

ECHT PROJECT OUTPUT

Theory of Change for Chemical Traceability in Textile Value Chains in 2040



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The Theory of Change presented in this document is a co-creative result of the ECHT project consortium as composed at the time of development:

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Luxinnovation G.I.E.
Sympany
Techtera

Darmstadt University of Applied Sciences, 2025

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Methodological Background

Aiming to change complex systems represents a particularly difficult endeavour because this requires long-term impact, which is influenced by a number of confounding factors. A key challenge lies in the fact that actions need to be taken right now, while their actual effects are beyond the scope of the activity itself. What sounds rather abstract has been theorised by researchers and coined by the term “Theory of Change” (e.g. Claus & Belcher, 2020). Claus and Belcher (Fig. 1) differentiate between three spheres when aiming for long-term impact in complex systems:

- 1. The Sphere of Control** refers to all aspects a group can actually control, i.e. by conducting specific activities that lead to certain outputs. Since the members of this group are themselves active in these activities and produce these outputs, they can control how and what is done.
- 2. The Sphere of Influence** is affected by the outputs of the **Sphere of Control**, but is not directly controlled by the group. Instead, the outputs of the Sphere of Control create or at least shape mid-term outcomes.

- 3.** These outcomes (which are also influenced by other processes outside the group’s scope) ultimately influence the long-term impact the group seeks to achieve. This impact lies in the **Sphere of Interest** that is neither controlled by nor directly linked to the group, but only mediated through a chain of causal relationships.

The “Theory of Change” (ToC) method is a valuable tool for designing (“roadmapping”) and monitoring of system innovations. It allows individual steps and sub-measures to be captured and examined in a structured way, taking into account the respective impact relationships. Against this background, the ToC extends the perspective beyond the directly workable aspects of a project and includes parallel developments with regard to the overall goal orientation. In summary, the ToC has several functions: on the one hand, it creates structures and points out systemic weaknesses in the project. The development of a ToC is based on an iterative process that reflects measures and projects in relation to their effects and makes necessary upstream measures visible. On the other hand, it can be used as a communication tool, as it reduces complex transformation processes to their essentials. Finally, it provides starting points for the development of project performance indicators.

