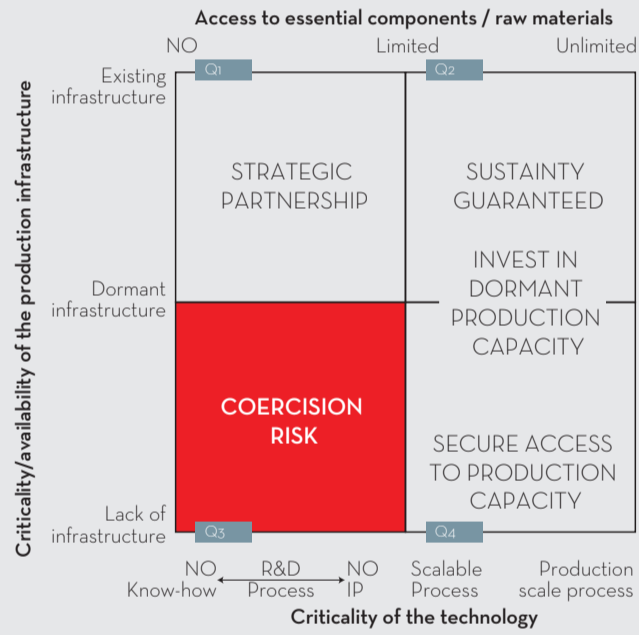
Before the implementation of a real security policy in order to guarantee our sovereignty, a detailed analysis must be organized in order to:

- Identify the critical technologies;
- Define the critical infrastructures (existing to be protected or possibly new to be created).

3 TECHNOLOGICAL SOVEREIGNTY ANALYSIS: THE METHOD

DEGREE OF SOVEREIGNTY

This two-entry system makes it possible to visualize the criticality of both technologies and infrastructures.



Source: B. Dubuis, 2023

Deepen and sources:

- European industrial sovereignty, Future Watch Strategy Brief, Frost & Sullivan
- Deep Tech Start up, Finance in Europe, Hermann Hauser 06.22
- Antoine DUBOSCQ dans le Figaro (09.04.2021): Souveraineté technologique: "La France a de nouveau un rôle singulier à jouer dans le monde". <https://www.lefigaro.fr/vox/societe/souverainete-technologique-la-france-a-de-nouveau-un-role-singulier-a-jouer-dans-le-monde-20210409>
- Jennyfer CHRÉTIEEN et Etienne DROUARD dans "La souveraineté technologique européenne". <https://www.renaissancenumerique.org/publications/la-souverainete-technologique-europeenne/>

4 CONCLUSION: THE QUEST FOR SUSTAINTY

What is the strategic argument today, and what is the lever of power? It lies in mastering a combination of physical, digital, and biological technologies that can influence, and even control, economies and nations. Both the United States and China have understood this, as has Vladimir Putin, who famously said, "Whoever masters AI will dominate the world." The more pessimistic will point to an economic obstacle: China and the U.S. are so far ahead in key technologies that Europe and Switzerland may never catch up, due to the law of economies of scale, which favors size and accumulated capital. While this law shapes our thinking and dominates industries, administrations, and finance, innovation remains fundamentally a matter of inventiveness, creativity, and boldness. Size is not an insurmountable obstacle. Moreover, every technological breakthrough offers an opportunity to reset the game.

Nothing is ever definitively established. Recall the swift, surprising collapse of once-established leaders like IBM in mainframe computers, Kodak in photography, and Nokia in mobile phones. Even the giants of today, despite their dominance, can be vulnerable to disruption as technologies evolve, creating opportunities for new players to emerge and challenge the status quo.

The strength of giants like GAFAM and BATX, with their vast user bases, stems not only from their mastery of rapidly evolving technologies (as exemplified by Open AI) that are always vulnerable to imitation, circumvention, or obsolescence, but also from the determined backing of their powerful states. In this context, Switzerland and Europe can offer a third path in the strategic technologies that shape our freedom, jobs, and sovereignty. Far from the negative connotations often associ-

ated with sovereignty—linked to nationalism or protectionism—it should be understood in its original sense as "the power to act." Sovereignty, therefore, should not be viewed as a question of hegemony or withdrawal, but as a question of strategic autonomy. This strategic autonomy not only preserves the independence of nations but also fosters a balanced global technological ecosystem where smaller players can thrive alongside larger ones.

However, these approaches will not bear fruit overnight. Technological sovereignty has long been sidelined and will take time to develop. This is why a strategic analysis is essential to map the technological landscape before considering a timeline and structural forward-looking measures. Only with a clear understanding of the technological terrain can Europe and Switzerland hope to carve out their own competitive and sustainable space in this rapidly evolving global environment.

METHODOLOGY



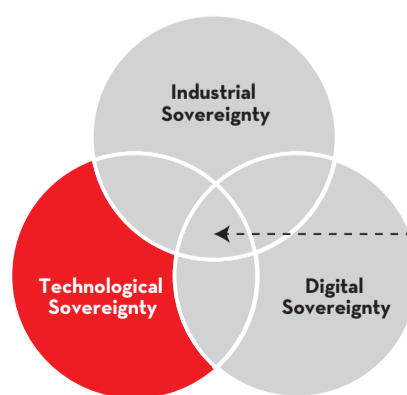
Technological sovereignty refers to specific technologies or industrial sectors that can be considered particularly important for creating a competitive advantage for a national economy on the global stage, or that constitute the key enabling technology for the development of other related or dependent technologies (e.g., artificial intelligence, batteries, quantum computing, etc.). Technological sovereignty is thus one of the defining elements of the concept of industrial sovereignty as presented in Figure 1 below.

DEFINITION ATTEMPS

A INDUSTRIAL SOVEREIGNTY	B TECHNOLOGICAL SOVEREIGNTY	3 DIGITAL SOVEREIGNTY
GLOBAL INTERDEPENDENCIES	COMPETITIVE ADVANTAGES	DATA SECURITY
Industrial sovereignty is the most general concept that calls into question global interdependencies and raises questions about the effectiveness of globalization in terms of value creation, wealth distribution and diffusion of innovations. It presupposes a certain level of self-sufficiency in general or in certain industries, which is extremely difficult and costly to re-establish or create from scratch and then maintain. Access to raw materials is another important aspect.	Technological sovereignty refers to key technologies or industries that are vital for strengthening a nation's competitive edge in the global economy, or that serve as foundational technologies essential for the development of other interconnected or dependent innovations (e.g., artificial intelligence (AI), batteries, quantum computing, and others). These technologies not only shape the future of industries but also determine a nation's ability to maintain its autonomy and leadership in critical sectors.	Digital sovereignty is deeply intertwined with data processing and security, spanning areas such as the internet, communications, machine learning, the Internet of Things (IoT), and AI. In today's world, data has become a critical and highly valuable resource, and access to it holds strategic significance across nearly every business sector. The protection of sensitive or personal data, which requires special care, has become a key concern, further emphasizing the importance of safeguarding digital sovereignty.

FIG 1 | THE CONCEPT OF INDUSTRIAL SOVEREIGNTY

The concept of industrial sovereignty refers to a certain level of industrial independence, but it is not homogeneous and encompasses different dimensions, depending on the context, content and scope.



Source: Frost & Sullivan

5 RESILIENCE

Supply chain resilience is the centerpiece of the debate on how economic relationships should be designed to ensure uninterrupted supply of the goods and services most important to health, energy, and food security. It does not require industrial, technological or digital sovereignty, but rather strategies and actions focused on diversification and risk reduction.

SOVEREIGNTY

AND SECURITY OF SUPPLY

THOUGHTS ON TECHNOLOGICAL SOVEREIGNTY

BY BENOIT DUBUIS

THE CRISIS AS A REVELATION

The COVID-19 pandemic, followed by the destabilization of several regions around the world, has dealt a significant blow to what the World Economic Forum (WEF) and the World Trade Organization (WTO) once viewed as the sole path to global development: globalization. The interconnected world, driven by open markets and borderless exchanges, now seems increasingly fragile. In its place, nationalism has risen within national policies, and the subject of sovereignty—especially regarding supply security—has evolved into a central geopolitical issue.

The shifting global landscape has revealed the vulnerabilities in a system that once prioritized efficiency and global interdependence. For decades, the dominant narrative was that globalization was the key to economic growth, stability, and development. Yet, when critical supply chains were disrupted, and nations were left scrambling for essential goods like medical supplies and food, the limitations of this model became painfully clear. Today, nations are more focused on safeguarding their own interests, ensuring their sovereignty, and securing their supply chains, rather than relying on global systems that are often unpredictable.

Recognizing these changes, the Swiss Academy of Engineering Sciences (SATW) made sovereignty its annual theme for 2023 and 2024, bringing forward discussions that encompass a wide range of critical issues. Topics such as energy, food security, digital technologies, and healthcare have become focal points of the conversation, with a special emphasis on technological sovereignty. As technology becomes more integrated into every aspect of modern life, from healthcare to communications to security, ensuring that nations maintain control over their digital infrastructure and data has become an essential component of sovereignty. Technological autonomy is no longer a mere ambition but a necessity in a world where data privacy, cybersecurity, and critical digital infrastructure are of paramount importance.

The complexities surrounding sovereignty—whether technological, energy, or food-related—make it a vast subject to tackle.

Addressing these issues involves multiple layers, from political ideologies to the research community, industrial stakeholders, and entrepreneurs. Each of these sectors plays a pivotal role in shaping the future of sovereignty, and their efforts must be aligned in order to build a resilient and secure society.

However, it is impossible to cover such a broad and intricate subject exhaustively, as the challenges and solutions vary greatly depending on the context and region. Sovereignty in one part of the world may look entirely different from sovereignty in another, shaped by cultural, economic, and political factors. Some nations may prioritize energy independence, while others focus on securing their digital infrastructure. As such, these pages do not aim to present a final conclusion but rather to contribute to an ongoing discussion—a dialogue that will continue for as long as credible solutions have not been found to the pressing issues of technological autonomy, energy security, and food sovereignty.

These discussions are not just academic or theoretical; they are deeply practical and essential for shaping the future of our global society. The questions surrounding sovereignty—whether it's the ability to control critical industries, ensure access to clean energy, or protect sensitive digital information—are questions of national security, economic stability, and societal well-being. How we address these issues will define the future of international relations, the global economy, and the security of citizens around the world.

At the core of this conversa-

**TECHNOLOGICAL
SOVEREIGNTY
DEMANDS
DEEP REFLECTION,
THOROUGH
ANALYSIS,
AND A CLEAR
STRATEGY.**

tion is the idea that sovereignty is no longer just a political concept but a multifaceted, evolving challenge that demands urgent attention. Technological sovereignty, in particular, represents a key battleground in this new era. As we confront the complexities of this new geopolitical reality, it is clear that solutions must be both locally grounded and globally connected. Nations will need to cooperate on many fronts, but at the same time, they must ensure that they retain control over critical aspects of their national infrastructures.

This brochure serves as a contribution to the ongoing dialogue about sovereignty, aiming to spark discussions and thought leadership that will guide us toward credible and sustainable

solutions. It is not a conclusion, but a call to action, urging governments, businesses, research institutions, and individuals to collaborate on shaping a future where sovereignty and security can coexist with technological progress, energy sustainability, and global cooperation. As we move forward, the path to sovereignty will be shaped by these conversations, and it is through continued collaboration and innovation that we will navigate the complexities of an ever-evolving world.

Goh Chok Tong, Prime Minister of Singapore (speech to the Confederation of Indian Industry on January 19, 2000)

T SUSTAINTY

DEFINING SUSTAINABLE AND ACCEPTED SOLUTIONS

The word sovereignty is widely used. However, it has a protectionist and inward-looking connotation, whereas the discussion is about not being in a state of scarcity, given the logistical problems created by the pandemic. Solutions must also be sustainable and not just "acceptable" in times of crisis. This is why the notion of sustainability is introduced, the predicate being that only a sustainable, long-lasting and accepted effort is worth undertaking. In this respect, SATW has chosen the issue of sustainability as a theme for its next two years in five sectoral areas (food, energy, access to vaccines, medicines and medical devices, data) and two cross-cutting themes: technology and employment. This document aims to specifically address the issue of technological sovereignty.

CRITICAL TECHNOLOGIES

Benoit Dubuis
President SATW

W
THE RIGHT BALANCE

BY MAJOR GENERAL CLAUDE MEIER

THERE ARE CONFLICTING TRENDS BETWEEN INCREASING GLOBALIZATION AND SOVEREIGNTY: THE RIGHT BALANCE NEEDS TO BE FOUND TO RESOLVE THIS DILEMMA

External dependence is not a new concern. The oil crisis of the 1970s, the increase in imports from Southeast Asia from the 1980s onwards, the effects of the global financial crisis of 2007-2008, the consequences of the Covid-19 pandemic or, more recently, the high-intensity conflict in Ukraine, the war between Israel and Hamas in the Gaza Strip, or the Houthi attacks on maritime traffic in the Red Sea and the Gulf of Aden are all events that have highlighted the technological, production and supply dependency in strategic sectors, not only for Switzerland, but also for European countries. Environmental or accidental causes, such as climatic disasters in Asia or the blockage of the Suez Canal by the container ship Ever Given in March 2021, also highlight the fragility and vulnerability of supply chains. Add to this a regime of international sanctions or embargoes at a time of heightened tension, and the effects are even more accentuated.

In these times of multiple crises, the notion of scarcity has (re)emerged, and with it that of sovereignty, in the sense of guaranteed access to goods, technologies and services. As a result, questions related to technological, industrial, or digital sovereignty, to the defense industry and its related exports, or to dependence on foreign food or energy supplies have taken on a new dimension. They are becoming increasingly decisive for economic policy and contribute to the debate and reflection on sovereignty and strategic autonomy in critical areas.

