● Summary Report for Embassy and Government Review

This report consists of three pages.

The first page outlines the diplomatic and policy relevance of the proposal, the second explains the technological integration of TinyML and the 18KB AI, and the third presents deployment scenarios in disaster management, public safety, and healthcare, along with cost and governance recommendations. All descriptions are written in narrative form without tables.

● Page One. Alignment with Luxembourg's Policy and Diplomatic Significance

The core of this proposal is to deploy an ultra-light autonomous artificial intelligence that operates entirely offline for public purposes, achieving real-world impact grounded in data sovereignty and human rights protection. Luxembourg has long adopted human-centered and trustworthy AI, as well as digital sovereignty, as pillars of its national strategy. This initiative is fully aligned with those directions.

Its underlying philosophy is to minimize personal data collection, enable local decision-making without centralized servers, and ensure ethical control by default—transferring authority immediately to humans whenever human intervention is detected. This approach naturally corresponds with the EU's risk-based regulatory framework, human oversight principles, and rules of privacy and data minimization. It also complements Luxembourg's human-rights-based and digitally inclusive approach to development cooperation by providing a cross-border, public-interest model.

From the perspective of human-centricity and sovereignty, this proposal avoids the vulnerabilities of centralized AI systems. Even in conditions of unstable internet connectivity or damaged communication infrastructure, it continues to operate under ultra-low power, interprets local data, and initiates safety measures immediately. These characteristics contribute to public-service continuity in both normal and emergency situations. The modular and replicable design also considers ease of repair and replacement in developing contexts while offering high mobility and cost-efficiency for disaster response, public safety, and preventive healthcare in advanced economies. In short, it technically embodies the values of trust, universality, and social impact that Luxembourg aims to uphold.

● Page Two. Synergy Between TinyML (Sensory Function) and 18KB AI (Cognitive Function)

The technical architecture is based on a division of labor between sensing and reasoning. TinyML, operating on microcontrollers, converts physical signals such as temperature, vibration, heart rate, and soil moisture into compact feature values. The 18KB AI receives these inputs and performs reward-based learning and policy updating.

Its distinctive features are as follows. First, learning, inference, and ethical control all take place entirely on-device. The 18KB AI autonomously improves performance without network access and can function for long periods on battery power even under unstable electricity. Second, it records success and failure locally in concise form, adjusting its internal policy during the next cycle. This allows adaptation to field conditions without server-based learning, converging toward optimal behaviors through accumulated performance ratios. Third, an ethical safeguard halts autonomous operation whenever human intervention is detected, transferring control immediately to the user. This ensures both explainability and responsible use.

The combination of sensory input (TinyML) and decision-making (18KB AI) yields clear practical advantages. It responds rapidly to danger signals due to minimal latency, automatically adapts to seasonal or environmental variations in sensor patterns, reduces false positives and misses, and eliminates external data transmission, significantly reducing legal and ethical burdens in protecting vulnerable groups such as children, persons with disabilities, and refugees. Because it is implemented on a single small semiconductor chip, production and maintenance costs remain low, and faulty units can be easily replaced on site. Its compact, transparent code structure further facilitates auditing, verification, and certification. Together, TinyML as the sensory layer and the 18KB AI as the learning and ethical reasoning layer define a scalable, lightweight standard for autonomous AI across disaster management, healthcare, education, agriculture, and water management.

● Page Three. Deployment, Cost, and Governance Proposals

In advanced economies, this technology addresses the practical challenges of communication failure and power outages during disasters. In earthquakes, fires, floods, or blackouts—when central clouds are inaccessible and heavy equipment may be delayed—these devices operate instantly on site, detecting smoke, vibration, gas leakage, or temperature anomalies, issuing local alarms, and prompting human response through limited autonomous

judgment. In security contexts, they recognize irregular patterns such as intrusions or vandalism in public spaces at night and combine automated alerts with manual verification. In healthcare and caregiving, they detect anomalies in heart rate or movement within the device itself and trigger caregiver alerts while ensuring that no personal data leaves the device. In agriculture and water management, they link soil-moisture sensing to pump control, reducing water consumption and improving yield stability. The absence of network or server dependency makes them a practical supplementary intelligence layer across both urban and rural infrastructure, in normal and emergency conditions alike.

The realistic production target is between ten and fifteen US dollars per unit. This range covers a microcontroller, basic sensors, and simple display or alert components. Depending on casing, power module, and waterproofing level, the cost may vary, but large-scale procurement and standardization make this price point achievable. Ongoing costs remain minimal due to low power consumption and the absence of communication fees. This cost-efficiency enables wide deployment in public facilities, schools, hospitals, and care homes in advanced economies, while remaining affordable for development cooperation programs.

Governance should combine open verification with local accountability. The code must remain simple enough for public auditing, and recorded parameters should be exportable in human-readable form. Policy and ethical standards should be periodically reviewed through collaboration among public institutions, academia, and user communities. Deployment should begin with small pilot groups, iteratively refining thresholds and procedures through logged successes and failures before scaling up. Luxembourg’s open innovation culture and its human-rights-based approach to development cooperation position it ideally to institutionalize this lightweight autonomous AI both domestically and internationally.

In conclusion, this proposal presents an ultra-light autonomous AI system that embodies trust and digital sovereignty through its architecture. Its restraint in cost, power, and data usage signals the emergence of a small yet resilient form of public-interest intelligence. By pioneering this standard, Luxembourg can strengthen public safety and welfare at home while establishing itself globally as a model state for ethical and practical artificial intelligence.