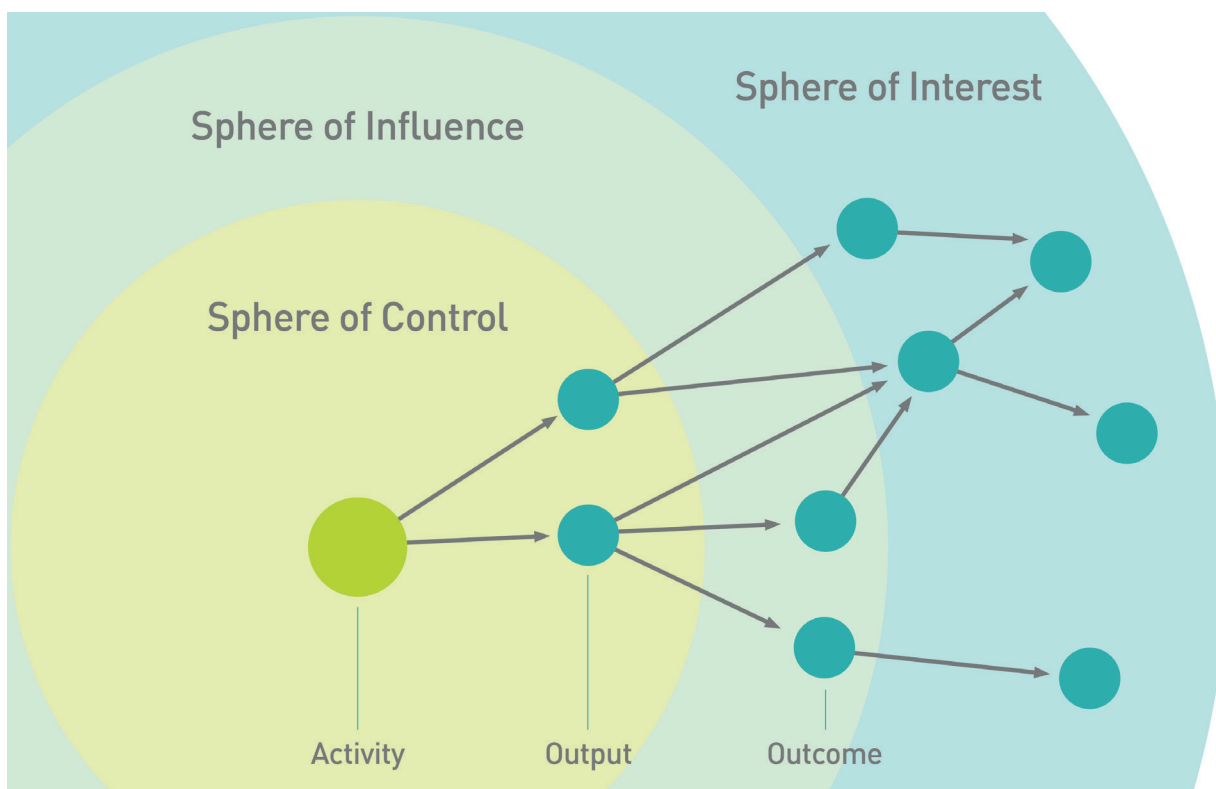


Fig. 1) Concept of „Theory of Change“ based on Claus and Belcher, 2020

With regard to the project at hand and chemicals in global textile value chains, the project group does not have sufficient power and size to directly influence the entire system. The desired changes require complex, subsequent and long-term processes of which the project group can only control a small part. However, the key to unlocking the potential of this project is to understand the complex system and form a logical structure of how to most effectively influence these processes.

ToC for Chemical Traceability

In line with this assumption, the project group developed a Theory of Change for “Chemical Traceability in Textile Value Chains in 2040” in a series of workshops and asynchronous work phases over a period of several months (2024). In a back-casting process, starting from a future vision (targeted impact outlined in the scenario story / Sphere of Interest), long-term and mid-term outcomes (Sphere of Influence) as well as short-term activities and outputs (Sphere of Control), outcomes were formulated and aligned with the overall project structure (see p. 6).

The overall goal of the ToC is represented by the scenario story “Empowered by Transparency” the project team envisioned:

“In 2040, chemicals traceability in the global textile apparel value chain is fully in place. This is possible thanks to the Digital Product Passport (DPP) that has been introduced globally and expands beyond the use phase of textile apparel. Reliable data on chemicals in products and processes is now recognised as an important aspect of business models in all value chains. Accordingly, the textile apparel value chains have made significant progress towards a nontoxic, climate-neutral, resource-preserving circular textile apparel economy.”

Four lines of separate but interdependent developments are displayed in the Sphere of Influence that make the overall impact possible:

1. Enforced regulations and implemented standards are the result of a progressive harmonised regulatory process with clear and actionable requirements

for all relevant stakeholders, collaboratively developed industry standards and effective enforcement routines.

2. The availability of reliable data on chemicals in products and processes depends on three parallel processes: The mindset of the industry (incl. SMEs) is being adapted to a perspective of traceability and substitution as the “new norm”. There is an obligation to declare chemicals in both products and processes. Specific standards are being established for the disclosure of chemical formulas, including what data is disclosed to whom and how, while protecting the intellectual property and business interests of all parties.

3. A technical ecosystem to enable data exchange is established and depends on four different processes: Capacity is built up along the entire value chain including both know-how and human resources. Standards for data formats and exchange are agreed upon, allowing all members of the value chain to participate in the process. An effective conceptual system for exchange is scaled-up globally. This is closely linked to physical traceability solutions that are both feasible and user-friendly for all value chains members who need to participate.

4. Informed decision-making in favour of chemically sustainable textile products is taking place along the entire value chain (incl. consumers, companies and governments). This is based on the majority of the global public being aware of the relevance of this topic and caring about these processes. Customers (B2C, B2B and GPP) have access to information according to their individual needs and competences regarding the specific decision-making process. Product development and product design teams have access to information to support their processes in line with the aforementioned objectives of this ToC.

The main purpose of this ToC is to inform the implementation of the ECHT project in order to increase its effectiveness and impact towards the vision mentioned before. In line with this, specific activities and outputs have been formulated and designed to address the mid-term outcomes described above. These activities and outputs are structured according to the logic of the overall project, which is divided into five major work packages:

three Action Plans (policy, textile apparel and rugs/ carpets), a set of Training Schemes and the Knowledge Platform.

A detailed description of the individual tasks and outputs is beyond this introductory paper and can be found in Figure 2 (page 6). However, it is worth noting that all of the five work packages are interlinked and feed into each other, while the Knowledge Platform acts as a central hub for information and dissemination and is therefore a foundation for the other four work packages. All activities and outputs do not address a specific mid-term outcome, but are intended to work synergistically to influence a set of mid-term outcomes that in turn aim to influence long-term outcomes eventually having an overall impact on the system at hand.

The Theory of Change is a living document that can be revisited and adapted throughout the project.

REFERENCES:

Claus, Rachel; Belcher, Brian (2020): Theory of change. Hg. v. Swiss Academies of Arts and Sciences: td-net toolbox for co-producing knowledge (td-net toolbox profile, 5) available online at www.transdisciplinarity.ch/toolbox.