Focusing solely on cost efficiency and rationalization opportunities, and following China's accession to the WTO in 2001, entire segments of European and American industrial production were simply shifted to China and, more broadly, to Southeast Asia. This Western de-industrialization clearly neglected the issue of security and supply chains. Largely for reasons of profitability, companies have become accustomed to working just-in-time, eliminating stocks (or at least greatly reducing them) and relying on increasingly low-cost logistics for their supplies. As a result, when transportation is disrupted, the consequences can range from shortages of consumer goods to food scarcity in certain regions, as well as economic slowdowns and, in the worst case, production disruptions due to shortages of raw materials or critical parts and components.

Under the illusion of a peace dividend after the end of the Cold War, armies were not spared either. For years, military spending was no longer a priority. States could invest elsewhere. In Europe, the reduction of budgets allocated to the armed forces led to a historically unprecedented reduction in defense capabilities, including in Switzerland.

This makes the wake-up call all the more painful. It's the end of a certain carefree attitude to ensuring the availability of various goods and services for industry, business, research, as well as in defense. Times have changed. Now that a new normal seems to be settling in, it's time to build the world afterwards by carefully assessing the new situations that have arisen. We now need to look to the future, taking into account emergency situations and adopting a medium- and long-term approach, far from hasty declarations and taking into account, in particular, our capacity for resistance and resilience.

In fact, this is a strategic issue for our industry and economy, and our industrial and technological sovereignty is at stake. The discussions that have begun should help to determine the degree of dependence or independence of our country in the fields of technology, industry, research, digitalization and defense, to name but a few. Awareness of the stakes involved in technological sovereignty should ultimately help to reduce Switzerland's dependence on foreign suppliers in key areas,

and ensure that the country possesses essential technological skills, knowledge and industrial capabilities.

Only sustainable, long-term solutions can provide our economy with the security it needs to weather stormy times without being challenged at daybreak. To sketch out the contours of this new normal, it may be useful to refer to some of the principles of military conduct, such as freedom of action or security. The challenge is considerable. It consists of striking a balance between an economic practice aimed at maximum liberalization through offshoring and a national strategy aimed at protecting our country's technological and industrial sovereignty, based on diversified and resilient supply chains capable of withstanding geopolitical vulnerabilities and taking into account the energy transition.

In practice, this means making supply and production more resilient to shocks and crises. Improving resilience and strengthening strategic room for maneuver are measures aimed at reducing vulnerabilities and induced risks and protecting against surprises and external influences, such as market volatility or special or extraordinary situations as described above. In addition, the aim is to gain and maintain sufficient room for maneuver through contingency planning - Plan B - and to protect ourselves as much as possible from surprises. Anticipation means not only being able to endure, but also being able to take the initiative when necessary. This means planning ahead and maintaining human and material reserves. This way of thinking and acting, which is based not only on economic criteria and the "just in time" approach, but also on the availability of appropriate stocks or even just buffer stocks at critical points in the supply chain, obviously has its price. And only if there is a reasonable relationship between the expected effect to achieve the desired end-state and the considered and accepted disadvantages, also in financial terms, can we talk about appropriate measures or strategies. There must be no disproportion between these disadvantages and the expected benefits. Finding the right balance is the challenge.

When a company chooses its production site and suppliers, its primary objective is often to minimize costs. However, the examples above also highlight the risks of such a strategy. To achieve greater resilience, it is therefore advisable to ensure, where possible, that contingency plans are in place for inventories of certain goods, and to consider diversifying to or from certain suppliers. Replacing or complementing "just in time" thinking with "just in case" thinking appears to be a promising approach. However, this approach entails risks in terms of inventory management, particularly the risk of overstocking. Nevertheless, it remains a relevant crisis management tool in the current geopolitical and economic context. The trick is to combine the best of both systems without becoming overly dependent on either.

This situation has similarities to the military sector, and in particular to operational logistics. In fact, military operations - and especially high-intensity ones - and combat logistics are characterized by confusing, ill-defined, and rapidly changing operational requirements, including the short-term deployment of troops, their equipment, and often non-standard material as urgent operational needs. As in industry, unexpected, unpredictable and unique scenarios require sudden increases in demand, sometimes on extremely short notice. In addition, hostile enemy action causes interference, loss and attrition. Key questions in combat logistics include: what type of ammunition supply is needed, where, and when? How many axle drive units for vehicles, radio batteries, seals and other air or fuel filters? The unavailability of certain items can have catastrophic consequences for the conduct of operations and, ultimately, on the course of a war. The true test of a military logis-

tics system is not how effective it is when things are going well, but what happens when things are going badly, particularly its ability to cope with unexpected events and difficult military scenarios such as short-notice mobilization and deployment in hostile conditions. The conduct of military operations depends on many unpredictable variables, and the delivery of goods, equipment and services can go from "just in time" to "just too late" in an instant, with deadly consequences. For this reason, the militaries - including the Swiss armed forces - need robust logistics and sufficient stocks, especially of ammunition, fuel and spare parts, to ensure the physical sustainability of the forces in-

development and maintenance of critical technologies in the country, the reflection initiated in certain sectors could be inspired by some of the principles of military conduct and lead to greater strategic autonomy. In some cases, the strengthening of technological and industrial sovereignty could be accompanied by reshoring or nearshoring, i.e., the repatriation (or at least the approaching) of certain specific activities and/or suppliers and subcontractors previously located abroad, sometimes even at very great distances.

The dynamics between increasing globalization and sovereignty are contradictory. In order to re-

1
LEARNING FROM THE DEFENSE SECTOR

There are certain areas that have historically been considered strategic for a nation, such as national security, defense, and space, where significant efforts have been made to maintain maximum sovereignty. These sectors are often seen as the backbone of a nation's independence, and ensuring control over them is key to protecting a country's autonomy and resilience. Before exploring other strategic areas, we felt it was important to first draw lessons from these sectors, which have long embodied a clear and robust approach to sovereignty. That's why we have invited a military expert to share his perspective on sovereignty, providing us with a deeper understanding of the critical challenges, principles, and strategies that guide decision-making in these vital areas. His insights will help us broaden our view and approach as we move forward in considering other sectors of strategic importance.

olved, even over long periods of time. Predictive maintenance and logistics are not the solution to all the difficulties in the field. After the sharp draw-downs of recent decades, it has become clear that not only must stocks be increased, but systems must also be maintained on an ongoing basis, if necessary through agreements with industrial and artisanal firms, as well as private and public service providers. Another element to be taken into account is the national production capacity of the industry in the event of a crisis, and its ability to increase it, or even to switch to a war economy, to use a term that has recently come back into vogue.

Personally, I don't expect the increasing globalization and internationalization of trade to slow down much or even to stop in the long run. However, we can expect a certain amount of reorganization, which I hope will be accompanied by more prudent risk management, taking into account the risks associated with supply flows, especially when they depend on global geopolitical stability or the regional security situation in distant countries. In order to create an environment favorable to the

solve this dilemma and contribute to the development of a technological, industrial and economic space that is beneficial to Switzerland and capable of meeting future challenges in a volatile, uncertain and complex security context, we need to find the right balance between the two, with both pragmatism and realism. In a way, it seems appropriate to include a portion of "just in case" in our forward thinking and strategic foresight.

"Improving resilience and strengthening strategic room for maneuver are measures aimed at reducing vulnerabilities and induced risks and protecting against surprises and external influences we need to find the right balance between increasing globalization and sovereignty with pragmatism and realism"

**SCHWEIZER ARMEE
ARMEE SUISSE
ESERCITO SVIZZERO
ARMADA SVIZRA**

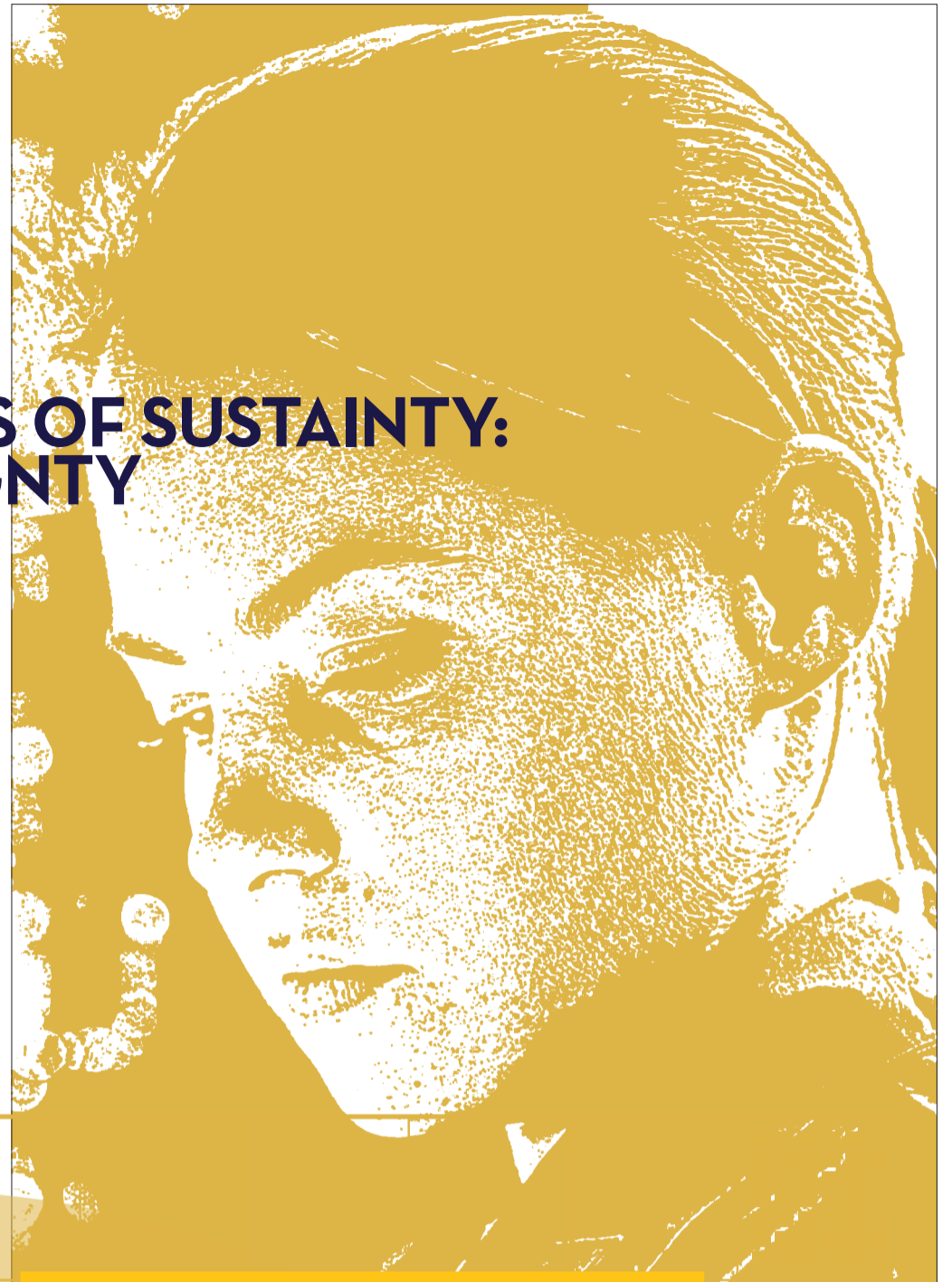


SECTORIAL ANALYSIS

EXPLORING THE DIMENSIONS OF SUSTAINTY: PERSPECTIVES ON SOVEREIGNTY AND LONG-TERM VIABILITY

" IN STRATEGIC SECTORS SUCH AS NATIONAL SECURITY, DEFENSE, AND SPACE, SOVEREIGNTY RELIES ON STRICT CONTROL OVER ADVANCED TECHNOLOGIES, SUCH AS SURVEILLANCE, CYBERSECURITY, AND DEFENSE SYSTEMS, IN ORDER TO MAINTAIN AUTONOMY AND REDUCE FOREIGN DEPENDENCE. SOME COUNTRIES IMPOSE STRICT RESTRICTIONS ON EXTERNAL COLLABORATIONS, THE EXPORT OF SENSITIVE TECHNOLOGIES, AND LICENSES GRANTED TO FOREIGN ENTITIES. THESE MEASURES AIM TO PROTECT THEIR TECHNOLOGICAL ADVANTAGES AND SENSITIVE INFORMATION WHILE PRESERVING THEIR INDEPENDENCE."

SOVEREIGNTY IN THE AGE OF TECHNOLOGY IS NOT JUST ABOUT BORDERS, BUT ABOUT MASTERING THE TOOLS THAT SHAPE OUR SECURITY AND INDEPENDENCE.



A
MAJ. GENERAL CLAUDE MEIER

SWISS ARMY FORCES

Major General Meier, former Chief of the Armed Forces Staff (2016 to 2020), has been seconded as a general officer to the Geneva Centers for Peace and Security Policy (GCSP, DCAF, GICHD) from 2021 until his retirement.

After graduating from pilot school in 1985, he joined the Swiss Air Force as a professional military pilot, serving as a fast jet pilot and as a basic and advanced qualified flight instructor. Alongside his regular duties, he was an early member of the PC-7 Team and served as its leader for two years.

In addition to his education at the Collège Interarmées de Défense in Paris, he earned a Degree of in-Depth Studies (Diplôme d'Etudes Approfondies - DEA) in historical methodology from the "Ecole Pratique des Hautes Etudes" in 2003 and completed on a work-study track the Master of Advanced Studies in Security Policy and Crisis Management (MAS ETHZ) from the Swiss Federal Institute of Technology (ETH) in Zurich in 2013. From 2009 to 2011 he was Head of Military Doctrine of the Swiss Armed Forces and from 2012 to 2025 he was Assistant Chief of Staff (ACOS) Operations and Plans at the Air Force Headquarters.

Since his retirement in September 2024, he has remained active in security policy and defense, as well as in the defense industry and civil/military aviation. He is also Vice President of the Center for Military History and Foresight (CHPM) in Pully and continues to share his expertise through academic engagements and strategic consulting.

"The right balance needs to be found"

Critical infrastructure ENERGY

POWERING INDEPENDENCE, SECURING THE FUTURE.

ACCESS TO AND CONTROL OF ENERGY RESOURCES

ARE CRUCIAL TO A COUNTRY'S ECONOMIC INDEPENDENCE AND RESILIENCE.

ENERGY SOVEREIGNTY HAS ALWAYS BEEN

A MAJOR ISSUE, PARTICULARLY IN TIMES OF GEOPOLITICAL CRISIS.

Access to and control over energy resources, such as oil, gas, and electricity, are essential to ensuring a country's economic independence and resilience. Energy is the driving force of the modern economy, powering industries, transportation, and the daily lives of citizens. Energy sovereignty allows a country to maintain its economic development without being subjected to the volatility of global markets or the influence of foreign powers. Historically, control over energy resources has been a crucial issue, particularly during times

of geopolitical crises, when sanctions, supply disruptions, or resource conflicts can paralyze an economy. In an increasingly globalized world, energy security has become a key factor in national stability and security. A country that relies on external sources for its energy supply becomes vulnerable to economic or political pressures. Therefore, ensuring energy independence and developing sustainable alternatives is essential to preserving sovereignty and strengthening resilience in the face of future challenges.

B RISK MANAGEMENT WITH A NEED FOR ADAPTATION

BY PROF. DR. WOLFGANG KRÖGER, ETH, SATW

Risk management includes risk assessment (identification, analysis and evaluation), risk management and risk communication, provided that risks are recognized and taken seriously. It is a continuous process that traditionally takes place in companies or administrations, and is standardized (ISO 31000).

Risk, as a central concept, extends to opportunity and daring, even if in the technical field the negative connotation is in the foreground, and includes as elements the probability of occurrence of disruptive events and their consequences, and (increasingly) also the uncertainties involved. This objective, mathematical risk differs from the subjective, perceived risk, in which psychological aspects play an important role, and which can vary considerably according to the perspective, type and amount of damage. A distinction is made between political, technical, economic/financial and logistical (supply chain) risks, which have hitherto been considered individually and separately.

A supply chain is a system involved in the delivery of a finished product or service to a consumer, including the transformation of natural resources, raw materials and components into a finished product, and the delivery of the latter to the end customer. Much of the trade encountered takes place between diverse companies from different cultures, who seek to maximize revenues within their sphere of interest, but may be unaware of other players or interests in the overall supply chain.

Today's supply chains have evolved, driven by globalization and digitization, often delivering quality products and efficient services to consumers at the lowest cost. This has been accompanied by a search for the most productive, cheapest locations and a "just-in-time" strategy to avoid unnecessary stockpiling, creating a highly interconnected global network of multiple actors, organizations and means such as material flows and transport capacities/routes. Supply chains cover diverse fields such as pharmaceuticals and food, construction (automotive) and textiles, electrical and electronic appliances, information and data services, financial transactions, among others.

Despite great successes for many economies and consumers, we have experienced some major disruptions that could increase in frequency and severity, raising concerns and calling for reflection:

- Disruptions in supply chains for raw materials and chips as well as pharmaceuticals caused by COVID-19 as one of the most dangerous and unexpected developments from 2020 onwards.
- Blockage of the Suez Canal (one of the maritime bottlenecks in addition to the Panama Canal, the Straits of Singapore and Hormuz) by "Ever Given" for seven days in March 2021, with a major impact on supply chains in various sectors, mainly in Europe.
- Disruption of textile supply chains caused by the collapse of a primitive sewing factory building in Bangladesh (2013), killing around 1,000 people.

These highlighted disruptions and vulnerabilities prompt us to extend the concept of risk management to risks of social importance, which can jeopardize the security of supply, and to understand them in all their significance and complexity. For the identification of risks and the analysis of potential hazards, there are, in addition to imagination, expert consultation and incident assessment, a multitude of different analytical tools such as probabilistic safety analysis (PSA), scenarios (FMEA, Hazop) and systems analysis techniques (STPA). To present and communicate results, it is possible to use the risk matrix or diagram used in many sectors, with probability of occurrence and extent of damage as axes (see also National Risk Analysis Disasters and Emergencies Switzerland 2020). To assess the results, risk quantities and acceptance criteria need to be agreed, and the respective aggregate risk should be placed in a social context ("comparative risk assessment").

Risk management/reduction measures should allow both costs and benefits to be taken into account (ALARA/P principle); they should therefore not just follow the narrow primacy of immediate costs or profitability in force today and, although appropriate, infringe the basic rules of safety technology - such as redundancy, diversity and storage - and state sovereignty. This applies in particular to the areas of national supply with critical supply chains and critical infrastructure; for example, dispensing with a redundant system for the Gotthard Pass while retaining the mountain line would have dramatically exacerbated the damage caused by the accident in the base tunnel.

Successful risk management requires appropriate risk awareness and continuous risk control. This requires clear responsibilities and overarching authorities - in companies, for example, the Chief Risk Officer, and in the case of states, the coordinator of the relevant offices. We should beware of blindly trusting in the omnipotence of technical perfection and financial resources for loss adjustment. Some point out that the scalability of traditional risk management steps is reaching its limits and that complementary measures and concepts are needed. This includes strengthening the resilience of a system, including that of systemically important supply chains. They should react "forgivably" to disruptions (shocks) of all kinds, i.e. they

should not collapse, but should return to their original performance in a timely manner after a loss of function that is as limited as possible. The resilience concept also seems to be better suited to dealing with uncertainties and changes, as it is less focused on identifying and managing specific risks, but rather informs us more about the characteristic behavior of a system after shocks and allows the planning of countermeasures ex ante and situationally.

EXPERT VIEW

C SBB CFF FFS

100% RENEWABLE BY 2025

THE CHOICE OF INDEPENDENCE

Electricity is of major importance to SBB - whether it is the railway current, the current that runs through the catenaries, or the household current that supplies the stations, offices and stores.

Traction current and domestic current

Rail power is a special form of energy with its own frequency (16.7 hertz). 90% of it comes from hydroelectric power (SBB-owned hydroelectric plants, joint power plants, supply contracts). Thanks to a nationwide high-voltage network, SBB distributes the electricity required for railway operations and offers its customers maximum availability of electricity at low, plannable prices.

- 13 power plants and frequency converters;
- more than 70 substations;
- more than 1,800 kilometers of transmission lines;
- SBB production: about 2,000 gigawatt hours per year.

Consumption

In 2022, SBB produced or purchased 2500 gigawatt hours of electricity, of which 2300 were used by SBB and other operators for railway operations.

Energy strategy

SBB's traction power mix, which is mainly supplied by its power plants, is 90% hydroelectric. This makes SBB one of Europe's most environmentally friendly railroads. SBB has decided to switch to 100% renewable energy for its traction power by 2025, thereby supporting the federal government's 2050 energy strategy.

www.cff.ch



B
PROF. DR. WOLFGANG KRÖGER

ETH | SATW

Wolfgang Kröger, a professor of Safety Technology at ETH Zurich since 1990, is a leading expert in risk and vulnerability analysis of complex technical systems, including energy and cyber-physical infrastructures. He has contributed significantly to frameworks for assessing and improving systemic risk governance. After retiring in 2011, he became Executive Director of the ETH Risk Center and focused on sustainability, resilience, and emerging technologies. He is involved in various advisory roles, including the Swiss Academy of Technical Sciences. His recent research addresses the resilience of interdependent critical infrastructure and future energy and mobility systems.

"The resilience concept seems to be better suited to dealing with uncertainties and changes"



TRANSPORT

VINCENT DUCROT, CEO SBB CFF FFS

ENERGY STRATEGY

Today, we are at 13.5 cents per kWh in a market that is fully regulated. We are able to produce 90% of our traction electricity over the year, the electricity needed to operate our rolling stock and, above all, our signals and installations. We want to reach 100%. As far as the power needed for our buildings is concerned, what we call domestic power, we will never be totally independent. We will always be linked to the market, but we want to produce enough over the year to cover our needs.

THE CHOICE OF INDEPENDENCE

Our objective with traction power is to remain independent. Today, we

are 110% in the summer and only 70% in the winter. We therefore want to develop winter power for traction power. We have our own network and our own lines.

This is a strategic choice that has been made in public transport: we prefer to have a constant price, stable over time with a production cost and production that we control, to avoid depending on a fluctuating market. Today, without betraying any secrets, we produce at 9-10 cents per kWh, including depreciation. In order to ensure our ability to refinance our infrastructures, the OFT has set the price at 13.5 cents, which gives us this refinancing margin allowing us to replace the installations and finance them ourselves. As a reminder, we are the only ones whose concessions cannot be called into question. We therefore control the entire supply chain and our strategy and policy is to continue with this model.

GUARANTEEING SERVICE

My colleagues envy all our electrical installations. They are buying power on fluctuating markets, which causes them huge problems. Our priority is to guarantee grid stability. It is important to know that the railroads, especially in times of crisis, have an absolutely key function, not only for passenger traffic, but also for the economy and especially for the transport of goods. People don't realize that we are the only ones who transport at night. This is why it is absolutely key for us, in a public service policy, to control access to energy... and therefore to produce it ourselves.

We are perhaps fortunate to have "slow" decision paths in the administration, which sometimes allows us to avoid mistakes. We have to admit that in the years 2005, 2010-2015, the SBB had invested less and in-

creased their dependence a little. But we realized that we were moving towards much more volatile markets, which convinced us to make a policy change, to reinvest much more, to do much more ourselves ... and not only in energy. One of the four pillars of the company is energy, but we have our own telecom network, our own fiber optics, our own data network. This means that we have retained a high degree of independence from the markets.

SWITZERLAND IS TOO DEPENDENT ON FOREIGN COUNTRIES AND THIS DEPENDENCE IS A RISK

Today, we see very clearly that this dependence has become a risk. The world, in particular, because of the war in Ukraine, has finally realized that interdependence presents a certain risk. I think there are key areas that we need to identify... look at the problem in drugs today: we get the expensive and complicated drugs on the market but we don't know how to do the simple stuff anymore. We have to relearn how to master the simple things ourselves.

Just imagine: today the retail trade is forced to hold tons, or hundreds of thousands of tons of basic products, flour for example. We have flour in the country, but we don't have the raw materials to make Dafalgan. As a society, we must have a base that must be guaranteed and

"Switzerland is too dependent on foreign countries and this dependence is a risk"

insured. Electricity is a typical case... but in defense of the electricians, we must recognize that we are facing a very big transformation. For a long time it was thought that we would rely on nuclear power. The change in policy has caused a wave of panic in Europe because we had no real alternative.

I am of course thinking of hydroelectric power... but we are not really able to exploit the wind power potential in Switzerland. My Austrian colleagues are very good at producing a lot of electricity in winter. We are in contact with them.

Our risk matrix is not only based on financial criteria. It is our great strength to have our own power plants and dams today. We are going to increase this strength further. We have the base that allows us to ensure this continuity.



VINCENT DUCROT

SBB-CFF-FFS | SATW

Born in Châtel-Saint-Denis (FR) in 1962, Vincent Ducrot graduated as an electrical engineer from the Ecole polytechnique fédérale de Lausanne and pursued further education. He held various positions at Swiss Federal Railways (CFF) from 1993 to 2011. Since April 1, 2020, he has been the CEO of CFF SA, leading Switzerland's largest transportation company. Ducrot has extensive knowledge of the integrated railway system and a strong network in public transportation, politics, and labor relations. He emphasizes open, transparent dialogue with employees, clients, and partners, and is committed to high-quality railway operations.

"ENERGY IS A KEY SECTOR FOR SBB. THAT'S WHY WE PAY CLOSE ATTENTION TO OUR SUPPLY AND TRY TO BE AS INDEPENDENT AS POSSIBLE"

Vincent Ducrot, CEO SBB CFF FFS

ENERGY: ACTING AT THREE LEVELS

1

SAVING

RESPECT THE VALUE OF ENERGY

Energy is so much a part of our daily lives that we often forget its value. Integrating this value leads us to respect it, not to waste it. Respecting it implies being concerned about the impact of our actions, whether in our daily lives or in our professional activities. Respecting it may mean changing our habits, but it also means identifying all futile or useless uses, considering our environment and adapting our sources of consumption to take into account the technological progress that allows us to have similar services but with less energy-consuming equipment.

2

INNOVATE

SUPPORT INNOVATION

The post-oil era has already begun. How to produce electricity without polluting? How can we do without fossil fuels? How to improve the energy efficiency of buildings and equipment? How can we invent new energy sources? The field of action is very broad. It mobilizes our research institutions, our creative minds, and our companies, because the expected innovations are not only the foundation of our future successes, but also of a sustainable energy future. The ideas to answer these questions are numerous and often daring. To be discovered in the framework of the Swiss Tech for Society award.

www.swiss.t4s.ch

3

RETHINK

VISIONARY APPROACHES

Together with our members and partners from R&D, civil society, industry, business and politics, SATW brings together energies to create solutions for tomorrow today. The Swiss Academy of Sciences' synthesis report Energy System Switzerland 2050, published in 2022, examines ways to achieve "net zero" CO₂ emissions and security of supply. The SATW annual conference will continue this discussion with key players in the Swiss energy world.

www.satw.ch/energie



SATW RECOMMENDATIONS FOR IMPROVING SECURITY OF ENERGY SUPPLY BEYOND WINTER!

CHRISTIAN HOLZNER SATW AND THE SATW EXPERTS: WOLFGANG KRÖGER, BERNHARD BRAUNECKER.