THEORY OF CHANGE: TRACEABILITY OF CHEMICALS IN TEXTILE VALUE CHAINS IN 2040

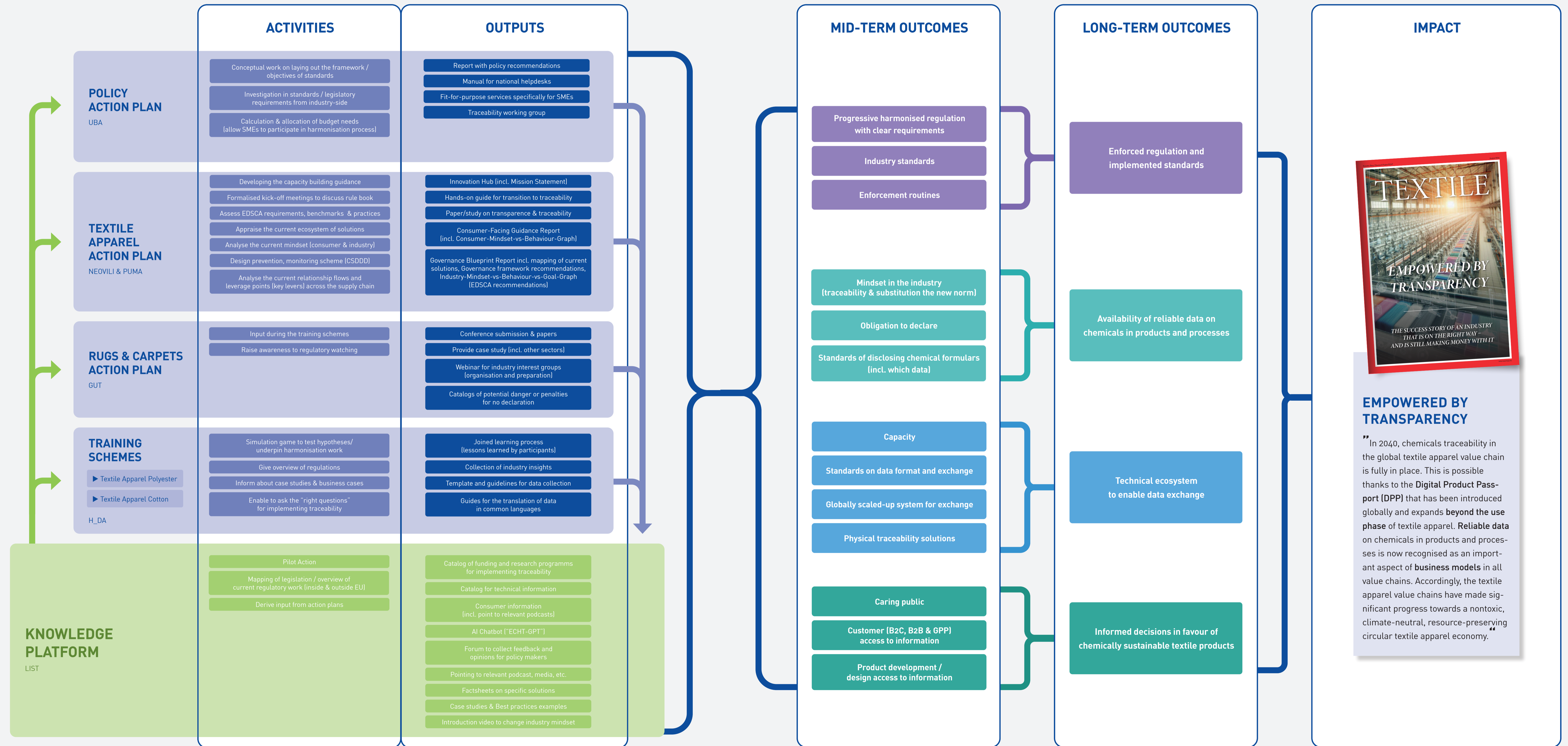


Fig. 2) Output from the transdisciplinary research project "ECHT - Enable Digital Product Passports with Chemicals Traceability for a Circular Economy". REVIEW VERSION - 08.10.2024 - For more information visit: <https://echt.nweurope.eu/>

TEXTILE

EMPOWERED BY TRANSPARENCY

*THE SUCCESS STORY OF AN INDUSTRY
THAT IS ON THE RIGHT WAY –
AND IS STILL MAKING MONEY WITH IT*

Empowered by Transparency

The success story of an industry that is on the right way – and is still making money with it

BY ECHT PROJECT CONSORTIUM

IN 2040, CHEMICALS TRACEABILITY IN THE GLOBAL TEXTILE APPAREL VALUE CHAIN IS FULLY IN PLACE. This is possible thanks to the Digital Product Passport (DPP) that has been introduced globally and expands beyond the use phase of textile apparel. Reliable data on chemicals in products and processes is now recognised as an important aspect of business models in all value chains. Accordingly, the textile apparel value chains have made significant progress towards a non-toxic, climate-neutral, resource-preserving circular textile apparel economy.