In addition to short- and medium-term preventive measures to deal with supply shortages in the coming winters, solutions for securing Switzerland's energy supply in the long term and in a sustainable manner must be promoted. The following areas of action are important for improving the security of energy supply and avoiding shortages - various civil society actors can contribute directly to this :

1. Reduce energy consumption. In principle, all energy consumers have the opportunity to reduce their demand by adapting processes or habits, particularly in households and transport. Energy Switzerland and the winter energy saving campaign, as well as various advisory services offered by the cantons, municipalities and other organizations, provide easy-to-implement solutions for companies and the general public.

2. Increase efficiency. With efficient appliances and vehicles, scarce energy can be put to better use. When buying new appliances, the energy label provides relevant information for comparing the different offers in terms of efficiency. The correct setting of heating and cooling devices is also decisive for efficient operation.

3. Replacing fossil fuels with renewable energies. The replacement of fossil fuels, for example by electricity generated by solar or wind power plants, is essential for a future energy supply with low CO₂ emissions. Security of supply increases due to less dependence on energy imports, and end consumers are less exposed to price fluctuations on the energy markets. For heating and mobility, the switch to heat pumps and electric vehicles has the advantage of greater overall energy efficiency.

4. Reliable and safe operation of power plants. The reliable and safe production of run-of-river and storage power plants, which are important for national electricity production, as well as existing nuclear power plants must be guaranteed in the long term. These critical infrastructures for Switzerland's supply must be sufficiently protected against hazards such as natural phenomena or cyber attacks and

kept in working order by appropriate maintenance. The framework conditions for the long-term safe operation of these facilities must be examined and, if necessary, adapted.

5. Expanding generation and networks. In order to reduce dependence on imports, avoid bottlenecks in winter and meet the growing demand for electricity, it is important to have additional production capacity in the country, regardless of the technology. The development of renewable energies, which has been slow so far, must be accelerated, both on a small scale with better framework conditions for private rooftop photovoltaic installations and with large-scale installations. Such projects using solar, wind, hydro and geothermal energy are often blocked by lack of acceptance and opposition. The same applies to the expansion and transformation of energy networks. Objective information and active participation in dialogue processes are essential to gain the support and acceptance of the population. Even technologies that are not feasible in Switzerland today for various reasons - such as deep geothermal energy or new next-generation nuclear power plants - should continue to be discussed and investigated as options for the future.

6. Energy storage. In addition to the existing pumped storage plants, there is a need for other means of energy storage, either short-term (to balance electricity supply and demand) or seasonal (to compensate for insufficient national electricity production in winter). To do this, advanced battery storage systems can be considered, as well as the conversion of electricity into hydrogen or other chemical energy carriers. Some electric cars and charging stations are already technically designed to feed electricity back into the grid. These systems could provide substantial storage capacity within a few years with appropriate framework conditions.

7. Promoting innovation. In the research and development of energy technologies, Switzerland can draw on the great expertise of universities and industry. These should be pooled for the implementation of unique energy infrastructure projects (e.g. for hydrogen produc-

tion) and could then stimulate the export of Swiss technologies.

8. Train specialists. There is a lack of specialists for the desired transformation of energy systems. The training of specialists with energy technology skills must be developed at all levels and interest in this topic must be stimulated at school level. This is where the SATW and various other organizations can help to promote young people in the MINT field.

9. Clarify cooperation with Europe. The close technical interconnection of the Swiss and European energy networks contributes to the security of supply for all partners. Without an electricity agreement and other bilateral agreements, Switzerland risks being excluded from the European coordination of energy supply security and, as a result, may see its imports restricted. While a self-sufficient electricity supply for Switzerland may be possible in the future according to some models, the import of fossil fuels and, in the future, of synthetic energy sources remains important. For this, too, a political and social consensus must be found on how this cooperation with Europe is to be organized in the future.

Innovative technologies must be taken into account in the debate on future energy supply, such as artificial photosynthesis, which directly produces hydrogen or synthetically produces fuels from sunlight; power grid technologies such as smart grids with intelligent control and storage, which allow for the strong development of decentralized renewable electricity production and charging stations for electric vehicles. It is also about highlighting the opportunities offered by advanced and highly secure nuclear technologies, including small modular facilities, called SMRs (Small Modular Reactors). This energy system of the future is complex and can only be operated safely through digitization and automation, and will thus provide large amounts of data - Big Data - from which artificial intelligence can derive new insights into safety, planning and efficient operation. In such a system, highly developed cybersecurity is essential to avoid attacks that could otherwise directly threaten the security of supply.

satw technology for society

Comprendre les enjeux DE L'ÉNERGIE

GARANTIR LA FOURNITURE D'ÉNERGIE VISANT LE NET-ZÉRO

ÉCONOMISER L'ÉNERGIE

DÉVELOPPER LES ÉNERGIES RENOUVELABLES

AUGMENTER LES CAPACITÉS DE TRANSPORT ET DE STOCKAGE

THE TECHNOLOGIST, FONDATION INARTIS

La méthodologie du « trilemme de l'énergie » utilisée par le Conseil mondial de l'énergie illustre très bien les trois dimensions fondamentales de la durabilité énergétique : la sécurité énergétique, l'équité énergétique (accessibilité financière) et la durabilité environnementale, le but étant d'assurer un équilibre entre ces trois objectifs afin de soutenir la prospérité et la compétitivité d'un pays.

Les événements de ces dernières années ont rappelé avec force la pertinence du cadre de ce trilemme. La nécessité d'équilibrer ces trois objectifs n'a jamais été aussi pressante, et la diversité des défis auxquels les pays sont confrontés est plus évidente que jamais. Nous sommes en proie à une crise énergétique mondiale, mais les pays ne la vivent pas tous de la même manière.

En effet, il ne s'agit pas d'une seule crise, mais d'une superposition de crises. La pandémie récente a provoqué une

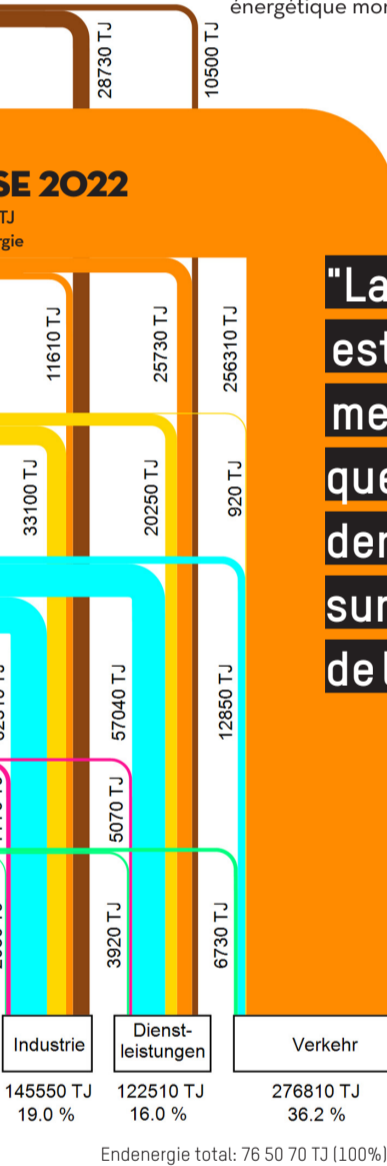
forte variation de la demande d'énergie. Elle a également perturbé les chaînes d'approvisionnement mondiales, de sorte que lorsque le monde s'est remis de la pandémie en 2021, l'offre d'énergie a eu du mal à répondre à la demande et les prix ont commencé à augmenter pour tous les combustibles.

L'invasion de l'Ukraine par la Russie en février 2022 a ensuite porté un nouveau coup dur aux systèmes énergétiques, en perturbant le flux de gaz naturel de la Russie vers l'Europe. L'épicentre de ce choc est l'Europe, mais les ondes de choc se sont répercutées dans le monde entier, car les efforts de l'Europe pour remplacer le gaz russe ont fait grimper les prix du gaz et d'autres combustibles sur les marchés internationaux. En Europe, l'offre de pétrole a été moins affectée que celle du gaz, et la guerre en Ukraine a ajouté une prime de sécurité à un marché déjà tendu.

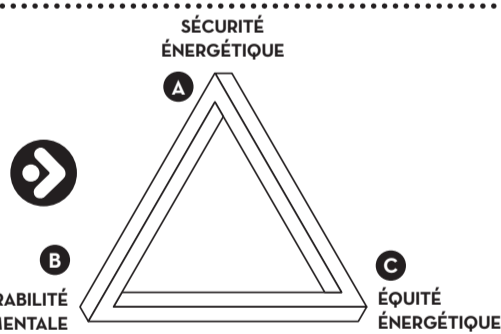
Si la guerre en Ukraine est au premier plan, il ne faut pas oublier qu'avant la guerre, et avant la pandémie de COVID-19, le monde était déjà confronté à une crise énergétique sous la forme d'une urgence climatique. Les événements climatiques extrêmes de 2022 ont souligné l'urgence de mettre en œuvre les actions nécessaires à la réalisation des objectifs de l'accord de Paris. Si la communauté mondiale veut vraiment limiter le réchauffement climatique à 1,5°C, nous devons agir à un rythme et à une échelle suffisants pour

"La situation est clairement meilleure que l'année dernière sur le plan de l'électricité"

Albert Rösti
Conseiller fédéral
11.09.2023



L'ÉNERGIE DANS LE MONDE INDICE TRILEMMA



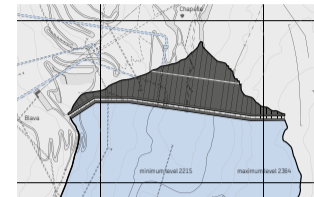
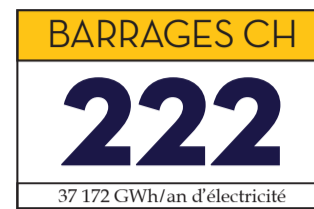
Performance générale

- A** Reflète la capacité d'un pays à répondre à la demande d'énergie actuelle et future:
- B** Évalue la capacité d'un pays à fournir un accès universel à une énergie abordable, équitable et abondante pour les besoins domestiques et industriels:
- C** Représente la transition du système énergétique pour réduire les incidences environnementales et l'impact sur le changement climatique:

Classement de la Suisse

- # 27/91**
- # 7/91**
- # 2/91**

OCTOBRE 2023



7

56% D'HYDRO-ÉLECTRICITÉ EN CH

682 CENTRALES PRODUISENT PLUS DE 37 000 GWH/A

222 BARRAGES EN SUISSE

Fin 2021, la Suisse possédait 682 centrales d'une puissance égale ou supérieure à 300 kW, qui produisent annuellement une moyenne de 37 172 gigawattheures (GWh/a) d'électricité. Environ 48,3 % sont générés par des centrales au fil de l'eau, 47,5 % par des centrales à accumulation et 4,2 % par des centrales à pompage-turbinage. Environ 63 % de la production totale proviennent des cantons alpins (Uri, Grisons, Tessin et Valais), mais les cantons d'Argovie et de Berne fournissent également des quantités considérables d'énergie hydroélectrique. Quant aux centrales internationales situées le long de cours d'eau frontaliers, elles représentent 11 % de la production totale suisse. La Suisse compte une centaine de réservoirs d'accumulation pour la production d'énergie hydroélectrique dont quinze d'entre elles disposent d'un système de pompage.

La capacité totale de ces centrales est inférieure à celle de nombreux autres pays comme l'Autriche (59%), l'Allemagne et l'Italie. En revanche, les centrales suisses disposent généralement de bassins de rétention d'eau plus importants et sont donc en mesure de fonctionner sur de plus longues périodes selon l'AES. En été, la Suisse exporte jusqu'à 25% de l'électricité qu'elle produit. La Suisse compte 222 barrages, dont près de 90 % servent à la production d'électricité parmi lesquels 25 dépassent les 100 mètres de hauteur et 4 font plus de 200 mètres : Grande-Dixence (VS), Mauvoisin (VS), Luzzzone (TI) et Contra (TI). La construction de barrages connaît une période faste dans les années 1950 à 1970, durant laquelle la moitié des barrages suisses sont construits. Au XXIème siècle, les nouveaux projets sont devenus rares, bien que certains barrages, comme Mauvoisin, soient surélevés.

POMPAGE-TURBINAGE

Les installations de pompage-turbinage utilisent une électricité en excès - et généralement très bon marché - sur le réseau pour pomper de l'eau d'un réservoir bas vers un réservoir haut. Lorsque l'eau est libérée, sa chute à travers d'un turboalternateur permet de produire à nouveau de l'électricité à un moment où elle manque au réseau. En Suisse, les 19 installations actuellement en service représentent une puissance de pompage de 2700 MW.

RÉSERVE HYDROÉLECTRIQUE

La Confédération a constitué une réserve hydroélectrique d'un volume de 400 GWh pour l'hiver 2023/2024. De la capacité supplémentaire doit venir s'y ajouter.

9 POWER STORAGE STOCKAGE

BATTERIES, RECYCLAGE STOCKAGE À LONG TERME, STOCKAGE PAR GRAVITÉ, ETC.

Les technologies de stockage de l'énergie de longue durée devraient entraîner l'adoption d'environ 20% d'énergies renouvelables, ce qui permettrait de réduire de 2,4 gigatonnes (Gt) les émissions de gaz à effet de serre, le stockage de courte et moyenne durée devrait faire passer la pénétration des énergies renouvelables de 30 à 80 %, permettant indirectement jusqu'à 6 Gt de réduction. Mais les batteries au Li ont des limitations (voir ci-dessous).

Si le prix des batteries lithium-ion a baissé de plus de 90 % au cours de la dernière décennie, elles ne peuvent transférer de l'énergie que pendant moins de 8 heures sans devenir très coûteuses et sans poser de problèmes en raison de leur taux d'auto-décharge élevé. D'autres solutions (stockage d'énergie de longue durée, stockage d'énergie par gravité «Energy Vault») sont nécessaires pour des semaines ou des mois de stockage.

10 POWER DISTRIBUTION SMART GRID RECHARGE

OPTIMISATION ET DISTRIBUTION DE L'ÉNERGIE

Il est attendu d'un système de réseau électrique avancé et intelligent qu'il fournisse des informations et un contrôle en temps réel du réseau de distribution. Le développement d'applications s'appuyant sur l'IA devra permettre d'exploiter le potentiel du big data (par exemple, améliorer la précision des prévisions de la demande).

INFRASTRUCTURE DE CHARGE ÉLECTRO-VOLTAÏQUE (EVCI)

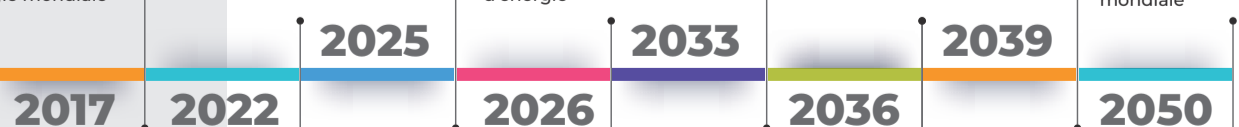
54%
Le pétrole et le gaz fournissent 54% de l'énergie mondiale

PÉTROLE
La demande mondiale de pétrole atteint des records

GAZ
Le gaz dépasse le pétrole en tant que première source d'énergie

-25%
La capacité mondiale de raffinage est réduite de 25 % par rapport à aujourd'hui

46%
Le pétrole et le gaz fournissent 46% de l'énergie mondiale



CO2
Le pic des émissions mondiales de CO2

GAZ
La demande mondiale de gaz culmine

GAZÉFICATION
La capacité mondiale de gazéification et de liquéfaction double par rapport à aujourd'hui

Sources:
1 McKinsey Tech Trends Outlook for 2022.
2 OFEN
3 CleanTech Alps
4 Technology outlook 2030 by GNV GL.
5 LeTemps du 14 avril 2023

Critical resource FOOD

ACTING LOCALLY, SECURING OUR FOOD SOVEREIGNTY

HISTORICALLY, LOCAL FOOD PRODUCTION HAS BEEN A FUNDAMENTAL PILLAR OF SOVEREIGNTY,

GUARANTEEING FOOD INDEPENDENCE AND ECONOMIC STABILITY.

THE COMMITMENT TO SELF-SUFFICIENT AGRICULTURE

IS OFTEN SEEN AS ESSENTIAL TO NATIONAL SECURITY.

T DEFINITION

FAO, 2006

FOOD SAFETY

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. This definition further emphasizes the multidimensional nature of food security and includes: "availability of food, access to food, biological use of food, and stability [of the other three dimensions over time]" (FAO, 2006)

T IN SWITZERLAND

ART. 104A OF THE CONSTITUTION

FOOD SAFETY

Art. 104a

In order to ensure the supply of food to the population, the Confederation creates the conditions for, among others:

- preservation of the basis for agricultural production, including agricultural land;
- food production that is adapted to local conditions and uses resources efficiently;
- food use that conserves resources.



SOME CHALLENGES

A CARBON FOOTPRINT

MEAT AND DAIRY PRODUCTS ACCOUNT FOR 14.5% OF GLOBAL GREENHOUSE GAS EMISSIONS

REDUCING CARBON IMPACT

Depending on the estimates, food accounts for between a quarter and more than a third of global greenhouse gas (GHG) emissions. This contribution takes into account the production, processing and transportation of food, as well as the manufacture of fertilizers for agriculture. According to the Food and Agriculture Organization of the United Nations (FAO), meat and dairy products represent 14.5% of these global emissions.

B REDUCING LOSSES

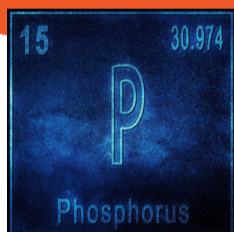
EATING HABITS

FOOD WASTE

Currently, about one third of the food produced worldwide is wasted. This corresponds, in Switzerland, to some 330 kg of food waste produced per year and per person. Far from being anecdotal, these losses represent about a quarter of the environmental impact of food in Switzerland, according to the Federal Office for the Environment.

Food waste occurs at multiple levels. Globally, about half of the losses occur during harvesting and processing, while the other half is generated by retailers and households, according to the UN Food and Agriculture Organization (FAO). Overproduction, lack of storage facilities, disposal of imperfect food, losses during transport, and purchases in excess of what is needed are among the reasons for this. Limiting this waste would have economic, ethical and environmental benefits. For this reason, the Federal Council adopted an action plan last year aimed at halving food waste in Switzerland by 2030, compared to its 2017 level. "Denmark is a pioneer in this field. Food waste has fallen by 25% between 2011 and 2018," says Christian Schwab, director of the Integrative Food and Nutrition Center at EPFL.

Various measures affecting our eating habits, such as planning meals in advance or tasting food instead of throwing it away as soon as it is past its optimal use-by date, can be adopted by everyone. But deeper transformations may be needed: "As resources become scarcer, we are likely to see less abundance in supermarkets and find other ways to source food, such as from community gardens. The development of urban agriculture could encourage the recovery of food waste, particularly through composting", argues University of Geneva sociologist Marlyne Sahakian.



C PHOSPHORUS

RECOVER TO FERTILIZE

Phosphorus is a basic substance that is used in the composition of many synthetic fertilizers. It is an essential element in the nutrition of plants, which absorb it in the form of phosphates. However, the world's phosphate reserves are running out, and there is currently no alternative solution. Research projects aimed at recovering phosphorus from sewage sludge for use as fertilizer in the fields are currently underway. This would close the loop.

D FERTILIZERS

60% IMPORTED

Farmyard and recycling fertilizers used in Swiss agriculture are almost exclusively produced in Switzerland. As far as mineral fertilizers are concerned, Switzerland has to import their entirety because there is no longer any indigenous production since 2018. 23% of the nitrogen used in Swiss agriculture comes from mineral fertilizers. In 2021, 60% of the mineral fertilizers imported into Switzerland were nitrogenous fertilizers, of which about 7% came from Russia. It should be noted that certain ecological soil fertilization techniques increase agricultural yields in the absence of chemical fertilizers.

www.blw.admin.ch

E AGRICULTURE

STRUCTURAL CHANGES

About 1000 fewer farms than last year. Since 1980, the number of farms in Switzerland has more than halved. According to the Swiss Agricultural Outlook (SAO) calculation model, another 10,000 farms will disappear by 2024. More than half of the farm managers are over 50 years old, and half of them say they have no successors. The theme of the death of farms is therefore more topical than ever. At the same time, many well-trained young farmers cannot find a farm. Swiss agriculture is moving away from a traditional agriculture towards an industrial agriculture.

www.petitspaysans.ch



D
JEAN-MARC CHAPPUIS

SEFRI | OFAG

Jean-Marc Chappuis took up his post as Deputy Director of the Federal Office for Agriculture (FOAG) on 1 August 2018. He has been Deputy Director since 16 March 2020. He heads the Markets and International Affairs Directorate Unit. Jean-Marc Chappuis is an agricultural engineer and holds a doctorate in agricultural economics. He headed the Knowledge Systems, Technology and International Affairs Directorate at the FOAG between August 2018 and June 2022. Prior to joining the FOAG, he was agricultural policy adviser to Federal Councillor Johann N. Schneider-Ammann. Schneider-Ammann and as rapporteur for the Federal Office for National Economic Supply (FONES) at the General Secretariat of the Federal Department of Economic Affairs, Education and Research.

"L'objectif est de maintenir le taux d'autosuffisance à son niveau actuel de 50%"

NON-FOOD USES OF VEGETAL FOOD COM...

FOOD REACHING FOOD CONSUMERS

CROP PROCESSED FOR FOOD

NUTRIMENTS FOR LIVESTOCK PRODUCTION

ANIMAL PRODUCTION

FOOD REQUIREMENT

D CHALLENGES FOR THE FOOD SYSTEM

AN INTERVIEW OF DR. JEAN-MARC CHAPPUIS
DEPUTY DIRECTOR OF THE FEDERAL OFFICE FOR AGRICULTURE

THE COVID-19 PANDEMIC AND THE WAR IN UKRAINE HAVE HIGHLIGHTED VULNERABILITIES IN GLOBAL SUPPLY CHAINS, PARTICULARLY IN ESSENTIAL SECTORS LIKE FOOD. THIS HAS SPARKED IMPORTANT DISCUSSIONS ABOUT FOOD SECURITY, SELF-SUFFICIENCY, AND SOVEREIGNTY. AS SWITZERLAND FACES GROWING CHALLENGES IN MAINTAINING ITS AGRICULTURAL INDEPENDENCE, IT IS ESSENTIAL TO EXPLORE SUSTAINABLE SOLUTIONS AND REDUCE DEPENDENCIES ON EXTERNAL SOURCES.
(GB FULL VERSION ONLINE)

La crise du COVID 19 et plus récemment la guerre en Ukraine nous ont interpellés sur la mondialisation en mettant en exergue les flux de matières et de service et nos degrés d'interaction, voire de dépendance dans de nombreux secteurs essentiels dont l'alimentation. Depuis, les considérations relatives à l'alimentation occupent la place publique et il est question de sécurité d'approvisionnement, de dépendance alimentaire, de souveraineté, quelle est votre vision des enjeux ?

Les enjeux concernant le système alimentaire pris dans son ensemble sont multiples. L'interdépendance entre la production agricole et la consommation pour relever les défis de la réduction à toutes sortes de dépendances, par exemple aux énergies fossiles, à certains fournisseurs, est certainement une des dimensions qui doit nous occuper de manière prioritaire. La production agricole indigène ne peut devenir plus sobre et résiliente que si les transformations qu'elle doit entreprendre sont simultanément accompagnées de changements au niveau de la consommation.

Quelle est la situation Suisse en termes de dépendance aux importations ?

Sur le plan alimentaire, la population suisse importe une calorie sur deux qu'elle consomme (taux d'autosuffisance ; rapport agricole 2023). Le taux d'autosuffisance par denrée alimentaire varie en fonction de l'orientation de la production agricole suisse. Ainsi, les taux d'autosuffisance sont au plus haut pour le lait et les produits laitiers en raison de la prédominance des herbages naturels dans la production agricole suisse. A l'inverse, les huiles et graisses végétales sont la catégorie présentant le plus faible taux d'autosuffisance (23 % en 2021). Ce faible taux reflète la relative rareté des terres arables en Suisse. Avec 446 m² de terres arables par habitant, la Suisse est bien en-dessous de la moyenne mondiale (1'800 m², Banque mondiale).

La production agricole et le système alimentaire suisses reposent par ailleurs sur l'importation d'intrants (semences, engrais, carburants, produits phytosanitaires) et d'installations (tracteurs, machines, ...) que la Suisse ne produit pas. Ces dépendances indirectes doivent également être considérées.

Quelles sont vos projections pour les années à venir ?

L'objectif du Conseil fédéral est de maintenir le taux d'autosuffisance à son niveau actuel de 50%. C'est un réel défi au regard de l'augmentation de la population et de la diminution des surfaces agricoles. Compte tenu de la concurrence croissante pour l'utilisation du sol, il est nécessaire de donner la priorité à la production directe de denrées alimentaires par rapport à celle d'aliments pour animaux. Cette approche fait aussi partie du rapport du Conseil fédéral en réponse à divers postulats sur l'orientation future de la politique agricole. Ainsi, le taux d'autosuffisance ne pourra être maintenu à moyen et long termes que si les cultures destinées à l'alimentation humaine directe sont privilégiées sur les terres arables. Les terres arables servent aujourd'hui dans une large mesure (environ 55 %) à la production d'aliments pour animaux (p. ex. prairies temporaires, maïs, céréales fourragères, etc.) Rapport agricole 2023 - Utilisation des surfaces (agrarbericht.ch)

Comment se prémunir contre la vulnérabilité aux crises alimentaires ?

Il existe déjà des mesures de la Confédération pour faire face à des pénuries de denrées alimentaires et d'autres biens stratégiques. La loi sur l'approvisionnement économique du pays prévoit notamment l'obligation de constituer des stocks obligatoires de produits agricoles, en particulier d'huiles et de graisses végétales, de céréales et de riz. A partir de l'existant, il convient encore mieux que par le passé de maintenir les bases de la production agricole en Suisse ainsi que des relations internationales étroites permettant un approvisionnement régulier et diversifié de la Suisse.

Le changement climatique représente-t-il une menace croissante pour la sécurité alimentaire en Suisse ? Comment y répondre ?

Deux dimensions sont à considérer.

- La production en Suisse doit et devra faire face aux effets du changement climatique. La disponibilité en eau ou la tolérance des cultures aux périodes de hautes températures sont des questions nouvelles qui entraîneront des fluctuations des rendements. Le développement de stratégies d'adaptation à ces nouvelles situations (par exemple : installation de systèmes d'irrigation parcimonieux et leur pilotage avec des senseurs, choix des cultures et des variétés, pratiques culturales, etc.) fait partie de la réponse.
- Avec 50% de calories consommées importées, la Suisse est également touchée par les fluctuations de rendement qui ont lieu à l'étranger. Si grâce à son pouvoir d'achat, la Suisse ne devrait pas voir la première sa sécurité alimentaire menacée, elle dispose également d'un levier pour éviter d'accentuer les pénuries sur les marchés internationaux. En faisant des progrès importants dans la réduction du gaspillage alimentaire, elle peut contribuer à réduire les tensions entre l'offre disponible et la demande utile de denrées alimentaires. Chaque kilo de nourriture qui n'est pas jeté réduit la pression sur la demande et participe au maintien de prix abordables sur les marchés internationaux durant les périodes de pénurie.