SOMEONE HAS TO MAKE A START

The starting point for this transformation was an active, critical public: concerned citizens, supported by NGOs, were increasingly informed about the dangers of hazardous chemicals for humans and nature and questioned the safety of textile apparel products they currently bought and used. 2026 marked the turning point and led in subsequent years to a continuous shift in consumer behaviour that demanded more substantiated information and, as a result, significantly extended the use phase of their textile apparel products.

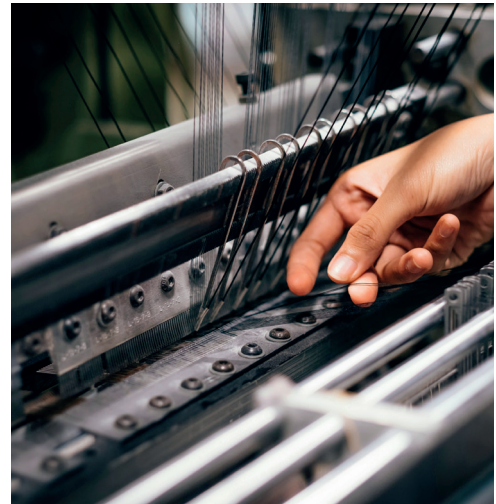
At the same time, EU regulations on traceability and transparency were tightened, which include specific obligations to report substances in

products and processes. Sanctions were imposed for non-compliance. Due to the globalisation of markets and, above all, the work in several projects and initiatives (e.g. UNEP, ZDHC), there has been a corresponding increase in harmonisation of other legal frameworks worldwide, which use EU regulations as a model.

In the EU in particular, strategies such as the “Green Deal” and its associated actions plans (regulations, directives, etc.) were largely enforced by national administrations, while public authorities cooperated effectively, creating significant pressure – and reassurance – on industry actors, who gradually changed their mindset and ensured greater transparency and a level playing field. A growing consumer awareness for more sustainable consumption, which enables corresponding business models, has clearly supported this. As a result, both the textile and chemical industries as well as related industry actors invested substantially in traceability capacities (both human resources and infrastructure).

STEPS ALONG THE WAY

Against the background of this development, new structures for acquisition and dissemination of scientific knowledge of chemical substances



(including toxicity profiles) were created with the support of the chemical industry, which led to a significantly higher knowledge output and uptake from academia and industry.

Actual traceability was enabled and realised due to several factors: The first cornerstone were global, industry-wide traceability standards driven by industry actors on issues such as data, information provision, formats and data protection. This has been supported by continuous innovation in traceability technology that eventually had specific requirements which could be applied to efficient development processes. In line with industry demand, an efficient global infrastructure for traceability was created through standardised processes and formats as well as innovations in new business models and services. In practice, this window of opportunity was utilised by first movers who had prepared their value chains accordingly (data readiness). Industry associations and cooperations such as ZDHC supported the distribution of these best practices and the establishment of industry-wide rules that recognized the overall benefits of cooperation both within value chains and among peers.

THE GUIDE TO SUCCESS

The chemical industry was involved in every step of this process and was included in a feedback loop of information provision and product demand. The chemical industry actors that provided sufficient information about their chemical products, while ensuring high quality of data, had a market advantage as the textile industry depended on access to this information. A key to this system was the global introduction of the Digital Product Passport (DPP), which is both a physical (tracking technology) and a non-physical entity that expands beyond the use phase.

Finally, the global business ecosystem of chemical and textile companies has recognised traceability as a driving force for both financial success and environmental protection. Greater transparency enabled fairer markets and encouraged the trend towards more globally balanced location factors. While legislation initially was one of the primary drivers, the process has evolved naturally involving more and more stakeholders. This success story is not an end in itself, but continues to serve as a driver for all in the textile apparel value chains and as an inspiration for neighbouring sectors. Because in the end, the goal is a truly circular economy.

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Empowered by Transparency - The success story of an industry that is on the right way – and is still making money with it.

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Darmstadt University of Applied Sciences, 2024

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Disclaimer

This document does not report on actual events and developments but is merely a fictional story of a potential scenario for the global textile apparel value chains in 2040. It is the result of the transdisciplinary research project “ECHT - Enable Digital Product Passports with Chemicals Traceability for a Circular Economy”. The project is funded by Interreg North-West Europe (2024-2026).

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