La croissance démographique, l'urbanisation et l'expansion des infrastructures exercent une pression croissante sur les ressources naturelles, telles que les terres agricoles et l'eau. Quelle incidence sur la productivité et la production suisse ?

Au cours des 33 années entre 1985 (1979/85) et 2018 (2013/18), 1,1 m² de surface agricole (y compris les alpages) a disparu chaque seconde. Cela correspond à une surface de 1'143 km² - environ deux fois la taille du lac Léman - et à une perte de 7%.

La crise du COVID 19 et plus récemment la guerre en Ukraine nous ont interpellés sur la mondialisation en mettant en exergue les flux de matières et de service et nos degrés d'interaction, voire de dépendance dans de nombreux secteurs essentiels dont l'alimentation. Depuis, les considérations relatives à l'alimentation occupent la place publique et il est question de sécurité d'approvisionnement, de dépendance alimentaire, de souveraineté, quelle est votre vision des enjeux ?

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Quelle est la stratégie fédérale en termes de sécurité d'approvisionnement ?

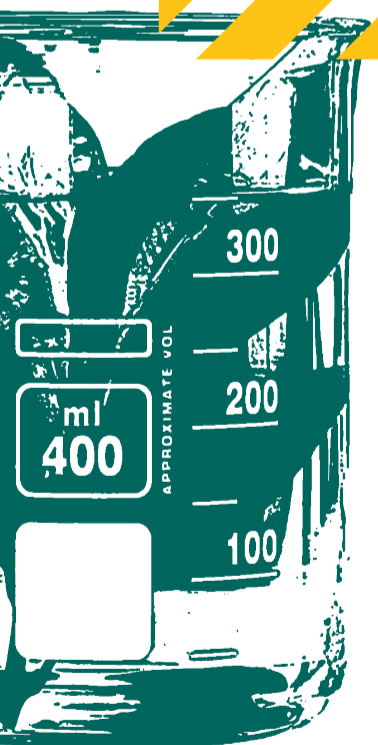
Maintenir les bases de la production agricole (sol ; eau ; capacités de transformation, ...) dans un état fonctionnel adéquat pour contribuer à atteindre le taux d'autosuffisance réalisé les années passées. Réduire les pertes alimentaires. Disposer des stocks obligatoires de certains produits agricoles et d'engrais en cas de pénurie.

COMMODITIES

FOOD CONSUMED

PRODUCTS

EXPERT VIEW



FOOD SAFETY

WILL OUR SUPERMARKETS BE EMPTY TOMORROW?

Project management: Janine Hosp SATW
Consultants: Prof. Erich Windhab and Bernard Lehmann

Empty shelves in supermarkets? It is hard to imagine that, given the abundance of foodstuffs. But it is precisely for Switzerland that the question of supply is essential - the country has not been able to supply itself for a long time and is one of the countries in the world that has to import the most food per capita.

Empty shelves in supermarkets? Given the abundance of foodstuffs, it is hard to imagine. But it is precisely for Switzerland that the question of supply is essential - the country has not been able to supply itself for a long time, and is one of the world's largest per capita importers of food.

Even if the last flower bed at the side of the road was cultivated, and vegetables were grown in front of the Federal Palace as they were during the Second World War, the Swiss population has not been able to feed itself from its own soil since the beginning of the First World War. The Germans, with a self-sufficiency rate of about 80%, are almost entirely self-sufficient, even without imports. And the French even produce more food than they eat. In Switzerland, on the other hand, the self-sufficiency rate has fallen from 62% (2000) to 56% (2020) despite all efforts. In reality, it is much lower, because this self-sufficiency rate only takes into account foodstuffs and not fodder, seeds, fertilizers, plant protection products or machinery. Switzerland also has to import a large proportion of these products. In reality, it cannot even live halfway on its own fields. This is why Switzerland cannot support itself.

The question arises: why is Switzerland, which is so well organized, doing so badly?

The reason is simple: the population is growing faster than the productivity of agriculture, mainly due to high immigration. The population is also growing faster than in any other European country. Twenty years ago, the population was still 7.3 million, today it is already 8.9 million. And by 2050, it will probably exceed 10 million. At the same time, good land is disappearing, as the population needs not only more food, but also more housing. Between 1985 and 2018 alone, 766 square kilometers of agricultural land were built up - an area as large as the two half cantons of Obwalden and Nidwalden combined. But if the Swiss want to eat more organic food, they need more land, not less. If all farms in Switzerland were to convert to organic production, the number of calories produced would drop by 30 percent.

Today, Switzerland has only 500 square meters of arable land per capita and a small area of grass. This should be enough to feed one person. In no other country in Europe do people have to make do with so little space, except in small states like Andorra or Montenegro.

Fields are needed in case of emergency

In Switzerland, arable land can only be extended to a limited extent. In a large part of this small country, it is not possible to cultivate anything: Two thirds of its surface is occupied by forest, mountains, water and stone as well as roads and houses. In order to ensure that there is enough arable land in case of need, the federal government

has obliged the cantons to protect their most fertile soils, the so-called rotation areas. In 1992, the federal government wrote in the "Sectoral plan for rotation areas" that 438,560 hectares of fields were needed to cope with the emergency. At that time, Switzerland had a population of 6.9 million, compared to two million more today. Agriculture was able to increase its productivity, but not as much as the population. However, the federal government has decided not to increase the area of emergency fields in its 2020 update report. Instead, the target ration, which all people in emergency situations must receive, has been reduced. It is reduced from 3300 to 2340 calories.

Supply chains are becoming more vulnerable

So, Switzerland is now among the countries that have to import the most food per capita. This dependence on imports puts it in an uncomfortable position. The supply chains that arrive in Switzerland from all over the world have become increasingly long and complex in recent years, and therefore more and more prone to disruption. And at the same time, new dangers interrupt them: destructive plant diseases or an epizootic disease. A cyber attack on the telecommunications network, or a shortage of electricity or chips for electronic devices. Or a tiny virus of a hundred nanometers in diameter. Climate change makes this situation even worse, as it favors extreme weather conditions: a wet summer with heavy rainfall, as in 2021, can significantly reduce the harvest of bread cereals. On the other hand, a dry summer like the one in 2018 can lead to supply difficulties; at that time, the level of the Rhine dropped so low that no container ships could travel between Basel and the German city of Koblenz.

What would be left to eat without imports

The Federal Office for National Economic Supply regularly plays out a scenario: How much would the population be able to feed itself from its own fields if nothing could be imported for a prolonged period? They would still have food, but the portions would be much smaller - everyone would receive only the minimum necessary to live: 2340 calories instead of 3015 calories today. But this is only true in the best case scenario. But this is only true in the best of cases. If we no longer threw away any food and ate, for example, the fat from meat that we like to cut up today. And if everything that is absolutely necessary for food production were available: seeds, fertilizers, plant protection products, machines. The federal government is responsible for ensuring that everyone receives their 2,340 calories - it must take the lead if the economy is no longer able to supply the population. In that case, people would have to line up outside stores with ration tickets or food stamps - now digital - and wait to buy their small ration of flour, milk, cheese or meat, as they did during World War II. "Stick together and maintain discipline" was the watch-

“**BEYOND AGRICULTURE, FOOD SECURITY IS AN AREA THAT CAN BE SEEN AS “SPECIAL” BECAUSE OF ITS DIRECT IMPACT ON A COUNTRY’S SOCIAL AND ECONOMIC STABILITY.**”

word during the war. However, the Confederation would not only reduce consumption, it would also do everything possible to obtain food. To do this, it would encourage imports and force farms to convert their production, which would take more than a year; farmers would only be able to grow food and not fodder. Animals that need to be fed and are not grazing would be slaughtered in a hurry. This would provide a large stock of meat. However, all the other food stored in the compulsory reserves would only be sufficient for three to four months. What is the likelihood that Switzerland will no longer be able to import enough food for humans and animals and that there will be shortages for a long time? For example, because a large part of Europe would be affected by drought? Or because there would not be enough electricity available? Or because the two would combine and trigger a chain reaction? According to two SATW experts, it is difficult to estimate the probability of such a situation. But one thing is certain: it has increased! Thus, Switzerland cannot count on being spared from crises in the future. The Federal Office for National Economic Supply does not rule out the possibility that it will no longer be able to secure food supplies in the short term in the event of a crisis; it can only prepare for crises in principle, not for each one. For this reason, Switzerland, which is heavily dependent on imports, must be particularly prepared for emergencies.

S SATW RECOMMENDATIONS FOR IMPROVING THE SECURITY OF THE FOOD SUPPLY!

How can you, as an individual, ensure your own supply?

By creating a buffer yourself and building up an emergency stock of basic foodstuffs - just as every family once had a flour chest. The federal government currently recommends building up emergency reserves sufficient for one week.

Can we also contribute to food security by eating?

Yes, and it's simple: we can eat more protein from plants and less from animals. Switzerland has very little arable land - only 9% of the country. And almost half of this limited area is used for fodder production. The land can be used more efficiently if people eat the grain themselves instead of feeding it to animals first and then eating it. Chickens eat twice as many calories as their meat, feeder cattle seven times as much.

How much less meat will we have to eat so that livestock can also feed on Swiss soil alone?

If the population ate half as much meat as it does today, it would no longer be necessary to import fodder. In the course of a year, 74 million chickens, pigs, cattle and cows live in Switzerland. To feed them, even half of the arable land is not enough.

Every year, 4.9 million tons of fodder have to be imported, which significantly reduces the self-sufficiency rate from 56 percent to 49 percent. This shows the important effect that an increase in the consumption of plant proteins by the population can have.

Should we therefore drink less milk?

Not necessarily, if the objective is to increase food security. It is not necessary to import a lot of feed for animals like cows, sheep or goats that graze. It is mainly pigs and poultry that are fed. More than half of their food is imported.

What is the impact of reduced meat consumption on the environment?

A large part. Almost 30 percent of the harmful effects on the environment in Switzerland are due to food production, a large part of which is due to livestock farming.

Why is protein important?

Proteins are the building material of every cell in the body and our body systems also depend on them, such as the immune system, the blood system or the hormonal system. However, unlike fat, the body cannot store protein. This makes it all the more important to eat protein-rich foods every day. If we don't, the body draws protein from the muscles for vital functions, which weakens the body and makes it more immobile.

Innovative technologies are the key to making higher elevations profitable for cultivation:

- **Robotics:** Robots could be used to grow and harvest yellow peas. This would also address the lack of skilled labor in agriculture.
- **Circular economy:** by-products from processing can be better utilized through innovative technologies. For example, cellulose from yellow pea pods and other plant parts could be used in packaging and wrapping technologies.
- **Digitization:** thanks to digitization, robots can be controlled, monitored and maintained remotely. They also allow for better coordination during production and distribution of products.
- **Artificial intelligence:** Digital data can be used to identify models for optimizing and implementing production processes along the entire value chain.
- **Cybersecurity:** A high level of cybersecurity ensures that industry players collaborate efficiently and that processing takes place with the least possible disruption.

These technologies not only facilitate access to higher ground. They can also help transform the food system and secure long-term supply along the entire value chain: if farms grow more legumes (pulses) such as beans or yellow peas, they will also need to be processed, marketed and sold in Switzerland and their by-products reintroduced into the circuit.

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May 2023

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WHAT TO DO

In the short and medium term: create buffers! The SATW experts recommend that the federal government increase the mandatory reserves of vital foodstuffs so that they are sufficient for at least six months, but preferably for a whole year; today, it has built up stocks for three to four months. Experts believe that the global food system is capable of organizing itself within six months so that it can supply the population again.

In the long term: making sufficient arable land available. The federal government must also ensure that enough arable land is available for the growing population. The question arises, however, whether all the emergency fields are still suitable for cultivation - some have been so fragmented by construction activities that they can no longer be used efficiently. Others border waterways and cannot be fertilized. Moreover, it is not known whether the quality of these soils is still sufficient despite climate change. The Swiss Farmers' Union doubts whether all of them are suitable for cultivation. The federal government has now set up the Soil Competence Centre, which is responsible for recording the quality of all soils. It is also possible to discuss the possibility of increasing productivity with the help of genetic engineering.

But Switzerland can also use other arable land in another way. To do this, it can, as the alpine farmers have done for a long time, gain altitude. Plants such as the robust yellow pea grow above favorable areas, i.e. above 550 meters above sea level - and they bring more nitrogen into the soil. However, it would be expensive to grow yellow peas there today and the result would be expensive: the first mountain yellow peas would be up to four times more expensive than the others.

EXPERT VIEWS



E
CHRISTINA SENN-JAKOBSEN

SWISS FOOD & NUTRITION VALLEY

A passionate believer in the positive power of collaboration and innovation, Christina's work centers on solving some of the most pressing global issues related to food. With a background in food science and nutrition, Christina believes food system transformation is a team sport.

In her current role as Managing Director at Swiss Food & Nutrition Valley she brings the Swiss food ecosystem together to co-create innovations that shape more future-focused food systems and aims to put Switzerland firmly on the map as a food innovation nation.

Christina holds a Master's in Food Science & Technology from the University of Copenhagen and a Master's in European Food Studies from Wageningen University. She spent the first twelve years of her career at Mondelez in roles spanning R&D, innovation management, marketing and strategy before she moved on to work with entrepreneurs and startup collaborations.

Danish by birth, Christina studied and worked in fourteen different countries before making Switzerland home in 2007, when her love of the mountains made it impossible for her to leave.

"I want to do whatever I can to boost food innovation and drive more sustainable and regenerative food systems"

FACTS

SOVEREIGNTY

ACCORDING TO CURRENT DEMAND

SELF-SUPPLY

Culture	degree of self-supply
Potato	80%
Cereals (food)	54%
Wheat (soft)	78%
Rapeseed oil	82%
Vegetables	50%
Pome fruits	101%
Fruits	31%

SWISS ENDOGENOUS PRODUCTION

50% FOR VEGETABLE PRODUCTION

According to the Economic Accounts of Agriculture, crop production accounts for 50% of the value of Switzerland's total production. This means that crop production accounts for almost half of the value of agricultural production and is therefore of major economic importance. Potatoes and fruit have the highest self-supply rates in Switzerland. The variations from one year to the next can sometimes be very significant, depending on the weather and the crop, and it is not unusual to see losses of around 40%.



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INNOVATION NEEDS TO MAKE IT OUT OF THE LABS

AN INTERVIEW OF CHRISTINA SENN-JAKOBSEN

The COVID 19 crisis, and more recently the war in Ukraine, have challenged us to think about globalization, highlighting the flow of materials and services, and our degree of interaction and even dependence in many essential sectors, including food. Since then, food-related issues have taken center stage, with talk of security of supply, food dependency and sovereignty. How do you see the stakes?

Unfortunately it's now the new norm for our food system to face geopolitical challenges. Companies and governments alike need to develop new strategies for securing food supplies. Climate change is also having an impact on agriculture, leading to failed harvests due to droughts, flooding, hailstorms, pests and plant diseases. When we consider the extent to which our soil is degraded and the fact that Earth's population continues to grow, it's clear we need to have a game plan and prioritize building resilient and sustainable food systems.

What is the situation in Switzerland in terms of dependence on imports?

Now is a good time to put strengthening domestic food production capabilities to enhance Switzerland's food security and resilience to external shocks high on the agenda. Switzerland needs to diversify how it sources its imports, invest in resilient supply chains, promote sustainable agricultural practices domestically and abroad, and engage in diplomatic efforts to address geopolitical tensions that could impact food trade.

What are your projections for the coming years?

Today we still have a window of opportunity to transform our food systems. The signals are clear - but yet the world is moving too slow. I sometimes wonder how bad it needs to get before we really go into action. These shockwaves of food insecurity will keep rolling in. The best case scenario? The food system will become more agile in adapting to shocks with the help from technologies and new products. The worst case scenario? Some countries will pay a high price for our inaction. Will we go to war over food and water? I hope not. It is up to the global food system including governments,

How can we guard against vulnerability to food crises?

We can take preventive action and develop future-proof foods and food systems which have lower carbon footprints, use less water, have better nutritional profiles, higher affordability, and scale approaches that help to regenerate our soil. Then we can aim to anticipate future needs more efficiently by, for example, developing more drought-resilient crops and scaling cultivated food production. Making a shift towards more plant-based diets would also ensure that there will be more food available globally.

Is climate change a growing threat to food security in Switzerland? How can we respond?

Switzerland is already witnessing an increase in the frequency and intensity of extreme weather events such as floods, storms, hailstorms and heatwaves/droughts caused by climate change. The agricultural sector will need to adapt to reflect this new reality - new snowmelt patterns, shifts in vegetation zones, and increased risk of natural hazards. A couple of years back, hail storms ruined a lot of farmers harvest, leading to the highest insurance payout in history.

These changes are already disrupting traditional farming practices. We need to invest in research and development to tackle these challenges as effectively as possible.

Population growth, urbanization and infrastructure expansion are putting increasing pressure on natural resources such as agricultural land and water.

Faced with the threat of a global food crisis, Syngenta CEO Erik Fyrwald denounced the lower yields of organic farming and called for increased agricultural production. A pragmatic response to global challenges?

I see this differently. Erik is referring to 100 mio hectares globally out of 5 billion hectares of farmland (i.e. 2%), which is farmed for human and planetary health. I think the answer lies elsewhere. If we combine global grazing land with the

amount of cropland used for animal feed,

80% of agricultural land is used for animal feed/production. Only 16% is used to grow food to nourish humans, as 4% is grown for non-food products. Yet this 80% of farmland contributes to only 17% of global calories. Organic farming still makes up a small percentage (2%) of global farmland and treads more lightly on our planet. Shifting towards more plant-based diets could make a much more significant contribution. And further I believe we should talk about regenerative farming.

Most countries in the world need to reduce the amount of animal products their populations consume.

There are places, also in Switzerland, where animal farming makes sense, like in Alpine regions where the pastures can not be used for crops but are ideal for grazing.

We also know that high meat consumption is not only damaging for the climate, accounting for 17% of the total global CO2 emissions, but it also has a negative impact on our health. Swiss health bodies recommend that we could reduce our current consumption from 50 kg to 20kg a year.

Meat and vegetarian substitutes: the whim of a high-income population or a solution to the challenges of sustainability?

In Switzerland, as in the other developed countries, meat analogues are a part of the journey towards sustainable diets. But not the only solutions. Eating smaller portions of meat, and better meat, chefs and consumers learning to cook great tasting vegetarian dishes or even using more veggies and less meat in a stew are all important steps in the right direction. We don't have to change the way we eat overnight. I believe that cultivated or cell-based foods will, in the long term, become a possible solution for low- and middle-income countries and play a key role in feeding the world. It's important to find solutions that work for the whole world.

In this context, what role do you see for SATW and, more generally, for academies?

I see the food transformation happening in 3 steps.

- First we need to identify the challenges. Then we need to develop the solutions. Finally - and most importantly - we need to scale the most effective solutions to maximize our impact.
- Step one is typically led by colleagues in academia. Solutions are often developed when companies or entrepreneurs draw on and apply academic knowledge to create new solutions. Then, together with the government and all other stakeholders, they need to find ways to scale their work.
- We need to get better at talking to each other. This is the only way we can be sure that we're looking at the right problems and driving the right solutions that are truly scalable.

In other words: innovation needs to make it out of the labs. But here, I think we're already on the right track.

DRUGS VACCINES

WILL OUR PHARMACIES BE EMPTY TOMORROW?

F RECLAIMING MANUFACTURING SOVEREIGNTY: A PATH TO SELF-RELIANCE

INTERVIEW DU PROF. PATRICK AEBISCHER
PRESIDENT EM EPFL, GESDA

On parle de plus en plus de pénurie de médicaments et la question de leur production indigène est souvent suggérée. Vous suivez la question depuis longtemps, comment jugez-vous son développement.

La crise du Covid et les tensions géopolitiques nous ont fait réaliser la fragilité des chaînes d'approvisionnement des médicaments. Il faut cependant distinguer diverses problématiques telles que l'accès aux vaccins, l'accès aux médicaments de base ainsi que l'accès aux médicaments innovants comme certains nouveaux anticancéreux.

Comment y répondre ?

Par des politiques distinctes sachant que chacune de ces problématiques nécessite des réponses spécifiques.

Peut-on laisser faire le marché ou doit-on avoir une politique nationale ?

Le marché doit avoir toute liberté pour développer les médicaments innovants qui demandent des investissements significatifs et sont intimement liés à un risque commercial important. La question de la sécurité de l'approvisionnement pour certains médicaments essentiels comme les antibiotiques ou les anesthésiques ainsi que l'accès aux vaccins en cas de pandémie devraient faire l'objet de discussions entre les différents acteurs afin de répondre adéquatement à ce problème de santé public.

Que devrait / peut faire la Confédération dans ce contexte ?

Déployer des politiques incitatives pour le développement de médicaments innovants, un pilier important de notre économie. Cela inclut le soutien de la recherche fondamentale, le soutien aux start-up innovantes ainsi que l'amélioration des conditions cadres pour le capital risque. La Confédération se doit en parallèle d'initier des stratégies innovantes pour faciliter l'accès aux médicaments essentiels ainsi qu'aux vaccins. Elle vient de le faire dans le cadre des vaccins en publiant un document intitulé « Stratégie de promotion à long terme de la recherche, du développement et de la production de vaccins en Suisse ».

Qu'attendez-vous des producteurs de médicaments / vaccins ?

Qu'ils soient moins dépendants de la Chine et de l'Inde pour la production d'ingrédients pharmaceutiques actifs (API: active pharmaceutical ingredients) et qu'ils développent des technologies permettant la miniaturisation, la décentralisation et la personnalisation de la production des principes actifs. Cette approche commence à porter ses fruits pour les thérapies cellulaires ou la production d'ARN messenger.

Comment voyez-vous le développement de la problématique du manque de médicament évoluer ces prochaines années ?

Elle risque de continuer à se détériorer si l'Europe n'instaure pas d'incitations financières pour encourager les producteurs d'ingrédients actifs à s'installer sur le vieux continent. La Suisse, avec son « know how » en chimie et en matière de technologies de production a une carte importante à jouer.

Qu'est-ce que cela signifie pour les patients? On parle souvent de substitution ? Possible dans quels cas? Quelles problématiques se posent ?

La substitution et la fragmentation des doses offrent des solutions transitoires pour certains médicaments en rupture de stock. Mais elles ne résolvent pas le problème de fonds.

D'un côté, au vu du coût de la santé, le prix des médicaments est dans le viseur, d'un autre, des prix trop bas ne motivent pas les producteurs ? Comment agir de façon plus ciblée et efficace ?

Les problématiques sont différentes selon qu'on parle de médicaments innovants, où il est important de récompenser le risque pris par les entreprises pharmaceutiques, ou de médicaments essentiels dont l'approvisionnement doit être assuré. Le cas des antibiotiques constitue à cet égard un exemple intéressant. L'accès aux antibiotiques de base devrait être assuré avec une production autochtone. Le secteur public devrait également encourager un nouveau modèle d'affaire pour le développement et la fabrication de nouveaux antibiotiques afin de faire face au développement de la résistance à ces derniers. Les entreprises pharmaceutiques sont effectivement peu enclines à développer de nouveaux antibiotiques onéreux qui ne peuvent être utilisés qu'en dernier recours.

Des voix suggèrent que la confédération coordonne la production de médicaments, vaccins pour assurer son autonomie. Votre avis sur le sujet ? pour les vaccins, pour les médicaments « simples » de « basse technologie » et ceux faisant appel aux « dernières technologies » ?

La crise du Covid nous a montré combien la position de la Suisse était fragile pour l'accès aux vaccins. Nous sommes un petit marché et donc peu intéressant pour les grandes entreprises pharmaceutiques qui développent des vaccins en cas de pandémie. Même si le principe actif du vaccin à base d'ARN messenger de Moderna était fabriqué en Suisse par la Lonza, il n'a pas été aisé pour la Confédération d'obtenir ces vaccins. Moderna est une compagnie américaine, elle devait en priorité servir le marché américain. Le développement des vaccins à base d'ARN messenger offre cependant la possibilité pour les Etats de regagner leur souveraineté de fabrication. Grâce à la miniaturisation de la technologie de production, ces vaccins

peuvent désormais être fabriqués rapidement par des petites entités et à un coût compétitif. Cette approche devrait permettre à la Suisse et à d'autres petits pays de mieux se préparer à une prochaine pandémie.

Quelles sont les actions concrètes que vous pilotez / accompagnez ?

Nous avons récemment créé Swiss Vaccine SA, une compagnie basée sur un concept de partenariat public / privé pour la production de vaccins à ARN messenger. Cette technologie a l'avantage de la rapidité de production et d'extensibilité (scale-up). La miniaturisation de la technologie permet de développer une unité de production de moins de 2000 m2 capable de produire des vaccins GMP (Good manufacturing practice) à base d'ARN messenger contre les virus émergents et autres pandémies. L'objectif à terme est d'octroyer à la Suisse une indépendance en matière vaccinale. Cette entité aura une capacité de production de 20 millions de doses en moins de 100 jours, ce qui faciliterait grandement la gestion d'une pandémie. Hors pandémie, cette entité pourra contribuer à la préparation à une pandémie (pandemic preparedness) en produisant des vaccins expérimentaux contre des agents infectieux potentiellement pandémiques tels que la grippe aviaire. Elle pourra également produire de l'ARN messenger de qualité GMP pour des essais cliniques en oncologie ou en thérapie génique (édition génétique) pour des start-up suisses et étrangères développant ces nouvelles approches. L'entité pourrait ainsi maintenir son excellence de production en dehors d'un épisode pandémique. A cet égard, la stratégie de la Confédération envisage une aide financière pour le soutien compétitif de la recherche et des essais cliniques. Ce concept novateur prévoit également la possibilité d'octroyer un financement de base pour la réservation d'une capacité de production de vaccins dans le cas d'une future pandémie (reservation fee), garantissant ainsi au pays cette souveraineté vaccinale qui a fait défaut dans le cas de la pandémie de SARS-Cov 2. Un concept similaire pourrait être appliqué pour certains médicaments essentiels comme les antibiotiques.



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**PROF. DR. MD
PATRICK
AEBISCHER**

EPFL | GESDA

Patrick Aebischer is a senior partner at +ND Capital and chairman of the Novartis Venture Fund. He is the former president of EPFL, the Swiss Federal Institute of Technology Lausanne (2000 - 2016). He serves on the board of Nestlé, Logitech and Polypeptide Group and previously Lonza. Patrick Aebischer is the founder of four biotechnology companies. He is the vice-chairman of GESDA, the Geneva Science and Diplomacy Anticipator. He studied Medicine and Neurosciences at the University of Fribourg and Geneva.

"The long-term goal is to grant Switzerland independence in vaccine production"

EXPERT VIEW

DISCARD AFTER USE

G PROMOTING TAILORED SOLUTIONS TO ANTICIPATE SHORTAGES

AN INTERVIEW OF CATHARINA BOEHME
DIRECTOR-GENERAL FOR EXTERNAL RELATIONS
AND GOVERNANCE OF THE WORLD HEALTH ORGANIZATION (WHO)

Medicine shortages are being discussed more frequently in the media, but WHO has been following the topic for several years. Could you provide some background?

Shortages occur for different reasons, but the increasing number of climate and other health-related emergencies often leads to large and unexpected spikes in demand. Another concern is that there are around 40 countries globally that monitor medicines shortages, but we still have many regions where information is not available and where shortages are likely to be occurring. In those cases, a shortage that goes undetected can quickly lead to a stockout, with serious negative impact on public health systems.

WHO and national medicines regulatory authorities, mainly from industrialized countries, have been following the problem. The number of shortages increased drastically during the COVID-19 pandemic, with a complex landscape, including unprecedented problems such as border closures preventing trade of materials. Shortages are not new, but the pandemic has spotlighted the issue. Outside of pandemics and emergencies, WHO focuses on shortages of medicines that are included on the WHO Model List of Essential Medicines, which is a list considered to be necessary for basic health system functioning. A review of current data sources suggests that up to 20% of medicines currently in shortage are on this list of Essential Medicines.

The problem is serious, and it is important to understand that there is not a one-size-fits all solution to shortages. The technical, manufacturing and clinical implications vary from medicine to medicine. Reporting and monitoring of shortages by WHO and national regulatory authorities, including Swissmedic, may not be popular in a commercial sense, but timely awareness and action is critical to avoid a complete stockout. Recent data reviewed by WHO from a large national market suggests that up to 40% of shortages could be resolved without significant negative impact depending on the context and actions taken.

Has the situation become worse since the COVID-19 Pandemic?

Since 2021, the number of medicines reported to be in shortage affecting two or more countries has increased by over 100%. While this increase sounds alarming, there are two sides. One is that we are getting better at reporting and monitoring, so are likely to be finding more shortages that were not reported prior to the COVID-19 pandemic. The other is that the pandemic had

an impact on supply chains where there can be a whiplash effect as corrections move forward. This can take significant time to correct, and in some cases, even years.

Are there some medicines that are more susceptible? Can you provide examples?

Shortages are dynamic and can occur at any time for any product, but some medicines have chronic problems, such as older antibiotics and some injectable medicines. There are cases where manufacturers of older antibiotics have left the market because of pressures to reduce prices to levels that are not commercially viable. For injectable medicines, the manufacturing process is more complex, and it can be difficult to ramp up manufacturing to compensate for a problem. Shortages can occur unexpectedly for several reasons, including a manufacturer that discontinues production, a quality related recall and surges in demand, to name just a few. Not all of these can be predicted.

What are the potential solutions?

Each shortage is different. In some cases, there are short term solutions while others require longer term action. The shortage can have a broad impact or can be limited to a small group of patients. Two examples that highlight the problems and the different solutions required are paediatric tuberculosis (TB) medicines and certain diabetes medicines being used for weight loss.

Tuberculosis medicines are older medicines, and they treat a patient base of around 10 million people annually, which is a relatively small market. There are shortages of several adult products that have been ongoing for approximately a year, but shortages of pediatric TB medicines have a longer history. Treating children with TB is a patient base of roughly 1 million per year, divided across around 25+ high burden countries. This was always a small and commercially fragile market to sustain, but in 2014, a change in clinical guidelines left paediatric patients without an appropriate treatment on the market. The solution in that case was a market shaping activity with support from UNITAID, WHO and other partners to incentivize the development of new products, including a sustainable price structure and a procurement agency to manage demand planning. This type of long-term solution is not always necessary, but in this case was important. The work on TB remains ongoing and includes Swiss companies, who are engaging in manufacturing and research into newer and more sustainable treatments.

Another example is a group of diabetes medicines known as “glucagon-like peptide 1 receptor agonist” products. They are more commonly known by their brand names, such as Ozempic and Wegovy. Demand went up by nearly 200% when they were approved for weight loss in addition to their initial use for diabetic patients. The resulting shortage for diabetic patients is significant, and many cannot be easily switched to another medicine. This shortage, considering the very high demand for the product, has also led to substandard and falsified medicines entering markets. WHO issued an alert in January of this year to that effect. Several regulatory agencies have also issued alerts on falsified products and legal actions are underway to locate and stop all such manufacturing and distribution.

What are examples of WHO's work in this area?

WHO works with medicine regulators and major procurement agencies to anticipate shortages. Using applications developed by WHO that harvest publicly available information, we monitor for shortages of Essential Medicines. We particularly

monitor for medicines that are affecting multiple countries. The data that we gather is kept confidential and only provided to regulatory authorities. WHO also works with regulatory agencies and government procurement agencies to build capacity, including detecting and responding to shortages.

Does WHO work with industry on this problem?

There are ongoing discussions with WHO and industry associations about developing means to improve forecasts for Essential Medicines as well as approaches on predicting shortages in countries where visibility is extremely limited. There is no one-size-fits all solution, but governments have started working with national industry members to increase inventories of certain products. For low- and middle-income countries, the options are more limited.

Do we often talk about substitution? In what cases is it possible? What are the issues involved?

Regulatory authorities are the ones to give advice in a specific country, including whether to substitute with a clinically appropriate alternative or an alternative supply source. These are generally short-term solutions and are not always possible. A clinically appropriate alternative may be available in some cases, but depending on the nature of the substitution, it may not be suitable for all patients. Using an alternate supply source means a rapid market authorization from the national regulatory authority for a new supplier. The regulator in each country is the one to make these decisions and recommendations, considering the national context. Questions for them might include how broadly a particular medicine is used, the risks of using a clinically appropriate alternative, clinical capacity to manage an alternative in cases of specialized treatments, or the risks of an unknown supplier.

If nothing is done, will the market self-correct?

No, history is fairly clear that measures to reduce the negative impact of shortages require co-operation between industry members, regulatory agencies, large procurers and others.

How is it that we hear that health care costs are too high, while some medicines are commercially difficult to maintain due to price pressures?

There are estimates in the global medicines market that predict a growth of around 6% per year; however, most of this growth comes from new, patented medicines, where many are highly specialized and expensive. For older generic products, there are situations where pricing policies can have unintended consequences if they are not implemented well, including prices that are not sustainable. Depending on several factors, including a company's manufacturing capacity, a medicine with low profitability may be a lost opportunity cost for more commercially viable products, leading to discontinuations.

While a price on a national market is managed at national level, there are also initiatives to promote regional cooperation on pricing policies to reduce the risks of unintended consequences. Improved communication with manufacturers on forecasting models can support multi-country price negotiations, particularly when they consider the variability of purchasing power of countries. Preliminary market consultation with the private sector, innovative contracting and joint procurement schemes are a few examples of such collaborative activities.

Some people suggest that the confederation should coordinate the production of medicines and vaccines to ensure its autonomy. What's your opinion on the subject? For vaccines, for “simple” “low-tech” drugs, using the latest technologies?

There are strategies to diversify the supply chain for medicines that are being considered by several countries. Regulators, including Swissmedic, do already intervene in certain cases to support manufacturers in managing a specific shortage. In terms of shifting to centralized government-coordinated procurement and contracting versus other models, there are many factors that impact the success of a particular model, and WHO would encourage thorough assessments be made if a shift is being considered. Manufacturing technologies that facilitate rapid scale up of production during emergencies are also promising, but each use case is different and needs to be assessed according to the context of the medicine.



World Health Organization



G CATHARINA BOEHME

WHO - OMS

Catharina Boehme is the Assistant Director-General for External Relations and Governance of the World Health Organization. She previously served as CEO of FIND, an international non-profit organization headquartered in Geneva, Switzerland that drives the development and delivery of diagnostic tests for diseases of poverty. Catharina holds a MD from Ludwig Maximilians University in Munich and Heidelberg University, Germany, as well as diplomas in Public Health and Executive Development. She is the Chair of the New Diagnostics Working Group of the Stop TB Partnership and serves on several Public Health Advisory Committees (WHO TB STAG; EU Horizon 2020 Dx; Australian Innovation Exchange Programme). She has more than 100 publications. Prior to joining FIND, she worked for the Department of Infectious and Tropical Diseases in Munich and established a TB diagnostic research unit at Mbeya Medical Research Program in Tanzania.

"WHO works with medicine regulators and major procurement agencies to anticipate shortages"

THE NETWORK
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SATW

SWISS ACADEMY OF ENGINEERING SCIENCES

NEWLY ELECTED MEMBERS - 2024

VISION

AS SWITZERLAND'S LARGEST NETWORK OF EXPERTS IN THE FIELD OF TECHNICAL SCIENCES, OUR GOAL IS TO STRENGTHEN SWITZERLAND'S LEADING POSITION IN THIS FIELD AND TO SUPPORT THE APPLICATION OF KNOWLEDGE IN TECHNOLOGIES AND INNOVATIONS FOR THE BENEFIT OF THE ECONOMY AND SOCIETY.

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MEMBER COMPANIES

NETWORK

SATW promotes collaboration between industry, research and educational institutions and creates a network of leading national and international technical experts and organizations.

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INDIVIDUAL MEMBERS

INDUSTRY AND ACADEMIA

The individual members are eminent personalities from the world of teaching, research, business and politics. They are appointed for life.

satw technology for society



PROF. JÜRGEN BRUGGER has been appointed a Full Member of SATW in recognition of his contributions to the integration of new materials in micro- and nanotechnologies and for innovations in teaching for the next generations of microsystems engineers.



DR. MARTIN FORRER has been appointed a Full Member of SATW in recognition of his exceptional achievements in the industrial development of photonics applications and for his social engagement in photonics.



PROF. CHRISTOPH STETLER has been appointed a Full Member of SATW in recognition of his outstanding achievements in the development and clinical translation of innovative technical solutions with a holistic approach to diabetes treatment support.



PROF. ANNALISA MANERA has been appointed a Full Member of SATW in recognition of her research into nuclear reactor safety and her knowledgeable public contributions to explaining complex interrelated issues associated with nuclear energy.



DR. ALAIN-SERGE PORRET has been appointed a Full Member of SATW in recognition of his exceptional contribution to microelectronics and his contributions to the launch of numerous world technology firsts that have had a major economic impact.

PROF. ANNA FONTCUBERTA I MORRAL has been appointed a Full Member of SATW in recognition of her outstanding and significant contribution to the development of materials that facilitate technological breakthroughs by exploiting nanometre-scale phenomena.

"SATW plays an important role in representing the technical-scientific interests of all Switzerland"

PROF. ANNA VALENTE has been appointed a Full Member of SATW in recognition of her achievements on behalf of Switzerland as a centre of academic and business activity by linking innovative research approaches with industrial- and manufacturing-technology applications.



PROF. MARCO HUTTER has been appointed a Full Member of SATW in recognition of his exceptional research results in the field of autonomous walking robots and his outstanding commitment as a co-founder of various robotics start-ups.



PROF. AGATHE KOLLER has been appointed a Full Member of SATW in recognition of her outstanding contributions to research, teaching and knowledge transfer in laboratory automation, robotics and medical technology, all fields that are important for Swiss industry.



PROF. UELI MAURER has been appointed a Full Member of SATW in recognition of his fundamental contributions to cryptography and information security.



THOMAS C. NORDMANN has been appointed a Full Member of SATW in recognition of his outstanding dedication as an entrepreneur and pioneer of the successful implementation and promotion of solar thermal and photovoltaic solar energy in Switzerland.



DR. MARIE-CHRISTINE SAWLEY has been appointed a Full Member of SATW in recognition of her pioneering work as a scientist and engineer in the introduction and use of supercomputers in Switzerland and abroad.



MARKUS SIMMEN has been appointed a Full Member of SATW in recognition of his many years of dedication to the continuous development of a Swiss SME into an important medical technology company, to the promotion of innovation, new technologies and dialogue with universities of applied sciences, including in support of the promotion of young engineers.



PROF. FRANCESCO STELLACCI has been appointed a Full Member of SATW in recognition of his exceptional, visionary contributions to materials science and nanoscience and his groundbreaking approaches to the development of broad-spectrum virucides.

NEW MEMBERS 2024

SATW COMMITTEE

- Dr. Benoit Dubuis, (President) benoit.dubuis@satw.ch
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SECRETARIAT

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MEMBERS

Coming from all fields of technology and all regions of the country, SATW members are nominated and elected by their peers. They volunteer for the Academy's activities in the service of society as a whole.

The true value of the Swiss Academy of Engineering Sciences (SATW) lies undoubtedly in its members. It is they who, through their expertise and diverse backgrounds, form the heart and strength of the organization. Each of them possesses unique knowledge in a wide range of technological fields, whether it be in fundamental research, applied innovation, cutting-edge industries, or new entrepreneurial practices. The members of SATW come from academic, industrial, and entrepreneurial environments. This diversity of origins and perspectives allows the Academy to have a comprehensive and nuanced view of the current technological challenges. In addition to their technical expertise, they are in daily contact with the public, as well as the political world, enabling them to maintain a keen understanding of the challenges and expectations society faces. SATW acts as a catalyst for reflection,

and informed decision-making in the field of technology. It is able to initiate debates, propose solutions, and amplify expert voices on issues shaping the future. However, this work, no matter how relevant and vital, would not be possible without the unique knowledge and experience its members bring. Their commitment, networks, and ability to anticipate trends are what enable SATW to play an essential role in the evolution of technology and its interaction with our daily lives. Ultimately, SATW is more than just an organization: it is the result of a rich and dynamic collaboration among experts from various fields. It is thanks to the engagement of its members that the Academy can fulfill its mission to support innovation, inform decision-makers, and prepare society for the technological transformations ahead. Their expertise is the true driving force behind our collective success.



SAVE THE DATE
SATW ANNUAL CONGRESS
TUESDAY, MAY 27TH 2025
FHNW CAMPUS MUTTENZ
NEXT-GEN PHARMA: AI & QUANTUM
This conference will explore how the integration of advanced technologies, such as Artificial Intelligence and Quantum, is redefining the landscape of pharmaceutical research and development.